

Training Manual

Revision A
July 2013
Part Number 11-MM-10025

MES 2012 – Operations



INFORMATION IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE.

© 2013 by Invensys Systems, Inc. All rights reserved. No part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise), or for any purpose, without the express written permission of Invensys Systems, Inc. Except where noted, the companies, organizations, products, domain names, e-mail addresses, logos, people, places and events depicted herein are fictitious and no association with any real company, organization, product, domain name, e-mail address, logo, person, place or event is intended or should be inferred.

Invensys and the author(s) assume no responsibility for errors or omissions and no liability is assumed for damages resulting from the use of the information contained herein. Use of the Invensys software described in this document is subject to the terms of the applicable Invensys Systems, Inc./Wonderware license. These terms include provisions that limit your rights such as use restrictions, disclaimers of warranties and limitations of Wonderware/Invensys liability. By installing or using the Invensys software, you agree to accept all of the terms of the applicable Invensys Systems, Inc./Wonderware license. A copy of the applicable license will be displayed upon initial installation of the software. If a copy of the license is not displayed or you require an additional copy of the license, you may obtain one from Invensys' Wonderware business unit by calling 1.949.727.3200 or by sending an e-mail to support@wonderware.com.

Invensys, Wonderware, ArchestrA, Factelligence, IntelaTrac, InBatch, InControl, IndustrialSQL Server, InSQL, InTouch, InTrack, QI Analyst, SCADAAlarm, SuiteLink, SuiteVoyager, WindowMaker, WindowViewer are trademarks and registered trademarks of Invensys plc, its subsidiaries and affiliated companies. All other brands and product names may be the trademarks or service marks of their respective owners.

Module 1	Introduction	1-1
	Section 1 – Course Introduction.....	1-3
	Section 2 – System Platform Overview.....	1-17
	Section 3 – Wonderware MES Software/Operations Overview	1-19
	Section 4 – System Requirements and Licensing	1-27
Module 2	Wonderware MES Client Overview	2-1
	Section 1 – Wonderware MES Client.....	2-3
	Section 2 – Security	2-11
	Lab 1 – Enabling Security	2-17
Module 3	Define the Basic Operations Model.....	3-1
	Section 1 – Modeling Overview	3-3
	Lab 2 – Setting Up the Galaxy	3-7
	Section 2 – Entity Model	3-15
	Lab 3 – Defining the MES Entity Model	3-17
	Section 3 – Entity Capabilities	3-35
	Section 4 – Product and Process Definition.....	3-39
	Lab 4 – Defining Products and Processes.....	3-41
	Section 5 – Work Order Execution.....	3-69
	Lab 5 – Tracking Work Order Execution.....	3-75
Module 4	More on the Operations Model	4-1
	Section 1 – Rejected Production.....	4-3
	Lab 6 – Tracking Rejected Production.....	4-5
	Section 2 – Storage Capability.....	4-25
	Lab 7 – Tracking Storage Locations	4-27
	Section 3 – Bill of Materials.....	4-45
	Lab 8 – Defining a Bill of Materials	4-47
	Lab 9 – Tracking Genealogy.....	4-79
	Section 4 – Item Grades, States, and Reasons.....	4-91
	Lab 10 – Defining Item Grades, States, and Reasons.....	4-93
	Section 5 – By-Products	4-119
	Lab 11 – Tracking By-Products.....	4-121
	Section 6 – Schedule Jobs at a Parent Entity.....	4-131
	Lab 12 – Scheduling Jobs at a Parent Entity	4-133
	Section 7 – Job Management	4-167
	Lab 13 – Managing Jobs.....	4-169
	Section 8 – Job Creation.....	4-181
Module 5	Operator Visualization	5-1
	Section 1 – MES Operator Client.....	5-3
	Lab 14 – Manually Tracking Work Orders	5-5
	Section 2 – MES .NET Controls.....	5-37
	Lab 15 – Using Wonderware MES .NET Controls	5-51
Module 6	Steps, Specifications, Spares, and MES Attributes	6-1
	Section 1 – Operation Steps	6-3
	Lab 16 – Tracking Operations Steps	6-5
	Section 2 – Specifications.....	6-27
	Lab 17 – Managing Specifications	6-33
	Section 3 – Spares and MES Attributes.....	6-55
	Lab 18 – Using Spares and MES Attributes	6-59

Module 7 Inventory Management 7-1
 Section 1 – Inventory..... 7-3
 Lab 19 – Managing Inventory Lots 7-7
 Lab 20 – Tracking Job Inventory Updates..... 7-25

Module 8 Application Maintenance 8-1
 Section 1 – Middleware 8-3
 Section 2 – Database 8-5
 Section 3 – Data Archival, Purge, and Restore..... 8-7
 Section 4 – Data Editor 8-19
 Section 5 – Rejected Message Viewer..... 8-25

Appendix A MES Reports in Wonderware Information ServerA-1



invenSYS[®]
Learning Services



Module 1 – Introduction

Section 1 – Course Introduction	1-3
Section 2 – System Platform Overview	1-17
Section 3 – Wonderware MES Software/Operations Overview	1-19
Section 4 – System Requirements and Licensing	1-27

Module Objectives

- List the objectives of the course and describe the agenda
- Summarize the main purpose and core features of the software

Section 1 – Course Introduction

This section describes the objectives of the course, intended audience, prerequisites, and the course agenda. It also includes a description of Wonderware solutions and products.

Course Description

The MES 2012 – Operations course is a 4-day, instructor-led class designed to provide a fundamental understanding of the features and functionality of Wonderware MES Software/Operations. This course provides lectures and hands-on labs designed to provide an early learning experience. The class will demonstrate how to use MES Software/Operations to addresses the configuration and definition of the operations model, product definition, and production capabilities; implementation of production execution and data collection; and reporting of traceability and genealogy information. This course also covers integration between Wonderware MES Software/Operations and System Platform.

Objectives

Upon completion of this course, you will be able to:

- Define a production and execution model which addresses the bill of materials, operations, and inventory
- Create and execute work orders that enforce production rules
- Implement production capabilities such as data collection, traceability, genealogy, and material substitution
- View and analyze production reports
- Integrate Wonderware MES Software/Operations with System Platform
- Create Windows using Wonderware MES .NET Controls

Audience

Plant floor operators and managers, system integrators, consultants, engineers, and technical professionals who need to configure and use the Wonderware MES Software/Operations product in their manufacturing processes.

Prerequisites

- Completion of the Application Server course
- Completion of the InTouch for System Platform course

Course Outline

Module 1 – Introduction

Section 1 – Course Introduction

This section describes the objectives of the course, intended audience, prerequisites, and the course agenda. It also includes a description of Wonderware solutions and products.

Section 2 – System Platform Overview

This section describes the fundamental concepts and architecture of the Wonderware System Platform.

Section 3 – Wonderware MES Software/Operations Overview

This section describes the functionality and features of Wonderware MES Software/Operations, and provides an overview of the client applications.

Section 4 – System Requirements and Licensing

This section describes the hardware recommendations, software requirements, and licensing for Wonderware MES Software/Operations.

Module 2 – Wonderware MES Client Overview

Section 1 – Wonderware MES Client

This section describes the Wonderware MES Client interface.

Section 2 – Security

This section describes the security settings in Wonderware MES Software/Operations, including security groups, users, group privileges, and security parameters.

Module 3 – Define the Basic Operations Model

Section 1 – Modeling Overview

This section briefly explains what modeling means and describes the production model for the simulated manufacturing plant used in this course.

Section 2 – Entity Model

This section describes physical entities, how they are defined and configured, and how to grant user access to them.

Section 3 – Entity Capabilities

This section discusses entity capabilities within the Operations Capability Object.

Section 4 – Product and Process Definition

This section discusses items and item classes, and describes how to link a process to a production item.

Section 5 – Work Order Execution

This section discusses work orders, jobs, production counters, and examines the runtime JobExec in the Operations Capability Object.

Module 4 – More on the Operations Model

Section 1 – Rejected Production

This section discusses how to create Item Reasons and how they relate to the concept of rejected production.

Section 2 – Storage Capability

This section discusses storage capability in the Operations Capability Object.

Section 3 – Bill of Materials

This section discusses bill of materials, consumption counters, and product genealogy.

Section 4 – Item Grades, States, and Reasons

This section discusses the use of Item Grades, States, and Reasons and explains how to use Item Reasons in runtime Production and Consumption Counters.

Section 5 – By-Products

This section discusses how to define By-Products and how to track their production in runtime.

Section 6 – Schedule Jobs at a Parent Entity

This section discusses how to schedule jobs at a parent entity and run the jobs at children entities.

Section 7 – Job Management

This section describes how to modify a job after a work order has been created, and explains sequencing and filtering in runtime.

Section 8 – Job Creation

Describe how to create a job with the Operations Capability Object and compare a data entry job with a process job.

Module 5 – Operator Visualization

Section 1 – MES Operator Client

This section discusses the Operator Client, how to manually track production, and explains the MES .NET client controls.

Section 2 – MES .NET Controls

This section provides an overview of the .NET controls included with Wonderware MES – Operations. It describes the Operations .NET controls and shows how to import them into a Galaxy and use them in an ArchestrA symbol.

Module 6 – Steps, Specifications, Spares, and MES Attributes

Section 1 – Operation Steps

This section explains steps and sequence numbers and describes how to execute steps in an operation.

Section 2 – Specifications

This section discusses specifications, explains how to configure global specifications and browse and select them from the MES database, and describes specification capabilities in the Operations Capability Object.

Section 3 – Spares and MES Attributes

This section discusses the use of Spare fields and the concept of custom MES Attributes and how to create and link them.

Module 7 – Inventory Management**Section 1 – Inventory**

This section discusses the inventory management features of Wonderware MES Software/Operations and the Operations Capability Object attributes in runtime.

Module 8 – Application Maintenance**Section 1 – Middleware**

This section discusses the tools to configure component Middleware operational parameters.

Section 2 – Database

This section discusses the mechanisms for database creation, backup, and upgrade. This section also discusses the Database Connection Editor.

Section 3 – Data Archival, Purge, and Restore

This section discusses the tools for MES data archival, purge, and restore (APR).

Section 4 – Data Editor

This section describes using the Wonderware MES Data Editor to insert, modify, and edit data from the MES database.

Section 5 – Rejected Message Viewer

This section discusses the capabilities of the Rejected Message Viewer.

Wonderware Software Solutions

Wonderware is the market leader in real-time operations management software, including Supervisory Human Machine Interface (HMI), GeoSCADA, Mobile Operations, Production Management, Manufacturing Execution System (MES), Performance Management, and Enterprise Manufacturing Intelligence (EMI) workflow. It is also the leader in integration with asset management, supply and demand chain, and Enterprise Resource Planning (ERP) applications. Wonderware is a brand offering of the Invensys Operations Management Division.

Wonderware software delivers significant cost reductions associated with designing, building, deploying, and maintaining secure and standardized applications for manufacturing and infrastructure operations. Wonderware solutions enable companies to synchronize their production and industrial operations with business objectives, obtaining the speed and flexibility to attain sustained profitability.

More than one-third of the world's plants and facilities run Wonderware software solutions in dozens of industries worldwide, such as:

- Automotive
- Chemical & Pharmaceutical
- Consumer Packaged Goods
- Discrete Manufacturing
- Electrical Power
- Facilities Management
- Food & Beverage
- Mining and Metals
- Oil and Gas
- Process Manufacturing
- Water and Wastewater

Wonderware software solutions deliver manufacturing and operational performance improvements that help reduce the amount of project-specific work that is required to develop integrated information and automation applications across entire operational enterprises. Wonderware software solutions can be implemented in the context of existing systems, at a company's own pace, and to the extent that the company chooses.

These solutions leverage a powerful, layered software architecture that enables a variety of features and capabilities, such as visualization, optimization and control of plant floor data collection, data storage, and analysis.

Wonderware offers the following software solutions:

- **Manufacturing Execution Systems** – Wonderware MES software helps customers track the transformation of products from raw materials through finished goods. The software gathers in-process data, such as yields, throughput, equipment efficiencies, material consumption, and product quality. It also provides functionality, such as inventory management, work order/Bill of Material management, real-time reporting, and analysis, for a full view into operational efficiencies.

Leveraging the ArchestrA software architecture (see [page 1-9](#)), Wonderware MES solutions are completely scalable and configurable. This enables a unique, incremental approach to operational improvements, where low-risk deployment of increased application functionality can be realized one step at a time.

Wonderware MES solutions help to substantially reduce lead time and manufacturing costs, increase production throughput and product quality, and reduce efforts involved in compliance and governance.

- **Enterprise Manufacturing Intelligence** – EMI software solutions empower companies to analyze their overall operational Key Performance Indicators (KPIs), using simple, yet powerful, data analysis, reporting, and visualization tools.

KPIs such as production, costs, process capability, equipment downtime, and quality and variance data can be collected, aggregated, and displayed using Wonderware EMI software solutions. A powerful, yet secure, web interface, with intuitive, drill-down dashboards, helps deliver this information to the full range of plant workers, tailored to their specific information requirements.

- **HMI/Supervisory Control and Data Acquisition (SCADA)** – HMI/SCADA solutions often impose complex demands on software architecture. Wonderware InTouch HMI visualization software, coupled with the award-winning ArchestrA technology-based ArchestrA System Platform, is uniquely positioned to meet these challenges.

The HMI/SCADA software solutions are easy to use, implement, and configure, and offer simplified maintenance, high security and availability, and virtually unlimited scalability.

- **Data Historian** – Wonderware Historian Server software leverages the state-of-the-art ArchestrA System Platform, industry-leading historian technology, web-based reporting capabilities, and renowned open data source connectivity from Wonderware. The resulting Historian solution is unlike any other data archiving and reporting solution found in the market today. With blazing speed, broad scalability, highly efficient data storage and retrieval, high availability, and simple one-click historization setup, the Wonderware Historian Server software has an industry reputation for low total cost of ownership.

Preconfigured web-based reports and data analysis capabilities derive immediate value from data captured by the Wonderware Historian Server.

- **Batch Management** – Wonderware batch management solutions perform repeatable and consistent execution of batching processes across all hybrid industries, whether it is Electronic Batch Records (EBR) systems in regulated industries, Paper-On-Glass capabilities in paperless production environments, or automated recipe management for supervisory systems.

From simple batch processes, where only the formula changes for different products, to the most complex batch processes requiring dynamic allocation of shared equipment, Wonderware has a solution. Each of these solutions ensures reduced lifecycle costs and investment protection by leveraging the ArchestrA architecture.

- **Product Quality Management and Statistical Process Control (SPC)** – Delivering products with high “quality”—defined as “meeting specifications at the lowest possible cost”—is a top priority for manufacturers and industrial operations. Quality has many aspects, and Wonderware applications provide valued, integrated Quality Management functionality to tens of thousands of companies worldwide.

Starting with Wonderware MES, which provides the most sophisticated, integrated quality management and enterprise-wide SPC, to Historian Server, which provides incremental solutions to store volumes of process data for quality analysis, Wonderware applications consistently meet quality needs. The Wonderware InTouch HMI software offers real-time data monitoring and alarming. Historian Client trends data. MES Software provides specification management, genealogy, BOM enforcement, OEE, downtime monitoring, and quality data documentation and monitoring. System Platform monitors data levels, and application templates can deliver nearly any quality capability. InBatch software collects information on batch quality and recipe settings. The capability list goes on.

- **Mobile Solutions** – Wonderware Mobile Solutions enable manufacturers and producers to manage the processes and procedures used to ensure all field tasks required to achieve reliable operations are executed consistently.

Software running on rugged handheld computers enables field operators to collect data on noninstrumented machinery and to receive contextual information and guidance based on conditions encountered in the field. This helps ensure the consistent execution of best operating practices.

Collected data can also be used for process analysis and production reporting, as well as integrated into existing back-end systems and plant data historians.

- **Workflow** – Workflow solutions allow customers to take their standard operating procedures, in-house knowledge base, and standard practices and make them part of everyday operations. Workflow can overlay any Wonderware product to provide visibility, collaboration, enforcement of procedures, and documentation of results.

For more information on Wonderware software solutions and products, visit the Wonderware website at <http://www.wonderware.com>.

ArchestrA Technology

ArchestrA is a comprehensive automation and information software architecture designed to integrate and extend the life of legacy systems by leveraging the latest, open industry standards and software technologies. It also unifies the Invensys Operations Management products that make up the InFusion ECS. ArchestrA “industrializes” Microsoft .NET and other Microsoft technologies to provide an even more productive toolset for building critical operations management software solutions for manufacturing, production, and facilities operations. The result exposes services needed by manufacturing and industrial infrastructure, such as common name space, object management, industrial security, high availability and redundancy, plant connection, enterprise connection, client interface, web portal, and systems management.

Using ArchestrA technology, applications can be rapidly assembled using software objects rather than being “programmed.” Templates can be created for almost any purpose, and then used to build new applications, simply through reassembly and slight modifications, saving time and lowering development costs. Offerings built on ArchestrA empower decision makers to achieve their business goals without abandoning prior investments in systems or intellectual property.

ArchestrA technology helps reduce application engineering effort and deployment, increase efficiency, provide optimization and standardization, and enable integration of distributed automation systems and applications from virtually any vendor. Geographically dispersed applications (from a few hundred to one million I/O, and from a single node to hundreds of stations) can be rapidly and securely implemented.

The ArchestrA architecture leverages advanced software technologies to fill the gap between ERP systems and control systems. This architecture provides the following:

- **Framework**, which supports common services and a core set of system objects
- **Domain Objects**, which are industry-specific objects
- **Object Development Toolkit**, which enables third parties to create new domain objects customized for specific needs

The supervisory control and manufacturing information environment is served by a variety of systems, including HMI, Distributed Control Systems (DCS), SCADA, Process Information Management systems (PIM), MES, batch and recipe management systems, and advanced control/simulation systems. The ArchestrA Framework supports core services that are required by most of these different types of supervisory control and manufacturing information systems.

These core services include the following:

- Integrated Development Environment (IDE)
- Version management

- License management and centralized deployment
- System diagnostics and system administration
- Internationalization
- Data visualization and monitoring
- Event-based processing, scripting, and calculation capabilities
- Alarm and event management, historization, and security
- Data acquisition and field device integration
- Interobject communications and name service
- Reporting and ad-hoc query capability
- Support for industry standards, such as OPC and SQL

The ArchestrA architecture consists of the following:

- **Configuration and Deployment-Related Components** that are required for centralized deployment of the runtime components. These components are installed like any Windows application and include the following:
 - Centralized object repository (called Galaxy Repository)
 - Integrated Development Environment (IDE)
 - Object deployment services (called Bootstrap)
- **Runtime Components** that are centrally deployed and administered. These components include the following:
 - PCs with core infrastructure (called Platforms)
 - Key software applications (Engines)
 - Objects (Framework Objects) that expose framework-related functionality

Wonderware Individual Software Products

Wonderware software solutions offer robust, best-of-breed software components that empower customers to effectively develop and manage their automation and information applications in continuous, discrete, process, hybrid, and batch manufacturing environments. All the latest Wonderware software offerings leverage the latest ArchestrA technology and offer increased functionality and flexibility, as well as extensive connectivity.

ArchestrA System Platform

ArchestrA System Platform provides a single and scalable platform for all the SCADA, Supervisory HMI, MES, and EMI software-solutions needs of industrial automation and information personnel.

At the center of the ArchestrA System Platform is the “plant model,” which is the logical representation of the physical processes being controlled and supervised. ArchestrA object technology makes configuration, logging, delivery, and maintenance of real-time and historical information point-and-click simple.

Within the System Platform is a high-performance process historian with production history archiving, efficient data compression, and autoconfiguration of historical archiving that eliminates duplicate effort. The platform also contains an industrial web information server that dramatically simplifies the organization and delivery of operations information for use across all functions in an organization.

Wonderware InTouch HMI

InTouch software provides graphic visualization that takes operations management, control, and optimization to a completely new level. The InTouch HMI reputation stands above all the rest. What the industry now knows as HMI all began with InTouch software more than 20 years ago. No other HMI can match InTouch software for industry-leading innovation, architectural integrity, unequalled device integration and connectivity, uninterrupted software version migration path, and truly legendary ease of use.

All this leads to well-designed standards-driven systems that maximize productivity, optimize user effectiveness, increase quality, and lower development, maintenance, and operational costs, helping to make a company the best it can be.

Wonderware Development Studio

Wonderware Development Studio consists of a suite of cooperative tools designed to enable the rapid construction and maintenance of Wonderware applications.

The heart of the Development Studio is the ArchestrA IDE. Within the ArchestrA IDE, engineers can design, develop, test, and maintain any industrial application.

Without leaving the ArchestrA IDE, the user can develop vibrant and sophisticated graphics, and incorporate those into effective HMI, SCADA, MES, or Operations Intelligence applications.

Once development is ready for delivery, a single click is all it takes to deploy applications, objects, and associated logic to anywhere in the enterprise namespace.

ArchestrA Workflow Software

ArchestrA Workflow software is an advanced workflow application that enables companies to digitize manual and automated processes that include people or systems, or both. This sophisticated Business Process Management (BPM) application enables companies to model, execute, analyze, and improve processes inside and outside their organization to drive higher levels of collaboration, productivity, and innovation.

With ArchestrA Workflow, companies can institutionalize work processes that manage normal, unscheduled, or disruptive events within their operations environment, providing the *Right People* with the *Right Information* at the *Right Time*.

Wonderware Dream Reports

Wonderware Dream Reports provide the most intuitive and easy-to-use reporting solution available on the market today, giving the power to quickly and easily create reports from Wonderware InTouch HMI and many other data sources. It requires no IT or programming skills to design, schedule, and produce appealing and informative dynamic reports. It is easy to configure Dream Reports through simple drag-and-drop operations within the Report Studio. The design Studio also provides ease-of-use features, such as intelligent report objects and dialog boxes.

Wonderware Dream Reports will help to significantly reduce report development time, simplify report modifications, and empower users to transform raw data into great looking, information-filled reports. Custom reports can be created easily, quickly, and inexpensively, with scheduling tools to help deliver them to anyone, anywhere, anytime.

The Wonderware Dream Reports solution, along with Wonderware Information server or an included web portal, extends the availability of reports throughout an enterprise network and beyond.

Wonderware Historian Server

The Wonderware Historian Server is a high-performance, real-time database for historical information. It combines the power and flexibility of a relational database with the speed and compression of a true process historian, integrating the office with the factory floor or any industrial operation.

Wonderware Historian Server is designed to collect a wide variety of plant data, at full resolution and very high data rates, ensuring that decision makers at all levels will have the historical information they need to drive vital productivity improvement initiatives. Wonderware Historian Server offers unparalleled scalability and can be configured as a single data collection and aggregation system or as part of a larger, tiered architecture offering the ability to implement sophisticated summary and replication systems.

Wonderware Historian Client

Wonderware Historian Client provides rich data analysis and reporting capabilities to maximize the value of information stored in the Wonderware Historian Server.

Wonderware Historian Client is integrated with Microsoft Office components to deliver data-trend and numerical data analysis using Microsoft Excel, comprehensive data reporting using Microsoft Word, and the capability to publish real-time and historical plant information to the web or company intranet site using Wonderware Information Server.

Plant knowledge workers using information derived from the Wonderware Historian Server can quickly troubleshoot problems, study potential process inefficiencies and eliminate the time-consuming process of locating the data. Wonderware Historian Client makes the delivery and visualization of this information easy to implement and deploy.

Wonderware Information Server

The Wonderware Information Server offers an easy solution for aggregating and presenting plant production and performance data over the web or company intranet.

Plant personnel, with a minimum of training, can install, configure, and implement a highly effective plant information website without the need for custom web programming.

Using Information Server, large amounts of process data can be aggregated into highly informative production reports tailored to the information needs of plant personnel.

Content from the Wonderware Information Server can be incorporated into other web portals, making existing corporate IT portals more informative and valuable.

Wonderware Intelligence Software

Wonderware Intelligence Software enables companies to gather, store, and report on both historical and real-time operational data, using a dashboard to present KPIs that are used to visualize, tune, and maximize their operations.

The Intelligence Data Model is the foundation for transforming data into actionable information by adding context (equipment, product, work orders, material, personnel, and so on). This data in context helps to answer operational questions, such as:

How much product is available per site today?

How many work orders contained a specific raw material ingredient last week?

Wonderware MES/Operations Software

Wonderware MES/Operations software capabilities provide a scalable and configurable MES designed to help manufacturers across a wide range of industries improve their operational efficiency, manufacturing responsiveness, and brand integrity.

The incremental, low-risk approach to building MES from Wonderware allows MES to be implemented in steps, from basic functionality, including work order management, bill of materials, specifications, data collection, and traceability (track/trace/genealogy), to enhanced capabilities, such as inventory management, certifications, labor, and production steps.

Wonderware MES software fully leverages the ArchestrA System Platform and Invensys InFusion Enterprise Control System (ECS) for integration, development, and reporting, as a result of the underlying ArchestrA technology. This approach reduces deployment and maintenance costs, while facilitating rapid development and scaling of the application throughout the enterprise.

Wonderware MES/Performance Software

Wonderware MES/Performance software capabilities provide a software solution for collecting, tracking, and communicating real-time equipment performance and efficiency information, scalable from machine/equipment level information to line/plant enterprise KPIs.

Wonderware MES/Performance software delivers critical equipment downtime and efficiency information to operators and decision makers who can then take immediate action to improve plant performance and productivity, equipped with the most up-to-date operational results.

Wonderware MES software is highly configurable, fully leveraging the ArchestrA System Platform and Invensys InFusion ECS for integration, development, and reporting, as a result of the underlying ArchestrA technology. This approach reduces deployment and maintenance costs, while also facilitating rapid development and scaling of the application throughout the enterprise.

Wonderware MES/Quality Software

Wonderware MES/Quality software capabilities provide historical documentation of quality sample data and SPC monitoring of the sample data collected.

Wonderware MES/Quality software helps manufacturing companies configure, manage, and implement quality specifications that reduce the cost and increase the efficiency and accuracy of capturing and monitoring critical quality information on the plant floor. Information is captured and monitored either directly from process equipment or by operators using sample plan procedures.

Wonderware MES/Quality software incorporates electronic records of operational performance and quality sampling procedures for compliance with internal, governmental, or safety regulations that require tighter quality control and improved quality procedure management in many manufacturing industries.

Wonderware QI Analyst

Wonderware QI Analyst SPC software is an important part of any quality management program. Performing both online and historical SPC, QI Analyst supports real-time process monitoring and alarms, as well as historical reports to view process “health” over any period of time. Real-time SPC, analysis, and reporting are equally easy. By storing process data in the QI Analyst database and linking to external data sources, users can leverage enterprise-wide SPC to reduce variation, reduce costs of manufacturing, and increase productivity.

Wonderware InBatch Software

Wonderware InBatch flexible batch management software optimizes the management of any batch process. InBatch software automates recipe management using a graphical procedure environment featuring Sequential Function Charts (SFC). Consistent with the ISA S88 flexible batching standard, InBatch software offers comprehensive batch execution and equipment history, material genealogy, stringent security, web-based reporting, and the ability to facilitate the design and implementation of systems that are compliant with FDA 21 CFR Part 11 regulations.

Wonderware SCADAAlarm

SCADAAlarm alarm and event-notification software provides a telecommunications link to industrial automation software systems. It seamlessly integrates with the comprehensive Wonderware product family and has built-in browsers to enable fast configuration of information from ArchestrA System Platform and InTouch HMI software.

Wonderware Toolkits

Wonderware Toolkits provide powerful extensibility to InTouch HMI and System Platform applications by enabling developers to extend the capabilities of Wonderware products to meet specific system integration needs. The Toolkits promote adherence to industry standards, provide additional customization and intellectual property protection, and enhance the ability to interface Wonderware products with other software and hardware.

Wonderware offers the following Toolkits:

Toolkit	Enables developers to:
ArchestrA Object Toolkit	Extend the ArchestrA architecture with objects that provide specific application or device integration functionality.
GRAccess Toolkit	Create programmatic access to and interaction with System Platform Galaxy configuration data.
MXAccess Toolkit	Create programmatic access to runtime data in a System Platform Galaxy.
DAServer Toolkit	Build custom device integration servers more easily.
Historian Toolkit	Create high-value industrial applications that integrate with data sources from the System Platform and other data sources.
Alarm Toolkit	Produce custom-distributed alarm providers and consumers.
Wizard Toolkit	Produce their own Wizards for inclusion in InTouch HMI.
Script Toolkit	Develop custom InTouch scripts.

Wonderware Device Integration Servers

Connectivity to plant/facility devices is key to real-time information management. Wonderware maximizes choices with the broadest possible communication options for industrial automation and information devices. In collaboration with more than 100 third-party interface developers, Wonderware provides the largest selection of connectivity options to hundreds of control systems, such as PLCs, RTUs, DCSs, flow controllers, loop controllers, scales, gauges, bar code readers, and other hardware devices. Wonderware has also fully embraced the openness of OPC technology, exposing data via OPC from Wonderware products as an OPC Client, as well as providing the means to connect to any third-party OPC Server.

Device integration can be maintained more easily using Device Integration Objects (DI Objects) within the ArchestrA System Platform for seamless connectivity to any data source. Wonderware also offers the DAServer Toolkit, which empowers companies to create their own connectivity server.

Wonderware Enterprise Integration Application

The Wonderware Enterprise Integrator enables fast and reliable information exchange between Wonderware MES Software, ArchestrA System Platform, and enterprise systems.

Typical integration scenarios include connecting business systems with Wonderware MES, InBatch, or Intelligence and other shop floor applications.

The Wonderware Enterprise Integrator modular design allows any application to be integrated, so that one consistent approach to enterprise integration is adopted, eliminating isolated silos of information and high-maintenance point-to-point integration scenarios.

Wonderware IntelaTrac

Wonderware IntelaTrac is the industry-leading mobile workforce and decision support system.

IntelaTrac includes configurable software and ruggedized mobile hardware solutions that enable workflow, data collection, and general task management for plant operations, maintenance management, production tracking, and compliance applications. IntelaTrac is capable of exploiting integrated barcode and RFID reader technology found in many of today's leading mobile devices. This enables precise location verification of critical field tasks supporting regulatory compliance and continuous improvement initiatives.

IntelaTrac is also a key component of a complete plant-intelligence solution that connects all of your wired and stranded assets. This enables an even broader visibility into the performance of your assets than ever before. The IntelaTrac asset-centric approach makes tracking asset performance straightforward, which supports Reliability Centered Maintenance initiatives.

Section 2 – System Platform Overview

This section describes the fundamental concepts and architecture of the Wonderware System Platform.

Introduction

The Wonderware System Platform is a strategic industrial application platform built on ArchestrA technology which uses Wonderware Application Server as its foundation. Designed to suit the needs of industrial automation and information personnel, the System Platform provides a single, scalable software platform for Geographically Distributed SCADA (Geo-SCADA), Supervisory HMI, and Production and Performance Management software solutions. The System Platform is a unified bundle of previously available Wonderware software products, including: Wonderware Application Server, Wonderware Historian, Wonderware Information Server, and Device Integration products.

The Wonderware System Platform contains an integral core set of capabilities and services to support sustainable production and operations performance improvement through a comprehensive set of six capability areas:

- Industrial domain services for industrial computing functions that are not provided by commercial operating systems or products
- Software and device connectivity services for easy communication to virtually any plant or business information source
- Information and data management services for management of real-time and historical information
- Information delivery and visualization services for functions that provide information to the right user at the right time, and in the form in which they expect it
- Application development services that provide easy and intuitive development of modular industrial software solutions that can be easily changed to meet future needs
- System management and extensibility services that provide easy management, expansion, and modification of the application or the computing architecture

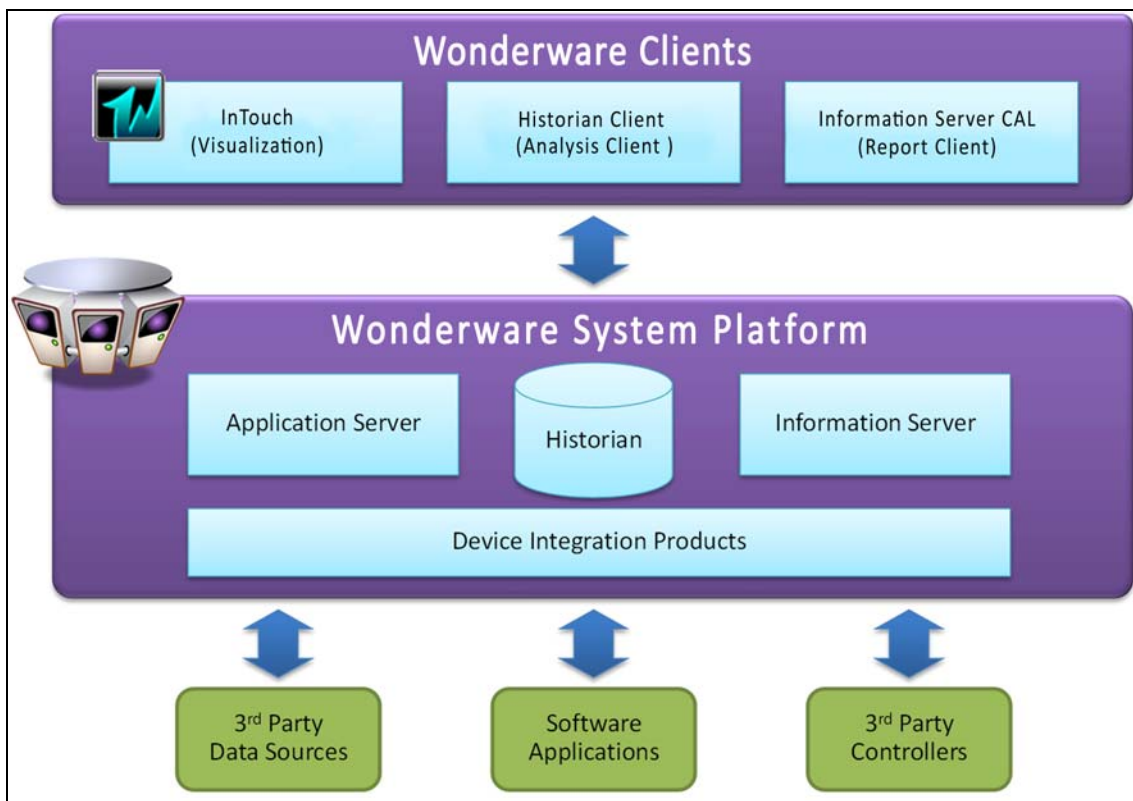
The ArchestrA technology that the System Platform is built on is a comprehensive plant automation and information architecture designed from the outset to extend the life of legacy systems by leveraging the latest software technologies. For more information, see “ArchestrA technology” on [page 1-9](#).

In the ArchestrA environment, software applications can be rapidly assembled rather than programmed. New applications also can be created simply through the reassembly of existing applications. The ArchestrA Integrated Development Environment (IDE) provides a centralized environment for development, deployment, and maintenance of scalable, secure, and standardized information and automation applications.

System Platform Architecture

The Wonderware System Platform consists of a variety of software components, including:

- **Application Server** for system-wide, real-time data acquisition, alarm and event management, centralized security, data manipulation, remote deployment, and collaborative engineering
- **Historian** plant data historian
- **Information Server** for Internet/intranet visualization and content management
- **Device Integration Products** for field device connectivity with third-party data sources, software applications, and third-party controllers
- Wonderware Clients, including:
 - **InTouch** human-machine interface (HMI) software as a visualization client for the System Platform
 - **ActiveFactory** trending and analysis software
 - **Reporting Client-Access Licenses (CAL)** for Information Server to enable information-sharing and reporting over the Web



Section 3 – Wonderware MES Software/Operations Overview

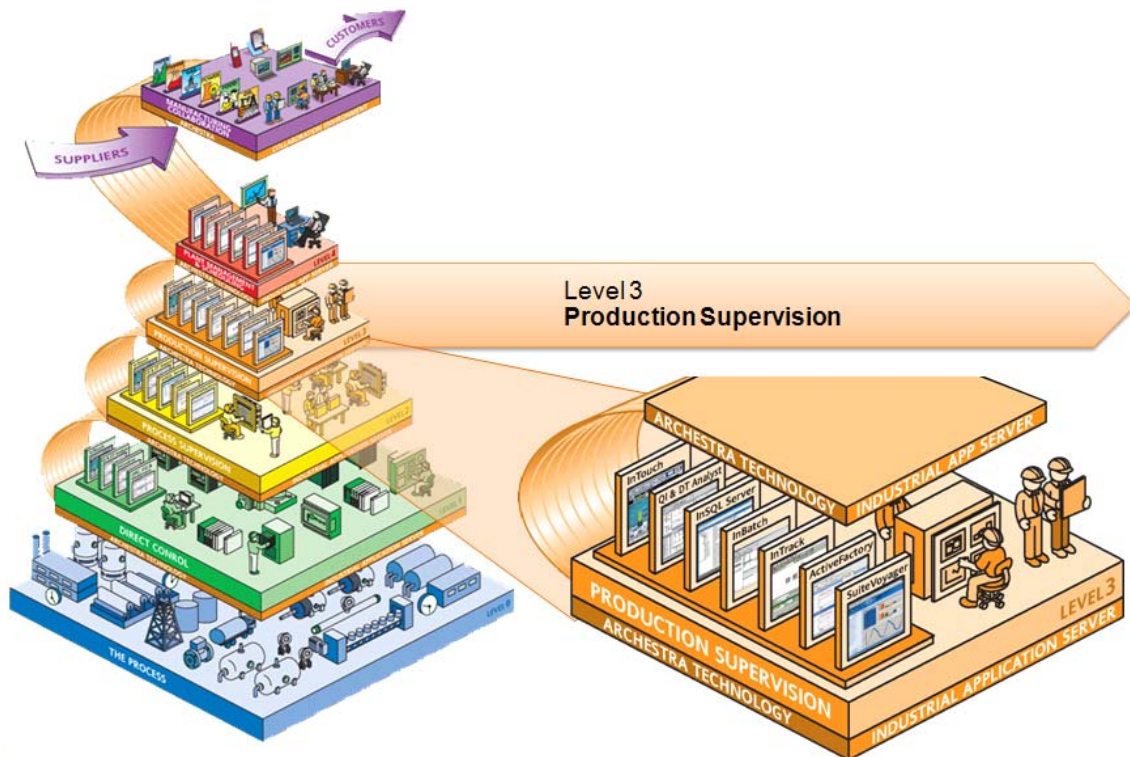
This section describes the functionality and features of Wonderware MES Software/Operations, and provides an overview of the client applications.

What is Wonderware MES Software/Operations?

Wonderware MES Software/Operations is an out-of-the box, configurable, modular Manufacturing Execution System (MES) that manages, tracks, and optimizes manufacturing production processes. It collects production data, executes work orders on the shop floor, and provides production visibility for reporting and analysis.

Manufacturing Execution Systems provide the critical link to fill the gap between Enterprise Resource Planning (ERP) and process machinery, supporting shop floor data in real time and providing the infrastructure for bottom line manufacturing improvements. Manufacturing Execution Systems optimize production activities from order launch to finished goods.

The definition of MES according to the Instrumentation, Systems, and Automation Society (ISA) is: The MES layer focus in a group of activities (operations, inventory, quality and maintenance activities) corresponding to Level 3 in the Functional Hierarchy model. This is illustrated in the following diagram:



Features

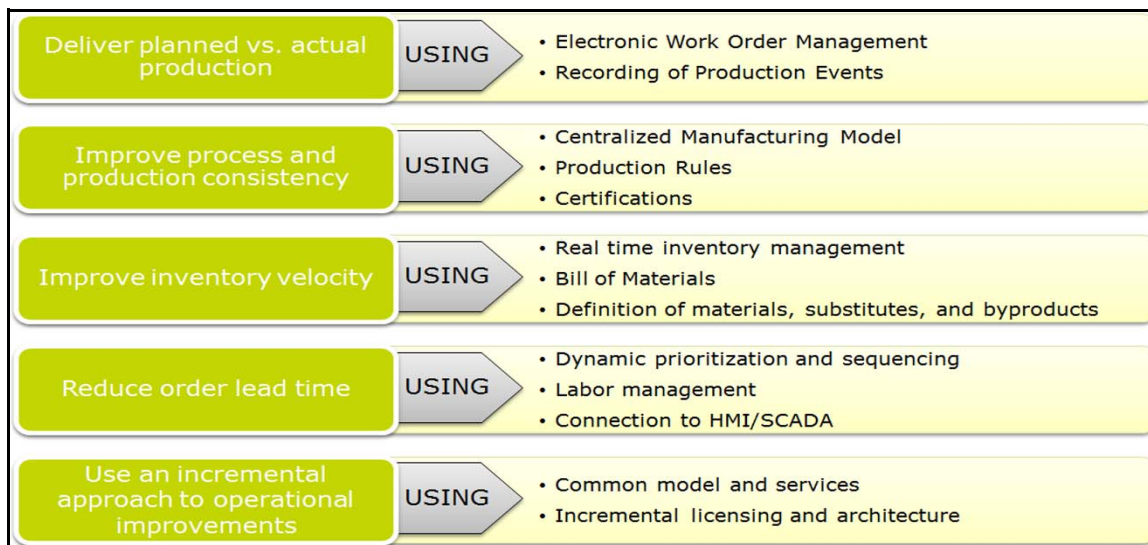
Wonderware MES Software/Operations enables you to:

- Deliver planned versus actual production using:
 - Electronic Work Order management
 - Recording of production events
- Improve process and production consistency using:
 - A centralized manufacturing model
 - Production rules
 - Certifications
- Improve inventory velocity using:
 - Real-time inventory management
 - Detailed definition of materials, substitutes, and byproducts
 - Bill of materials
- Reduce order lead time using:
 - Dynamic prioritization and sequencing
 - Labor management

Additionally, Wonderware MES Software/Operations provides:

- runtime communication with System Platform, allowing you to browse the Galaxy namespace through Message Exchange (MX)
- An extensive collection of .NET controls which can be hosted in ArchestrA symbols and integrated into InTouch windows (You can also integrate these .NET controls into third-party applications.)

Wonderware MES Software/Operations can be implemented in an incremental, modular approach, where you start small and grow as your MES needs evolve. For example, you can start with basic MES functionality to include bill of materials, specifications, and traceability and genealogy reporting and analysis. Additional capabilities can then be added later to provide inventory management, certifications, labor, and production steps.

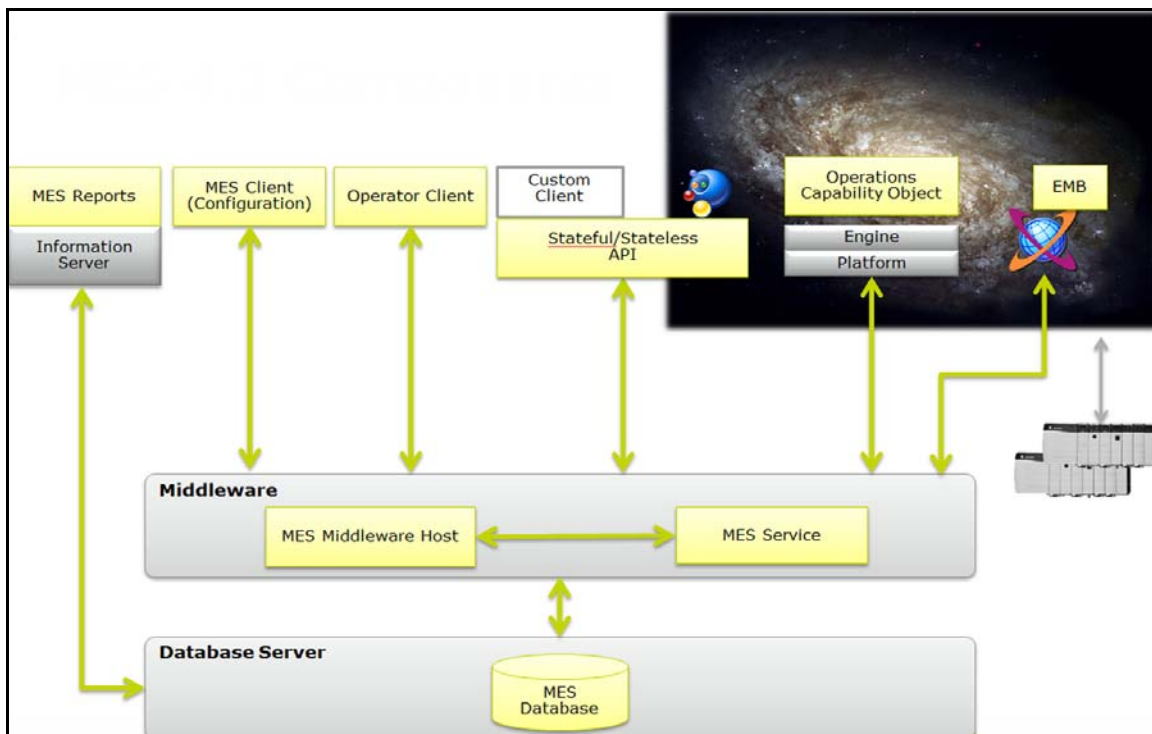


Components

Wonderware MES Software/Operations includes the following key components.

- **Clients**, which include the following individual applications:
 - **Wonderware MES Client** – Configuration of utilization for equipment performance can be simplified using the Wonderware MES Client
 - **Operations Capability Object** – The Operations Capability Object extends the ArchestrA IDE equipment model to trigger production events and log associated production data in the Wonderware MES database (MES database)
 - **Supervisor** – Used to coordinate and oversee the daily activities of the system, and to define and maintain bills of materials (BOMs), routings, and work orders
 - **Operator** – The user interface for operators and shop floor personnel used to collect data, view system status, and execute production-related processes or activities
 - **Custom .NET Controls** – A comprehensive set of .NET controls that you can use in ArchestrA symbols, Web-based information portals, and other third-party applications
- **Middleware Services**, which is a grouping of core services for the MES product that processes data from the various parts of the MES product as requests for information or actions based on shop floor activities. The grouping “middleware” contains services such as the MES Middleware Host, Middleware Proxy, Event Broker, and MES Service. These services are the primary transaction processors for data from other components into the MES database.
- **MES Database**, contains all the production data and configuration data generated or required by the system. The client components communicate with the production database through predefined procedures stored in the production database

Wonderware MES Software/Operations provides a scalable three-tier architecture that uses WCF to send asynchronous data between the MES database and the client layer.



Client Components

The client components of Wonderware MES Software/Operations represent the core MES functions used to configure the system, define the production process model, define how to track and execute the production process, and view real-time and historical production data captured by the system.

Wonderware MES Client

The Wonderware MES Client provides a user interface to configure and monitor your plant model and production processes.

The Wonderware MES Client gives you the ability to configure items, operations, processes, specifications, certifications, work orders, and jobs. You can configure the collection of data related to the plant floor equipment performance information for determining the Overall Equipment Effectiveness (OEE) and its components – Availability, Performance, and Quality.

The information configured in the Wonderware MES Client is used to collect your plant process information from operators and production equipment on the plant floor. The information collected and stored from your production processes gives you the information needed to control and improve the overall operation management and performance of the plant.

Operations Capability Object

The Operations Capability Object is an ArchestrA automation object that allows you to configure entities to perform the following tasks:

- Start, stop, and run jobs
- Record the amount of material that is produced or consumed while executing a job
- Store and transfer inventory items
- Load, upload, and download job specifications

The Operations Capability Object extends the ArchestrA IDE equipment model to trigger events and log associated data into the MES database. A single instance of Operations Capability Object supports all PEM events for its associated equipment within the equipment model. This includes material events related to material consumption, material production, and material movement, as well as status events related to equipment, production data, and personnel.

Operator

Operators and shop floor employees use Operator to run jobs, view instructions, enter quantities produced, report consumption, sign off on completed work, track consumed materials, and manage the shop floor. Operator is also used to capture machine utilization and labor data.

Operator supports a number of login scenarios such as multiple users logged in to one or multiple machines, or a user logged into multiple machines. The system can be set up to require a significant amount of interaction between the production employees and the application or minimal interaction.

Many of the production employee transactions with Operator can be automated by directly linking Wonderware MES Software/Operations with shop floor PLCs.

Operator Window

Operator has a window that is split horizontally. The top portion of the screen summarizes the current job information. The bottom portion of the screen has a tabular display. The tabs correspond to unique product functionality.

Depending on your license, the following tabs may be available.

- Route
- Work Queue
- Production
- BOM
- Genealogy
- Util/OEE
- Folders
- Steps
- Labor
- Audit
- DNC
- Data Log
- Inventory
- Storage

Each of these tabs are described on the following pages.

Route

The **Route** tab is used to display the routing for the job in process on the respective entity. The flow diagram illustrates the routing and illustrates the state of each operation with the corresponding color. A dashed line surrounds the active **Job** icon.

Work Queue

The **Work Queue** tab is used to manipulate the job queue for the respective entity and to change the state of a job at an entity. A production employee uses the **Work Queue** tab to change the state of job queues to a given entity, split jobs, or link jobs together.

Job sequencing can be defined in Supervisor and restrictions can be put on operators to enforce the desired workflow. The **Work Queue** tab can also be used to view the routing of an upcoming job. The Routing Diagram can be viewed by double clicking on any row on the **Work Queue** tab.

Production

The **Production** tab is used for reporting produced items. Production can be reported as either good or rejected pieces. This tab also allows you to change the lot data.

BOM

The **BOM** tab is used for reporting consumption against a job. The consumption can be reported for a consumable Bill of Material item that is listed in the table. This consumption can also be recorded as scrap from this tab. This tab also allows you to change the lot data.

Genealogy

The **Genealogy** tab shows the consumption history against the running work order.

Util/OEE

The **Util/OEE** tab displays the history of entity utilization and allows for the entry of changes to the entry state. The tab also displays some analysis data tools.

Folders

The **Folders** tab allows an operator to view, edit, and print files. The **Folders** tab can be displayed in two different formats. If a job is running on an entity when the tab is selected, only the files associated to that job will be displayed. You can then select the View button to open the file. If a user logs into an entity that is not currently running a job, the **Folders** tab will display all folders and the attached files.

Steps

The **Steps** tab is used as a step-by-step procedure guide for the currently running job. The tab displays the sequence of activities that must be performed in order to complete the operation. Steps can link to a document file, require data entry, require inspector sign-off, or simply a verification that the step was completed. Individual steps can be bypassed if given permission to do so. Each step requires the operator to log in and then mark the step **COMPLETED** when done. Time stamps are recorded for login and completion of each step.

Labor

The **Labor** tab displays a history of a current user's labor activity. The **Labor** tab allows you to login or log out users, change the current user, change the current user's labor codes, change the current user's logged in entities, and modify bulk labor users.

Audit

The **Audit** tab displays all certifications required for a job to be completed. This tab also allows you to sign off on these certifications and enter a comment for each.

DNC

The **DNC** tab will allow downloading of NC files from the Wonderware directories defined for the logged in entity, the local file system, or the network file system. The ability to download from the file system or a network drive is based on user permission and may override the Wonderware MES Software/Operations dirs setting.

Data Log

The **Data Log** tab allows you to record any type of information about the current job that is being run on this entity. The data collected is typically not a value that is specified prior to running the job. The fields that appear in this tab are created in Supervisor.

Inventory

The **Inventory** tab displays the current inventory status of the selected entity. This tab allows you to transfer in, transfer out, and reclassify inventory in the selected location only. It also provides filtering, and the ability to view and modify lot attributes for the selected row in the grid.

Storage

The **Storage** tab displays the configured storage locations, their location status, and the lots that are currently stored there. From this tab you can update the location of a storage entity (if it is movable) and the status of the entity (if it allows a dirty state).

Section 4 – System Requirements and Licensing

This section describes the hardware recommendations, software requirements, and licensing for Wonderware MES Software/Operations.

Hardware Recommendations

The recommended hardware requirements are listed below.

Middleware/Database Server

- Computer with dual-core processor with 2-gigahertz (GHz) or faster clock speed, or single-core processor with 3-GHz or faster clock speed; dual-core processor recommended for optimal performance
- 2 gigabytes (GB) or more of RAM (1 GB minimum supported; may limit performance of some features)

Wonderware Information Server

- Computer with 2-GHz or faster processor clock speed
- 1 GB or more of RAM

All Systems (Client Applications)

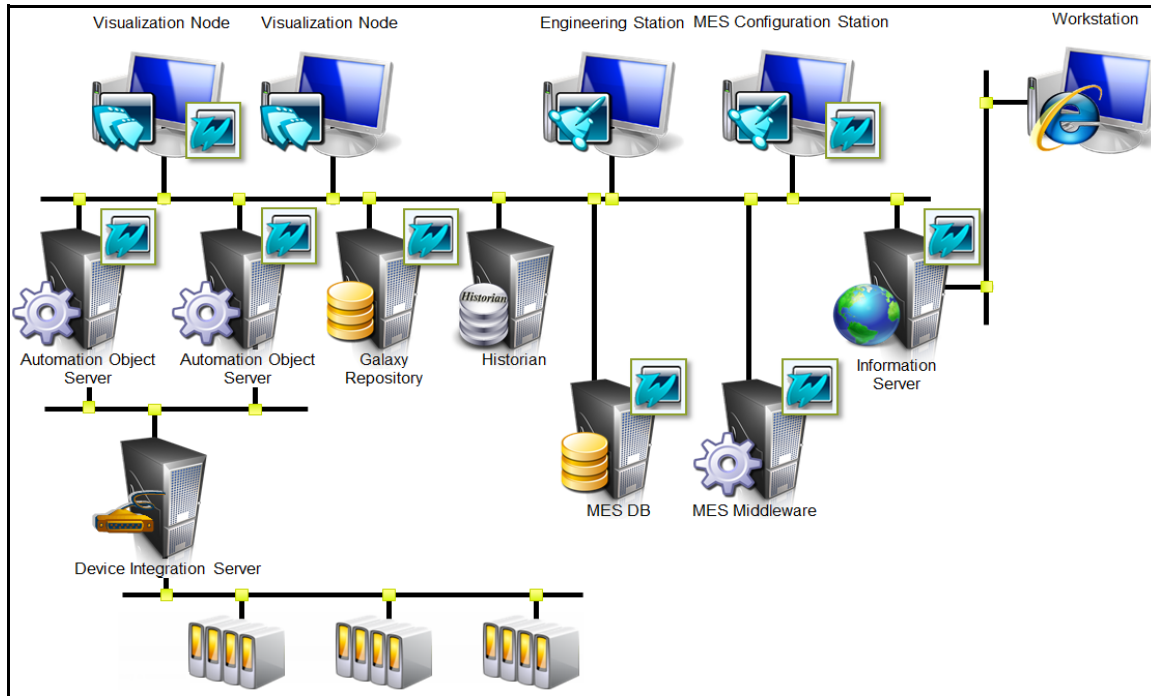
- 30 GB of available disk space
- CD-ROM or DVD drive
- Monitor, keyboard, and mouse or compatible pointing device

Note: For more information on hardware requirements, see the *Wonderware MES 2012 Readme* file on the installation DVD or Wonderware Developer Network (WDN) site at <https://wdn.wonderware.com>.

Example Hardware Architecture

The figure below shows an example of a hardware configuration that includes all available hardware that can be deployed in a Wonderware MES Software/Operations environment. It is not a minimum configuration. Different options for combining servers should be considered, including virtualization of servers.

The Database Server and Middleware Server components can be in same computer, but typically for larger systems, they will be in separate computers.



Software Requirements

Wonderware MES Software requires the following software:

- Microsoft .NET Framework

Note: Wonderware MES automatically installs the .NET Framework, if it is not installed on the computer.

- ArchedrA IDE
- SQL Server or Oracle
- Wonderware InTouch
- Wonderware Application Server
- Wonderware Information Server

System Requirements

The following table lists the supported operating systems for Wonderware MES:

	Client Components	Database MESDB	Middleware	MES Reports
Windows Server	Yes	Yes	Yes	Yes
Windows XP (32 Bit Only)	Yes	Yes	Yes	No
Windows Vista (32 and 64 Bit)	Yes	Yes	Yes	No
Windows 7 (32 and 64 Bit)	Yes	Yes	Yes	Yes
SQL Server or Oracle		Yes		
.NET Framework	Yes	Yes	Yes	Yes

Note: For more information on software requirements, see the *Wonderware MES 2012 Readme* file on the installation DVD or Wonderware Developer Network (WDN) site at <https://wdn.wonderware.com>.

Licensing

Wonderware MES Software/Operations uses the Wonderware licensing system. For instructions on installing or updating a license, see the *Wonderware MES 2012 Readme* file on the installation DVD or Wonderware Developer Network (WDN) site at <https://wdn.wonderware.com>.

Note: During installation, you only install Wonderware MES. There is not a separate installer for Wonderware MES Software/Operations. The Performance, Operations, and Quality features are enabled through licensing.

For more information on licensing and licensing requirements, contact your local distributor.



invenys
Learning Services



Module 2 – Wonderware MES Client Overview

Section 1 – Wonderware MES Client	2-3
Section 2 – Security	2-11
Lab 1 – Enabling Security	2-17

Module Objectives

- Describe the Wonderware MES Client interface
- Explain the MES security model

Section 1 – Wonderware MES Client

This section describes the Wonderware MES Client interface.

Overview

The Wonderware MES Client provides a user interface to configure items, operations, processes, specifications, certifications, work orders, and jobs. The information configured in the Wonderware MES Client is used to collect plant process information from operators and production equipment on the plant floor.

The information collected and stored from production processes can be used to control and improve the overall operation management and performance of the plant. The Wonderware MES Client offers a collection of modules, grouped by function and role of the user, to allow the configuration and monitoring of your plant operations.

You can use the Wonderware MES Client to:

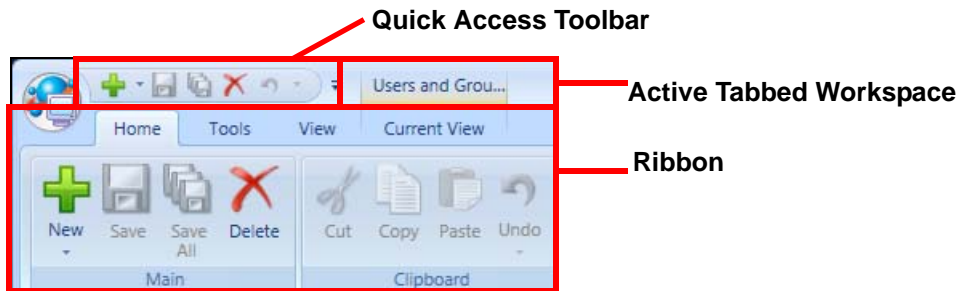
- Define users and user groups
- Define shift schedules for various machines
- Assign passwords, privileges, and entity access rights to different users to limit their access to different areas of the Wonderware MES Client
- Define global system parameters
- Define custom attributes
- Configure global specifications
- Configure entity classes
- Configure language strings
- Configure items and item classes
- Specify item states and grades
- Configure a work orders and jobs
- Configure a process, operation, standard operation, and dynamic routing processes
- Manage jobs
- Maintain the MES database
- Edit and resubmit rejected messages

Navigating the Wonderware MES Client

The Wonderware MES Client can display large amount of data in an organized way. The top of the window includes a customizable ribbon and the bottom of the window includes different panes which can also be customized.

Ribbon

The top of the page displays a ribbon similar to what you would see in the Microsoft Office suite of products. The ribbon is arranged as follows:



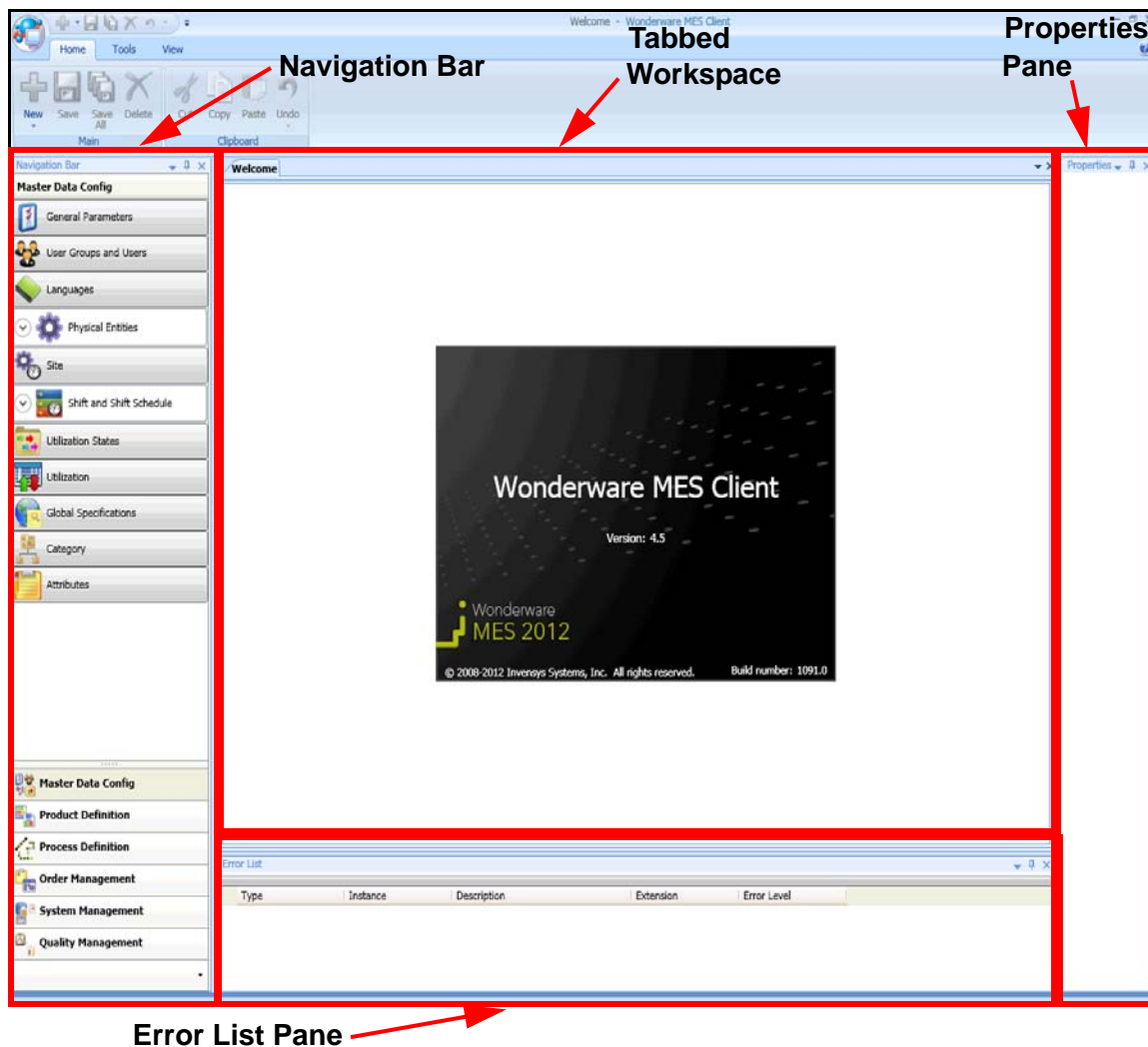
Quick Access Toolbar – Located the very top of the section is the **Quick Access Toolbar**. From this menu, you can select options such as **New**, **Save**, **Cut**, **Paste**, or **Delete**. You can also customize the **Quick Access Toolbar**.

Active Tabbed Workspace–The name of the **Active Tabbed Workspace** is displayed to the right of the **Quick Access Toolbar**. In this image, the **Users and Groups** module is currently active in the **Active Tabbed Workspace**.

Ribbon–Tabs on the ribbon include the following:

- **Home** – Includes options such as **New**, **Save**, **Cut**, or **Copy**
- **Tools** – Includes options for switching languages
- **View** – Includes options for customizing the Wonderware MES Client interface
- **Current View** – Includes options for customizing the view of the **Active Tabbed Workspace**

The following figure highlights different areas within the Wonderware MES Client:



In the Wonderware MES Client, you can auto hide the **Navigation Bar**, **Properties** pane, and **Error List** pane, so that the panes are reduced down to a tab that appears on the side of the application.

Navigation Bar

Select a group at the bottom of the **Navigation Bar** to show the associated module at the top. Select an module from a group to display the contents within the tabbed workspace. The following default groups are available in the Wonderware MES Client:

- **Master Data Config**
- **Product Definition**
- **Process Definition**
- **Order Management**
- **System Management**
- **Quality Management**

These are all discussed on the following pages.

Master Data Config

The following table describes the modules available in the **Master Data Config** group

Module Name	Description
General Parameters	Allows you to specify the system parameters for Wonderware MES Client.
User Groups and Users	Allows you to configure users and user groups and provide privileges and access rights to the specified user groups.
Languages	Allows you to configure languages for Wonderware MES Client.
Physical Entities	Allows you to name and describe physical entities. You can also view entity classes, view the parent-child relationship of entities, and view the capabilities of entities.
Site	Allows you to configure sites and its region details for an entity.
Shift and Shift Schedule	Allows you to configure the shift days, timings, and shift breaks for an entity on the plant floor.
Utilization States	Allows you to specify the utilization status of an entity. You can select and apply different colors to each status.
Utilization	Allows you to specify various reasons for the defined utilization status.
Global Specifications	Allows you to specify global specifications for an entity class, item class, entity, and item.
Category	The Category module displays a list of categories in the workspace. In the Category module, you can also link categories to items and assign item categories to MES QM specifications as item context.
Attributes	Allows you to specify the attribute of an item, item class, work order, or job. You can also specify its data and entry types.

Product Definition

The following table describes the modules available in the **Product Definition** group:

Module Name	Description
Items	Allows you to specify an item. You can also apply filters to the item classes.
Item Classes	Allows you to configure an item class and specify details of an item class, such as produced, consumed, and obsolete.
Units of Measure	Allows you to specify the units of measure for an item.
Item Grades	Allows you to specify various grades of an item, such as approved, on hold, or rejected. You can select and apply different colors to each grade.
Item States	Allows you to specify the state of an item, such as work in progress and finished goods. You can select and apply different colors to each state.
Item Reasons	Allows you to configure item reasons for an item. You can link BOM version, BOM item, and entities to the specified reason. You can also create a group of item reasons and link the classes and entities to the item reasons group.
Attributes	Allows you to specify the attribute of an item and item class. You can also specify its data and entry types.

Process Definition

The following table describes the modules available in the **Process Definition** group:

Module Name	Description
Processes	Allows you to configure a processes, operation, and data log properties. You can link processes to items. You can specify specification, steps, and attributes for an operation. You can also assign certification to an operation.
Dynamic Routing Usage	Allows you to configure a dynamic routing process.
Standard Operations	Allows you to configure a standard operation and data log properties. You can specify specification, steps, and attributes for a standard operation. You can also assign certification to a standard operation.
Attributes	Allows you to specify the attributes for operation and process. You can also select its data and entry type.

Order Management

The following table describes the modules available in the **Order Management** group:

Module Name	Description
Work Orders and Jobs	Allows you to configure a work order and job state. You can add files and URLs to a work order. You can also configure steps and step groups for a job.
Queue	Allows you to view all jobs configured in Wonderware MES. You can split jobs and view job queue diagram. You can also link different jobs.

System Management

The following table describes the modules available in the **System Management** group:

Module Name	Description
Database Information	Allows you to maintain the MES database version details, historical table details, and Database Server.
Database Maintenance	Maintains the MES database. Creates and executes archive, purge, and restore jobs.
Rejected Message	Allows you to view, edit, resubmit, and delete MES command messages that are rejected by the middleware while using the Without Response communication mode.

Quality Management

The following table describes the modules available in the **Quality Management** group:

Module Name	Description
Sample Plan Frequency	Allows you to define sample plan frequencies, which are used to determine when the samples are collected.
Sample Plan	Specifies a group of sample plane frequencies that apply to one or more QM specifications.
Characteristic	The Characteristic module displays error messages for characteristics linked to QM specifications.
QM Specification	The QM Specification module specifies a set of values that applies to characteristics with a defined context in which these values area applicable.
Attributes	You can use the Attributes module to create and maintain attributes for reporting or conveying information to the plant floor.

Tabbed Workspace

When you select a module from the **Navigation Bar**, the configuration contents appears in the tabbed workspace. If you have multiple editors open, the tabbed workspace shows a tab for every module. You can display different windows by clicking on the corresponding tab within this area.

Columns within the tabbed workspace can be configured.

- To rearrange columns, drag and drop the column in the tabbed workspace to the desired location.
- To sort a column in ascending or descending order, click the heading of the column. An up arrow or down arrow will appear indicating whether the column is sorted in ascending or descending order respectively.
- To change the width of a column drag it to the desired width.
- To stack and order columns, drag and drop a column onto another column. The columns are stacked when left and right arrows appear on both sides of the selected column.

The **Items** tab can be configured as follows:

Applying Filters – The **Filter** option in the **Navigation** pane lists all the available items. Changing width of a column in the tabbed workspace does not save the configuration of filter and column width. The configuration is saved if you change a columns position, add or remove a column, apply grouping to the grid, or change the sort order.

Arranging Columns –You can arrange the items information. The field chooser option limits and organizes the display of data fields from all qualifying records. Field chooser allows you to choose what information about each item is shown in the Items section.

Properties Pane

When you click an item in the tabbed workspace, its properties appear in the Properties pane and can be configured here.

Error List Pane

The **Error List** pane shows the errors occurred during configuration. Only configuration errors are shown in the **Error List** pane. All runtime errors are shown in the ArchaestraA Logger. The following information is shown:

- **Type** – Describes the type of error.
- **Instance** – Describes the reason for the error.
- **Description** – Shows the description for the error.
- **Extension** – Shows the name of the module of the error.
- **Error Level** – Shows the severity level of the error. For example, whether the error is critical or it is warning.

Section 2 – Security

This section describes the security settings in Wonderware MES Software/Operations, including security groups, users, group privileges, and security parameters.

Overview

To do anything in the Wonderware MES Software/Operations system you have to be a defined **User**, which is a specific member of a **User Group**. The user group carries access rights to the system clients, process entities, and certifications. The individual user account is configured to define passwords, default labor costs, and language preferences. You can set up and modify users and user groups in the Wonderware MES Client.

In the **Master Data Config** group, **User Groups and Users** module, you can create a user group and assign special privileges and entity access rights that enable the user to access the features and entities in Wonderware MES.

The top of the pane displays **Groups**, with **Users** listed beneath the groups. The bottom of the pane displays the **Privileges** assigned to each group and **Entity Access** for each.

The screenshot displays the 'User Groups and Users' configuration window. The main table lists user groups with the following data:

Status	User ID	Description	Language	Active
	Admin	MES Administrator	Default (English)	<input checked="" type="checkbox"/>
FactAdmin (selected)				
	Oper	Plant Operator	Default (English)	<input checked="" type="checkbox"/>
	Unassigned Groups	Unassigned Groups	Default (English)	<input type="checkbox"/>

The 'Properties' pane on the right shows the 'Description' for 'FactAdmin' and a list of 'Users':

User ID
<input checked="" type="checkbox"/> Admin
<input type="checkbox"/> Oper

The 'Privileges' tab at the bottom shows a list of privileges assigned to the selected group:

Statu	Privilege Name	Privi
	Supervisor (31 items)	
	Scheduler (8 items)	
	Report Designer (5 items)	
	Rejected Message Viewer (1 item)	
	Operator (37 items)	
	Messenger (1 item)	

The 'Error List' pane at the bottom is empty, with columns for Type, Instance, Description, and Extension.

Privileges

Privileges define the actions that a user can perform. A user group must have the specific privileges to access the corresponding component in the Wonderware MES Client, such as **Configurator**, **Supervisor**, **Operator**, **Manager**, **Report Designer**, and **Data Editor**. The **Privileges** tab in the Wonderware MES Client also defines general privileges, such as file, view, edit, and download levels.

You cannot modify privileges for individual users. You can only specify privileges for a user group.

Configure privileges for a **User Group** by selecting the **Privileges** tab in the tabbed workspace, after selecting the **User Group** you wish to modify.

Configuring Security Settings

Security settings are located in the **Master Data Config** group, **General Parameters** module of the Wonderware MES Client. The table below describes the different security modules available by selecting this module.

Field	Description
Allow default entity logon	Yes/No list which defaults to No. If set to Yes, shows a check box on the entity logon dialog entitled Always log on to these entities . If checked, on subsequent logs on the entities which are selected will be automatically logged into.
Allow default user logon	Yes/No list which defaults to No. If set to Yes, shows a check box on the Operator log on entitled Always log on as this user . If checked, on subsequent logs on the user logged in will default to this user.
Automatic Login	Yes/No list which defaults to No. If set to Yes, the system automatically logs on as the OS user. If set to No, the system prompts for a user name and password. Note: Only OS users and user groups can automatically log on to the system. You must select a domain for an OS user group while configuring an OS user group. If the selected user is not a domain user the error message, OS User group is not configured appears while logging in the Wonderware MES Client.
Default BOM substitution level	Numeric field. Defines the initial security level when a substitution item is created.
Default document download level	Numeric field. Defines the initial security level for downloadable documents.
Default document edit level	Numeric field. Defines the initial security level for editing documents.
Default document print level	Numeric field. Defines the initial security level for printing documents.
Default document view level	Numeric field. Defines the initial security level for viewing documents.
Default report view level	Numeric field. Defines the initial security level for viewing reports.
Default specification access level	Numeric field. Defines the initial security level when a specification is assigned to an operation or item.
Duration in minutes which constitutes consecutive logins 0=forever	Numeric field. Defines the time window during which failed log on attempts are to be considered consecutive. For example, if a user attempts to log on Monday and his log on attempt failed due to an incorrect password and then he attempts to log back in on Tuesday, should that be considered consecutive?
Minimum password length	Numeric field. The fewest number of characters a password may contain.

Field	Description
Number of days a password is valid 0 = passwords are always valid	Numeric field. The number of consecutive days a password will be active; after that, a new password must be selected.
Number of failed login attempts before deactivation 0=never	Numeric field. The number of attempts an incorrect password is allowed before he is terminated from the program.
Passwords	<p>Drop-down list containing Unique and Non-unique. If Unique, only a password is prompted, and not the user ID. If Non-unique, both the user ID and password must be entered.</p> <p>Note: The unique password is supported only if the Native option is selected in the Security Mode list.</p>
Seconds of inactivity before automatic logoff 0=never	<p>Numeric field. The number of seconds of inactivity before the user is automatically logged off the module. Operator will display the Switch User window requiring the user to enter his password before returning to the Operator screen.</p> <p>Note: You must restart the application after changing these settings.</p>
Security Mode	<p>Drop-down list containing Native, OS Users, and OS Group. If Native is selected, the MES database configuration is used to authenticate the user. If OS User is selected the individual OS users are authenticated based on their roles. If OS Group is selected, the OS user groups are authenticated based on their roles.</p> <p>Note: You can not change the security settings for a user if a process is checked out.</p>
Switch user requires password	Yes/No drop-down list. If Yes, a password must be re-entered before the session in Operator is reactivated.

Authentication Methods

You can configure users, user groups, OS users, and OS user groups in the **User Groups and Users** module. You can create a user group if you have selected the **OS Group** or **Native** option in the **Security Mode** in the **General Parameters** module.

If the **Security Mode** setting in the **Security** group of the **General Parameters** module is set to **OS Group**, the log on window does not appear and the application runs without user authentication.

You must use a domain user (not a local user) in the **Network Account** utility if you are using the OS Based Security. If the selected user is not a domain user, the following error message appears while logging on the Wonderware MES Client **OS User group is not configured**.

Wonderware MES Software/Operations offers the ability to use three different methods of validation of users of the system. They are as follows:

Native

In the **Native** mode the users and groups are defined in the MES database using the Wonderware MES Client with no limitations as to either of these attributes. In this mode you can define user names and group names. Any requirements for the passwords or names is controlled by the MES options defined in the **General Parameters** of the MES database.

OS Group

In the **OS Group** mode, the groups define privileges and allowable entities. The Wonderware MES Client must have access to a domain controller in order to import groups from the domain. After the groups are imported and validated, users in domain groups can be assigned privileges to the groups. The advantage of this mode is that you do not have to create, validate, or authenticate groups within the MES database because the operating system performs these tasks. When users log on using their user name in the form of domain name/user name, Wonderware MES Software/Operations passes the login information to the operating system for authentication. The accounts and passwords are validated and maintained by the domain controllers.

OS User

In the **OS User** mode, the users from a domain are assigned to groups within the MES database. The groups are not the same as domain groups and are not validated by the domain controller for privileges. To import users from the domain, the Wonderware MES Client must have access to the domain controller. After these groups are imported and validated, privileges are assigned by arranging the users in groups in the MES database. Only the operating system users have the appropriate privileges in Wonderware MES. The advantage of this mode is that you do not have to use the groups defined in the domain. You can create groups within the MES database. Additionally, you do not have to validate or authenticate users because the operating system is responsible for that task. When users log on using their user name in the form of domain name/user name, Wonderware MES Software/Operations passes the login information to the operating system for authentication. The accounts and passwords are validated and maintained by the domain controllers.

Exporting Security from Wonderware System Platform

Upon installation of the Entity Model Builder IDE extension, you can export ArchestrA users and roles to the corresponding users and groups in the MES database. Although this is not a comprehensive user/role synchronization tool, it provides the convenience of not having to reenter each ArchestrA user/role into the MES database. You must be using Galaxy, OS User, or OS Group ArchestrA Security to use this feature.

Lab 1 – Enabling Security

Introduction

In this lab, you will create users and security groups to enable security in Wonderware MES Client. A default user group named **FactAdmin** exists with full permissions to allow unrestricted development. First, you will create a new user, **Admin**, under the **FactAdmin** user group. Then, you will create the **Operators** group. Finally, you will create an **Operator** user under the **Operators** group. This user will conduct most of the plant floor activities during the rest of the course.

Objectives

Upon completion of this lab, you will be able to:

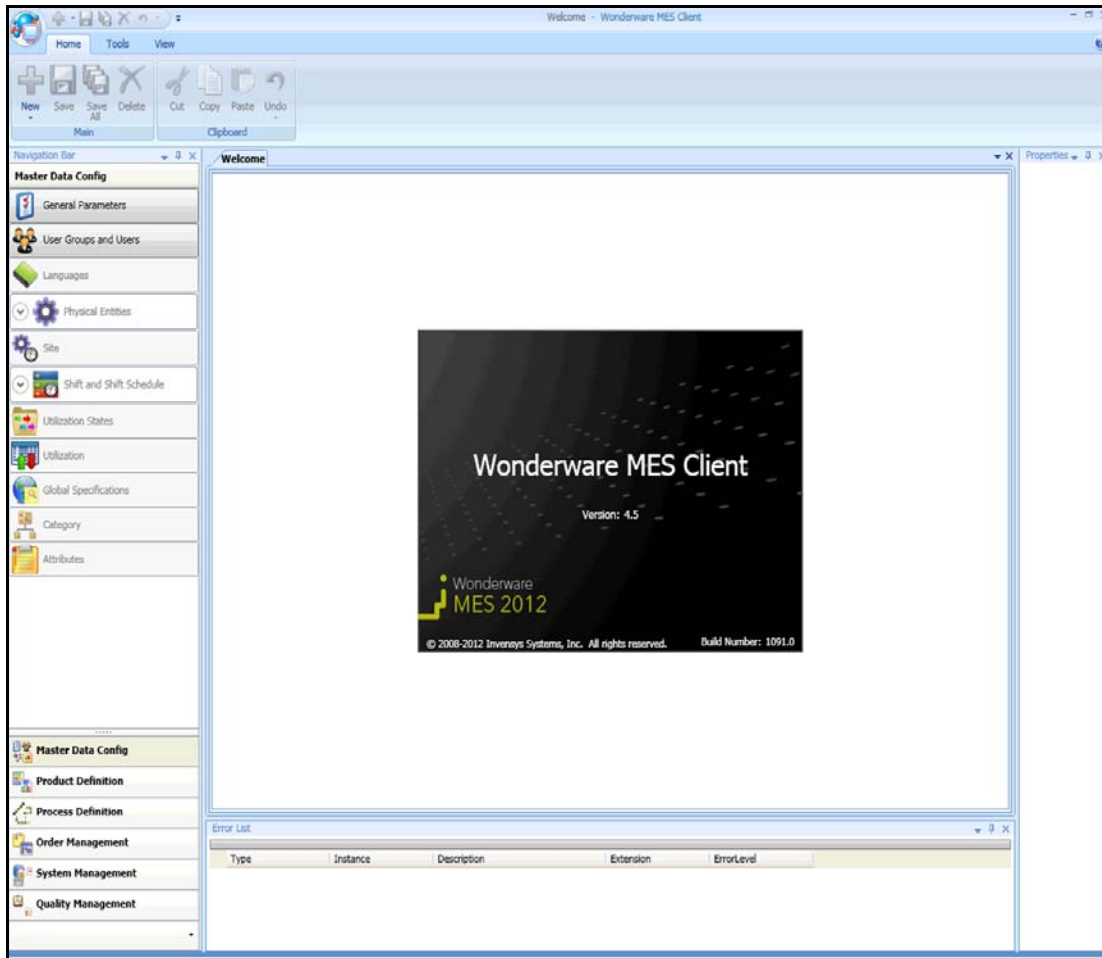
- Configure automatic logoff
- Create user groups
- Assign privileges to user groups
- Create users

Configure Automatic Logoff

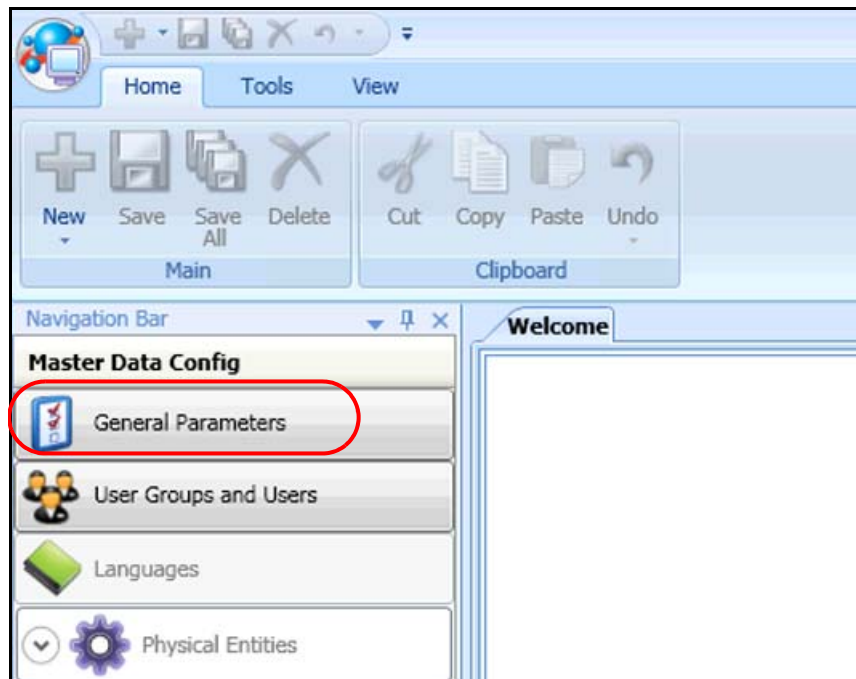
First, you will disable the automatic logoff feature.

1. Open Wonderware MES Client (**Start | All Programs | Wonderware | MES | MES Client**).

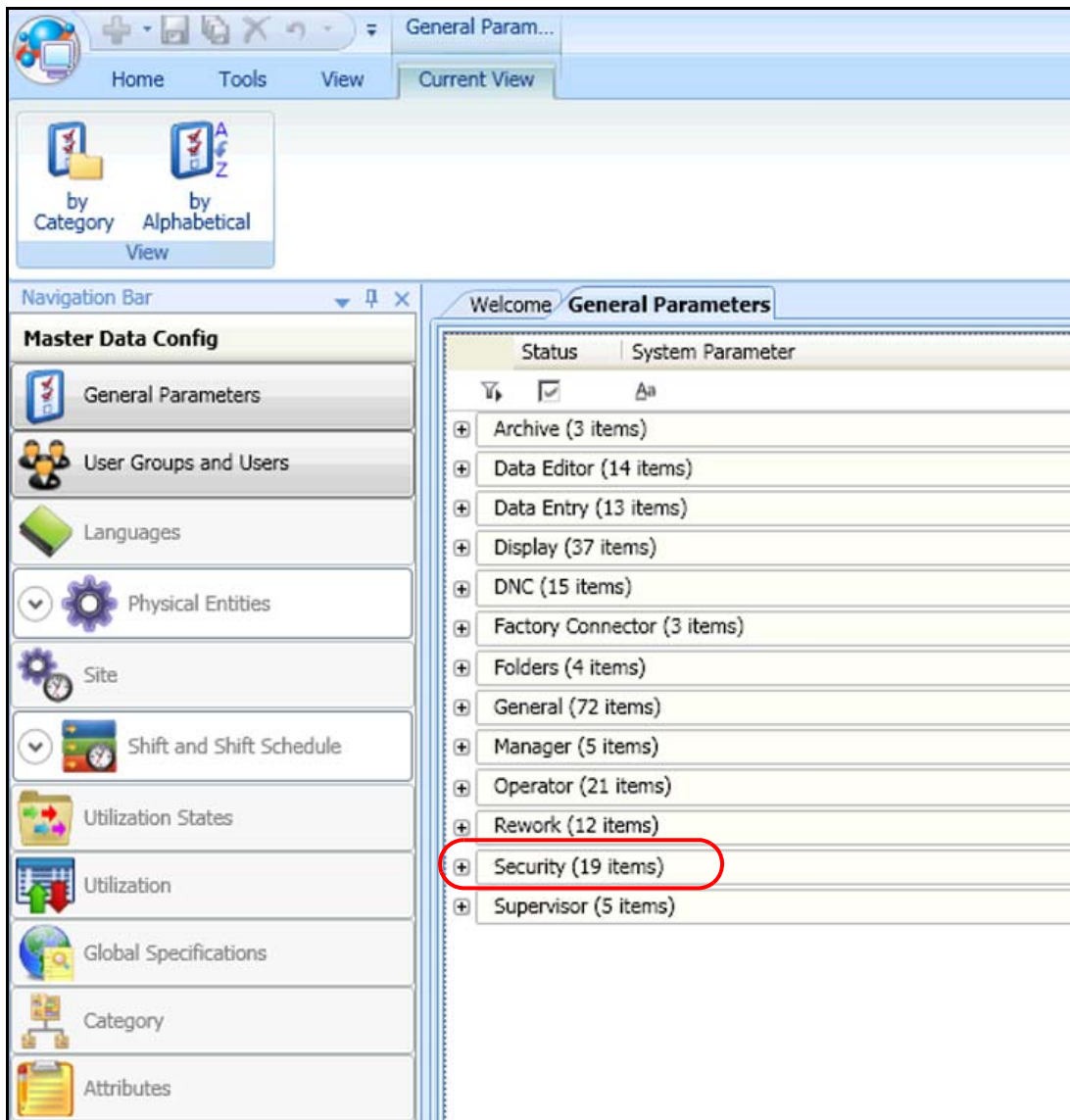
After a few moments, the MES Client window appears.



2. In the **Navigation Bar**, **Master Data Config** group, click the **General Parameters** module.



3. On the **General Parameters** tab, expand the **Security** group.



4. Scroll down to view all of the **System Parameters**, and then in the **Seconds of inactivity before automatic logoff 0=never** field, set **Value** to **0**.

Note: This option is used to automatically log off a user after some time of inactivity. In this example, the inactivity time is set to **0** seconds so that the automatic log off (time-out) feature is disabled. The automatic log off feature is disabled to facilitate application development in the classroom. The use of an automatic log off feature is normally utilized in the plant environment.

Welcome General Parameters*		
Status	System Parameter	Value
+	Factory Connector (3 items)	
+	Folders (4 items)	
+	General (72 items)	
+	Manager (5 items)	
+	Operator (21 items)	
+	Rework (12 items)	
-	Security (19 items)	
Status	System Parameter	Value
	Allow default entity logon	No
	Allow default user login	No
	Automatic Login	No
	Default BOM substitution level	0
	Default document download level	0
	Default document edit level	0
	Default document print level	0
	Default document view level	0
	Default report view level	0
	Default specification access level	0
	Duration in minutes which constitutes consecutive logins 0=forever	0
	Minimum password length	1
	Number of days a password is valid 0 = passwords are always valid	0
	Number of failed login attempts before deactivation 0=never	0
	Passwords	Non-unique
	Seconds of inactivity before automatic logoff 0=never	0
	Seconds of inactivity before automatic switch user Operator 0 = never	0
	Security Mode	Native
	Switch user requires password	Yes
+	Supervisor (5 items)	

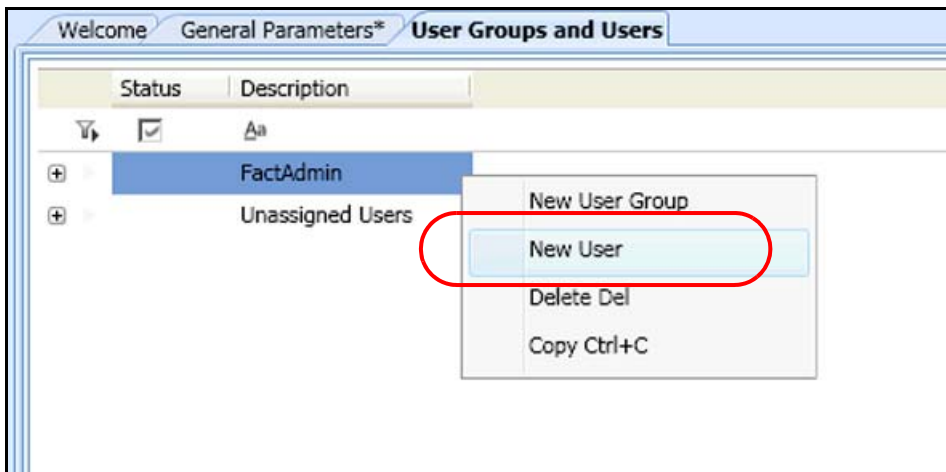
Create an Administrator User

You will now create an administrator user, **Admin**, in Wonderware MES Client.

5. In the **Navigation Bar**, click **User Groups and Users**.



6. Click the **FactAdmin** user group.
7. Right-click the **FactAdmin** user group and select **New User**.



8. In the **Properties** pane, configure the new user as follows:

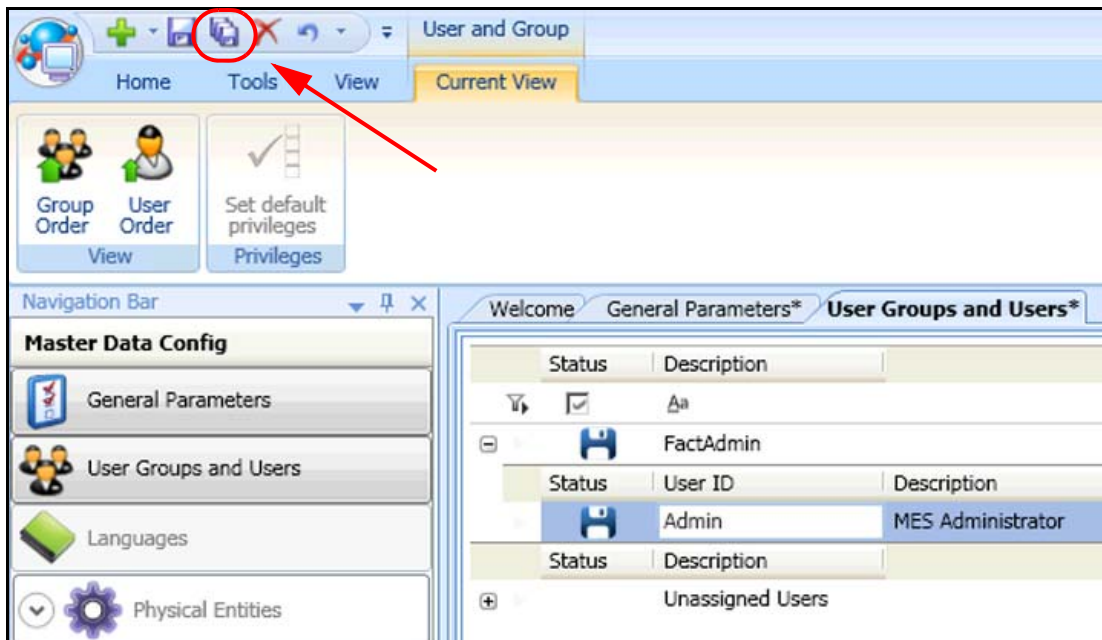
User ID: Admin
Description: MES Administrator
New Password: ww
Confirm Password: ww

The screenshot shows a software interface with a 'Properties' pane on the right side, which is highlighted with a red rounded rectangle. The 'Properties' pane contains the following fields and options:

- UserID:** A text box containing 'Admin'.
- Description:** A text box containing 'MES Administrator'.
- Language:** A dropdown menu set to 'Default (English)'.
- Active:** A checkbox that is checked.
- New Password:** A text box with two dots (••) indicating a masked password.
- Confirm Password:** A text box with two dots (••) indicating a masked password.
- Groups:** A section with a 'Description' header and a list of groups. The 'FactAdmin' group is checked.

The background of the screenshot shows a table with columns 'Active' and 'Privilege Value'. The 'Active' column has a checked checkbox, and the 'Privilege Value' column has a small icon (Aa).

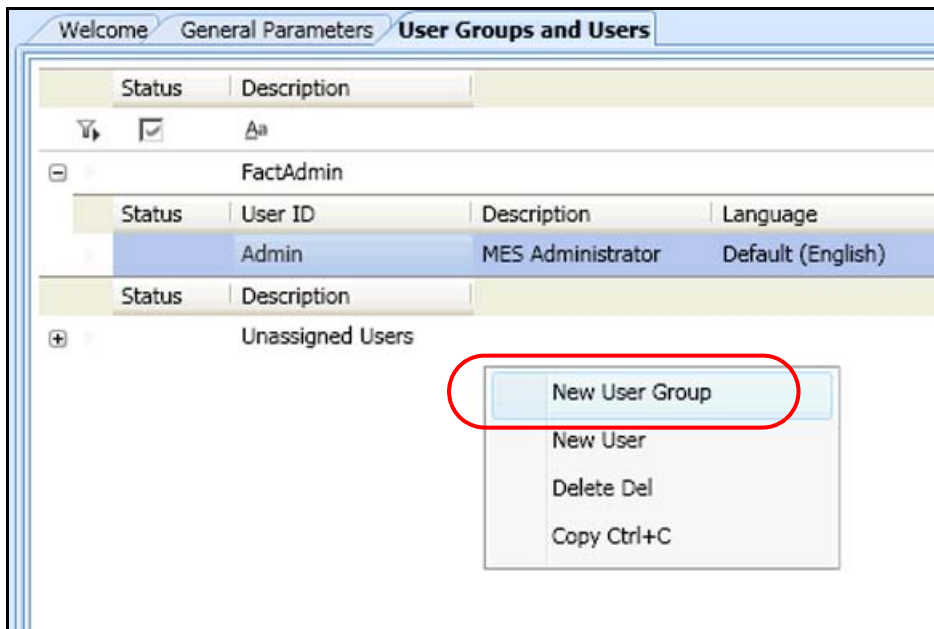
9. In the top-left corner, on the **Quick Access Toolbar**, click **Save All**.



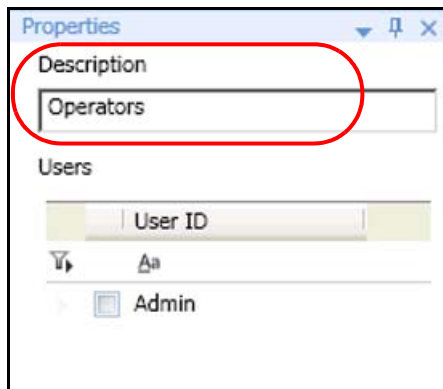
Create a User Group

Now, you will create a new user group. This allows you to assign different permissions to a separate user group.

10. On the **User Groups and Users** tab, right-click the empty workspace and select **New User Group**.

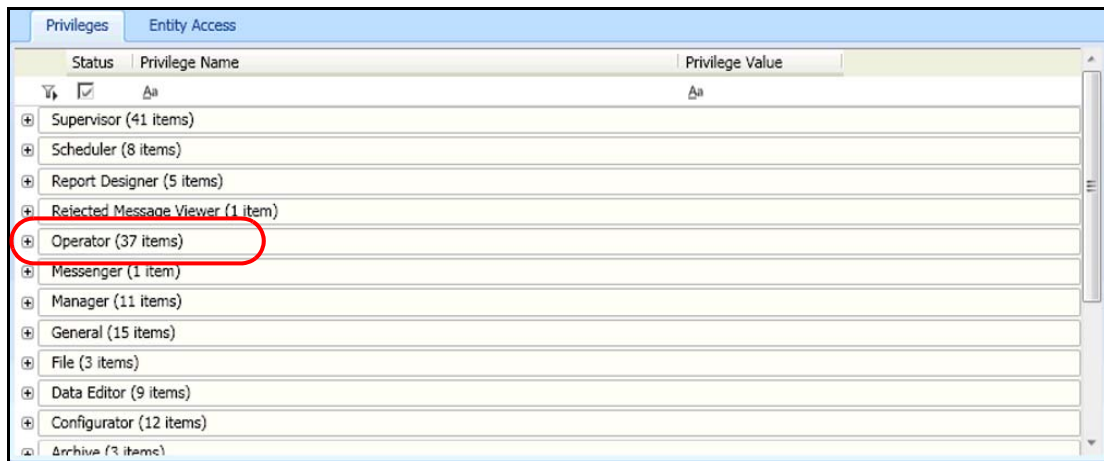


11. In the **Properties** pane, **Description** field, enter **Operators**.

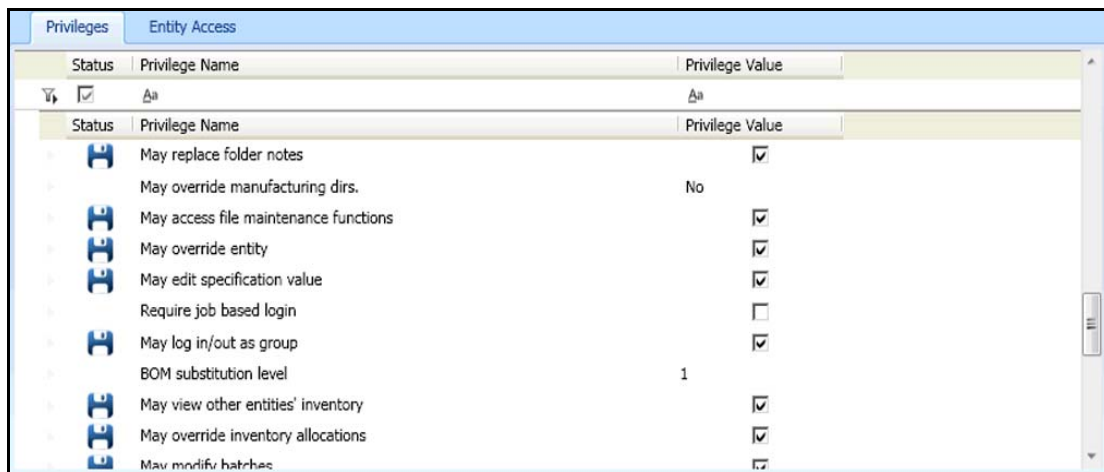


You will now assign appropriate privileges to the **Operators** user group.

12. In the bottom portion of the tabbed workspace, on the **Privileges** tab, expand the **Operator** privilege group.



13. Check all the privileges except **Require job based login**.

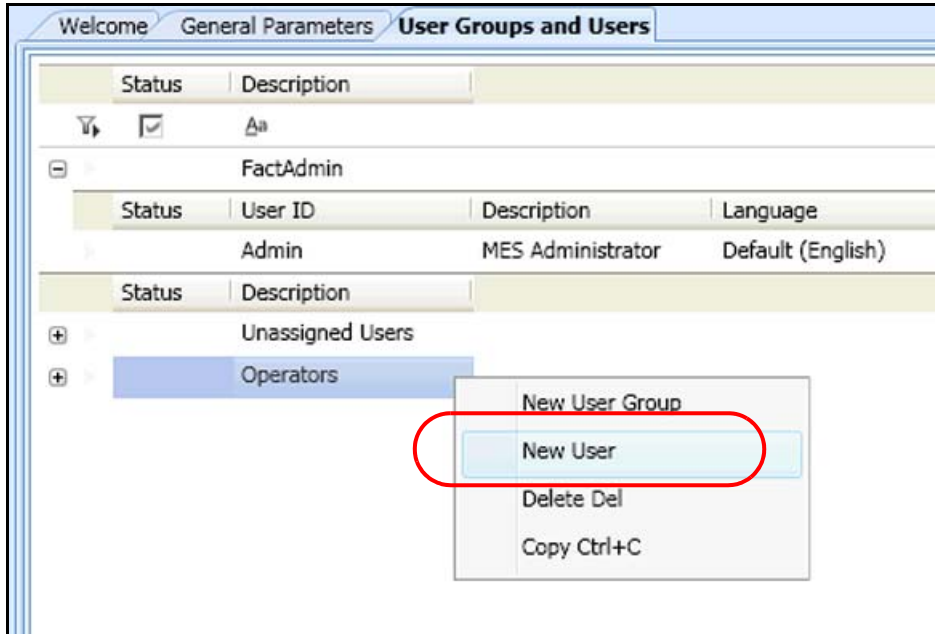


14. On the **Quick Access Toolbar**, click **Save All**.

Create a New User

After assigning privileges to the user group, you will now assign a user to it.

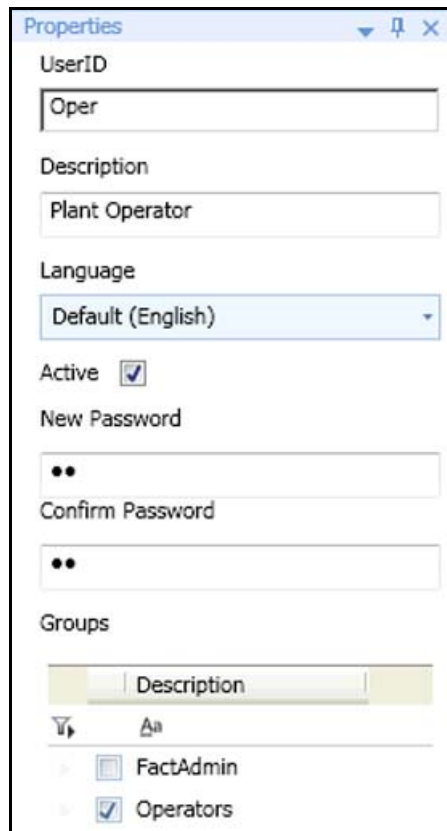
15. On the **User Groups and Users** tab, right-click the **Operators** user group and select **New User**.



A new user is created and automatically assigned to the selected user group, **Operators**.

16. In the **Properties** pane, configure the new user as follows:

User ID: Oper
Description: Plant Operator
New Password: ww
Confirm Password: ww



The screenshot shows a 'Properties' dialog box with the following fields and options:

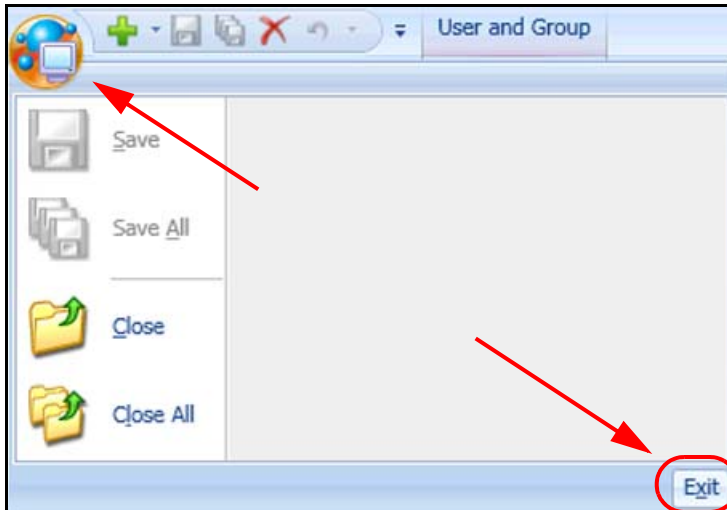
- UserID:** A text box containing 'Oper'.
- Description:** A text box containing 'Plant Operator'.
- Language:** A dropdown menu set to 'Default (English)'.
- Active:** A checkbox that is checked.
- New Password:** A text box with two dots indicating a password.
- Confirm Password:** A text box with two dots indicating a password.
- Groups:** A list box showing 'FactAdmin' and 'Operators'. The 'Operators' group is selected with a checkmark.

17. On the **Quick Access Toolbar**, click **Save All**.

Restart MES Client

After creating users, security is enabled in the MES database. Now, you will restart MES Client and log in as **Admin**. Restarting MES Client is also necessary for the changes made to the system parameters to take effect.

18. In the top-left corner, click the **Application Button**, and then click **Exit**.



19. Start Wonderware MES Client.

A dialog box prompting for credentials appears.

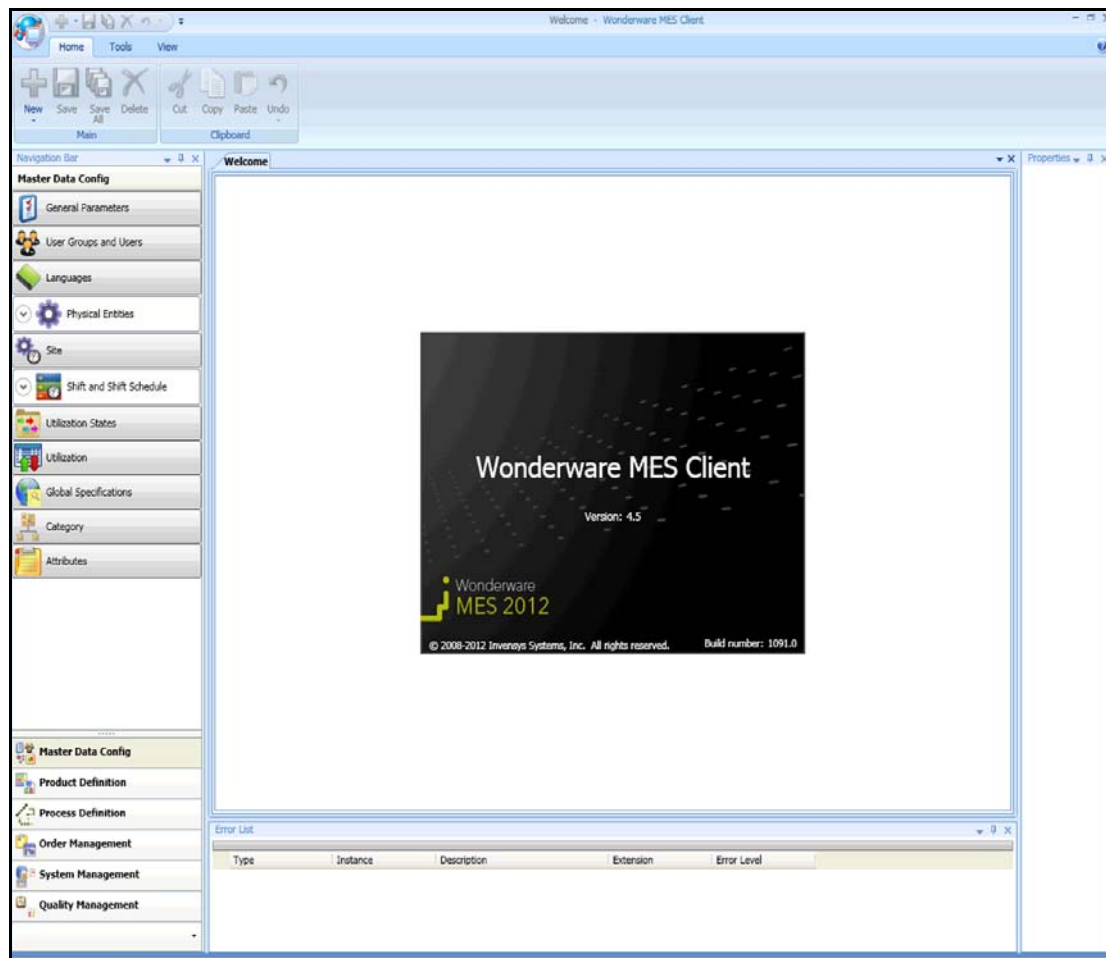


Log on as the administrator user by entering the following credentials:

User Name: Admin

Password: ww

The MES Client window appears.





invenys
Learning Services



Module 3 – Define the Basic Operations Model

Section 1 – Modeling Overview	3-3
Lab 2 – Setting Up the Galaxy	3-7
Section 2 – Entity Model	3-15
Lab 3 – Defining the MES Entity Model	3-17
Section 3 – Entity Capabilities	3-35
Section 4 – Product and Process Definition	3-39
Lab 4 – Defining Products and Processes	3-41
Section 5 – Work Order Execution	3-69
Lab 5 – Tracking Work Order Execution	3-75

Module Objectives

- Create a basic working model to track production activities in the plant floor
- Discuss the Operation Capability object
- Explain the MES Entity Model Builder

Section 1 – Modeling Overview

This section briefly explains what modeling means and describes the production model for the simulated manufacturing plant used in this course.

Modeling

To capture the MES data that defines a physical manufacturing process, Wonderware MES Software/Operations must be configured to support those data structures. This is known as Modeling and is one of the most important exercises in building a successful system.

You should always start with careful planning. Obtaining accurate Process and Instrumentation Diagrams (P&IDs) of the process before configuring the process model is very helpful. You can use the P&IDs to determine the components and capabilities of the process.

The goal of the process model is to mirror the real world as closely as possible. You should begin by collecting basic information about the plant layout, the different operations in the process, and the flow of materials.

Concepts and Terminology

To create a model, you need to tell Wonderware MES Software/Operations where you are making the products, what products you are making, and how you are making them. These are the minimum amount of configuration elements, no matter what the application is for, that the software needs to track production activities in your plant and to create rules to be enforced.

To answer the questions of where, what, and how, you will use the following configuration elements in the software.

Entities – Explains where to make the product. Entities are physical assets in the plant for which you want to track or report information. Entities could be an entire plant, a production line, a piece of equipment, or even a module inside a machine. Entities are also known as areas, equipment, or machines.

Items – Explains what to make. Items refer to any material you use in your process. Items could be input or raw materials, final product, WIP materials, scraps, or any material you want to track in your application.

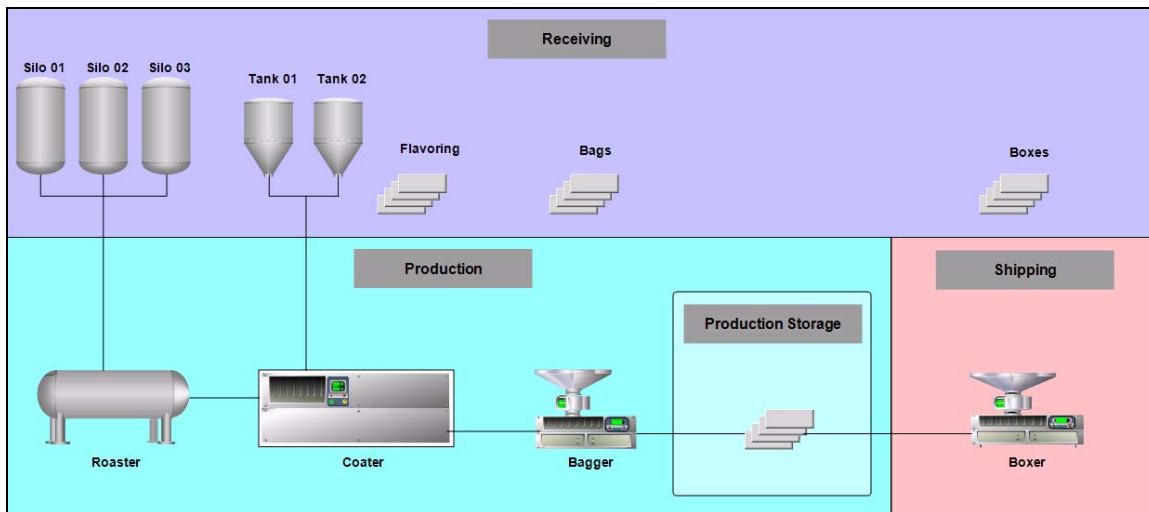
Processes and Operations – Explains how to make the products. An operation (also known as a phase or segment) is each of the tasks that needs to be successfully completed to make a product. A process (also known as route) is the method for producing the product. The process defines all the operations and entities required to produce a specific item.

Identify the Process

The process (the simulated plant built for MES courses) involves three key areas:

- Receiving
- Production
- Shipping

Keep these key areas or plant components in mind while building and configuring your application in the labs completed in this course to analyze, monitor, and manage the performance of your plant.



The Mixed Nuts Plant Process

During this training class, you are presented with the following scenario. You have been asked to create an MES application for a mixed nuts plant. As a part of the requirements for the project, you have been asked to implement a comprehensive operations model including: work order management and data collection. You must then integrate this MES application with an existing Wonderware System Platform application, which acquires and manages the real-time information provided by controllers, devices, and equipment in the plant.

To better understand the plant, you have collected basic information describing the plant layout, the different operations in the process, and the flow of materials. This section shows the result of that survey.

Process Operations

This is a representation of the operations used in the production of bags of mixed nuts and the progression of materials as they are stored, consumed, and produced.

This plant currently sells bags of mixed nuts. To manufacture the bags, this plant runs a single process. The process roasts the input materials, coats them with barbeque flavoring, bags them, and boxes them in preparation for shipping.

This process begins by taking the input materials from the **Receiving** area. Then, once the mixed nuts have been roasted to the right temperature and coated, they are packaged into four-ounce bags. They are then boxed 100 at a time and sent to the **Shipping** area, ready to be sent out to customers.

Input materials are received in the **Receiving** area in the plant. This area has three silos for storing the three types of nuts that are used for the nut mix: peanuts, cashews, and almonds.

Once a new work order is issued by the ERP system, a series of three operations are run in the **Production** area to make the requested order of mixed nuts. The first two operations are responsible for the roasting and coating of the input materials. The last operation is responsible for bagging the mixed nuts.

The first operation, called **Roasting**, roasts the mixed nuts at a specific temperature. This operation is run in the **Roaster** unit, and it produces perfectly roasted mixed nuts. These nuts are then moved to the **Coater**, where they are coated with barbeque seasoning stored in the **Receiving** area. The output of this **Coating** operation is 100 pounds of seasoned nuts ready for bagging.

After the required amount of mixed nuts has been produced, the plant runs a process to bag the mixed nuts. This process consists of one single operation in the **Bagger** unit. This unit fills the empty bags with the seasoned mix of nuts. The output of this **Bagging** operation is the four-ounce bags of mixed nuts that have been filled and sealed.

Finally, the bags coming out of the **Bagger** are sent to the **Boxer** unit in the **Shipping** area, where they are boxed with 100 bags per box. The boxes are then ready to be shipped to the customers.

Bill of Materials

The following table lists the materials that are used in the production of bags of flavored mixed nuts.

Operation ID	Operation Name	Material Produced	Sent To	Materials Consumed	Units	Consumed From
100	Roasting	Roasted Mixed Nuts	Coater	Peanuts – 45	Pounds	Silo01
				Cashews – 25	Pounds	Silo02
				Almonds – 25	Pounds	Silo03
200	Coating	Flavored Mixed Nuts	Bagger	Roasted Mixed Nuts – 95	Pounds	Roaster
				Coating Oil – 2	Gallons	Tank01
				Flavoring – 3	Pounds	Receiving
300	Bagging	Bags of Mixed Nuts	Production Storage	Flavored Mixed Nuts – 100	Pounds	Coater
				Empty Bags – 400	Pieces	Receiving

Lab 2 – Setting Up the Galaxy

Introduction

In this lab, you will create the ArchestrA Galaxy and import objects that represent a demonstration plant model for a mixed nut factory. This plant model will provide an MES asset model and runtime integration to the plant floor.

Objectives

Upon completion of this lab, you will be able to:

- Create a Galaxy
- Import objects into a Galaxy

Create the Galaxy

You will first create a Galaxy, **TrainingGalaxy**, using the ArchestrA IDE. This Galaxy will be used as a runtime application and plant model for all subsequent labs.

1. Open the ArchestrA IDE (**Start | All Programs | Wonderware | ArchestrA IDE**).

The **Connect To Galaxy** dialog box appears.

2. Click **New Galaxy**.



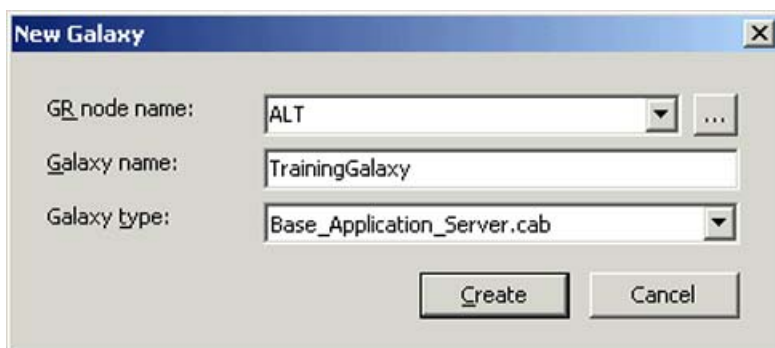
The **New Galaxy** dialog box appears.

3. Configure the **New Galaxy** dialog box as follows:

GR node name: *<local node name> (default)* In this example, **ALT** is the local node name

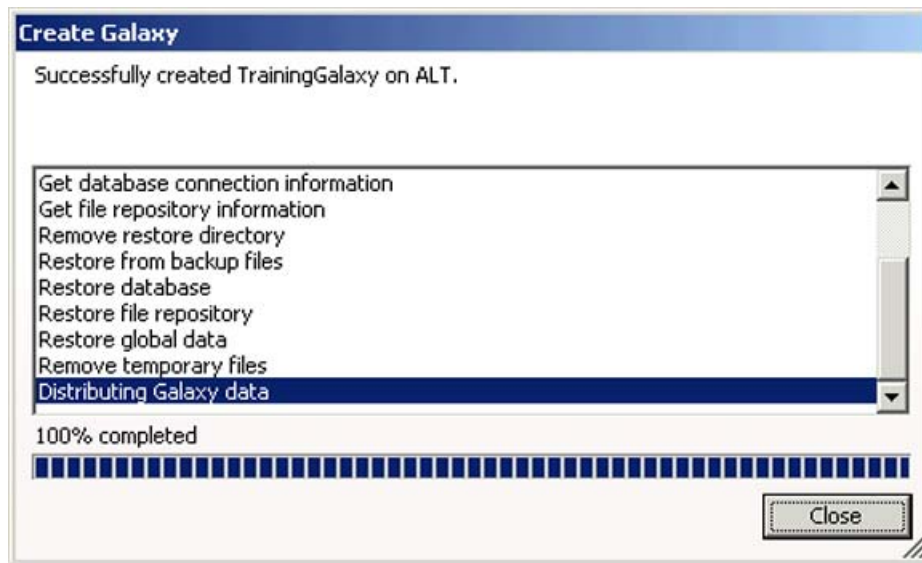
Galaxy name: TrainingGalaxy

Galaxy type: Base_Application_Server.cab (*default*)



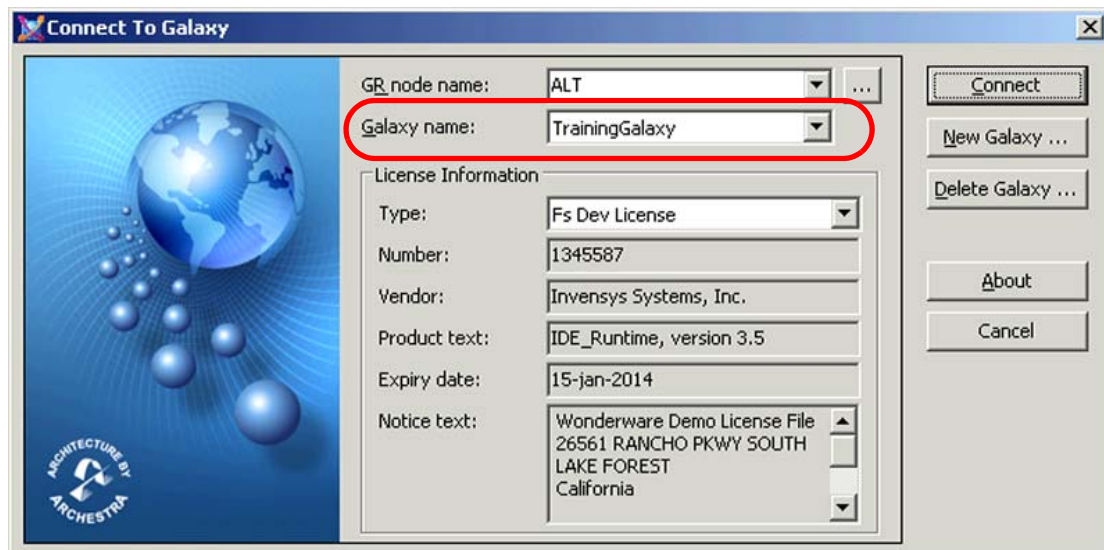
4. Click **Create**.

After a few moments, the **Create Galaxy** progress displays **100% completed** and the **Close** button is enabled.



5. Click **Close**.

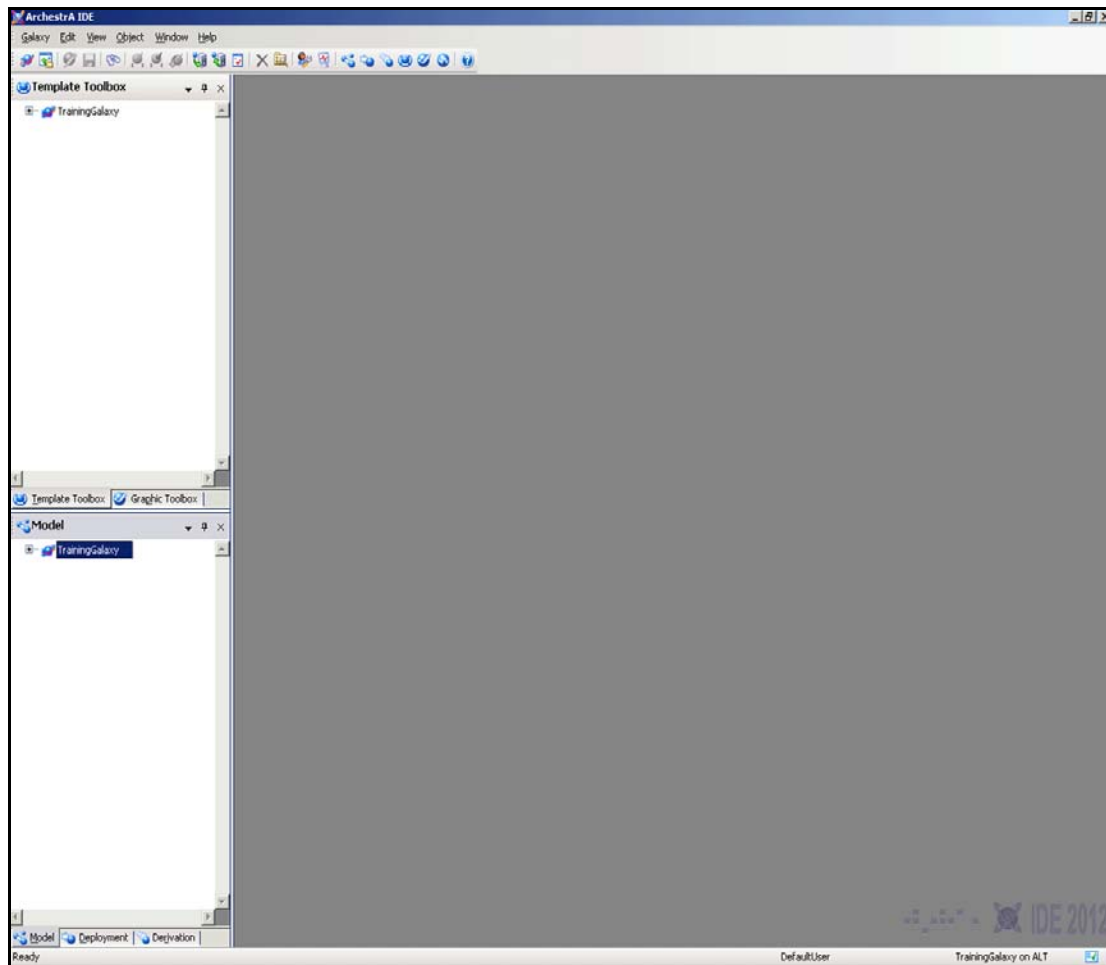
In the **Connect To Galaxy** dialog box, **Galaxy name** drop-down list, the new Galaxy name appears.



6. Click **Connect**.

3-10 Module 3 – Define the Basic Operations Model

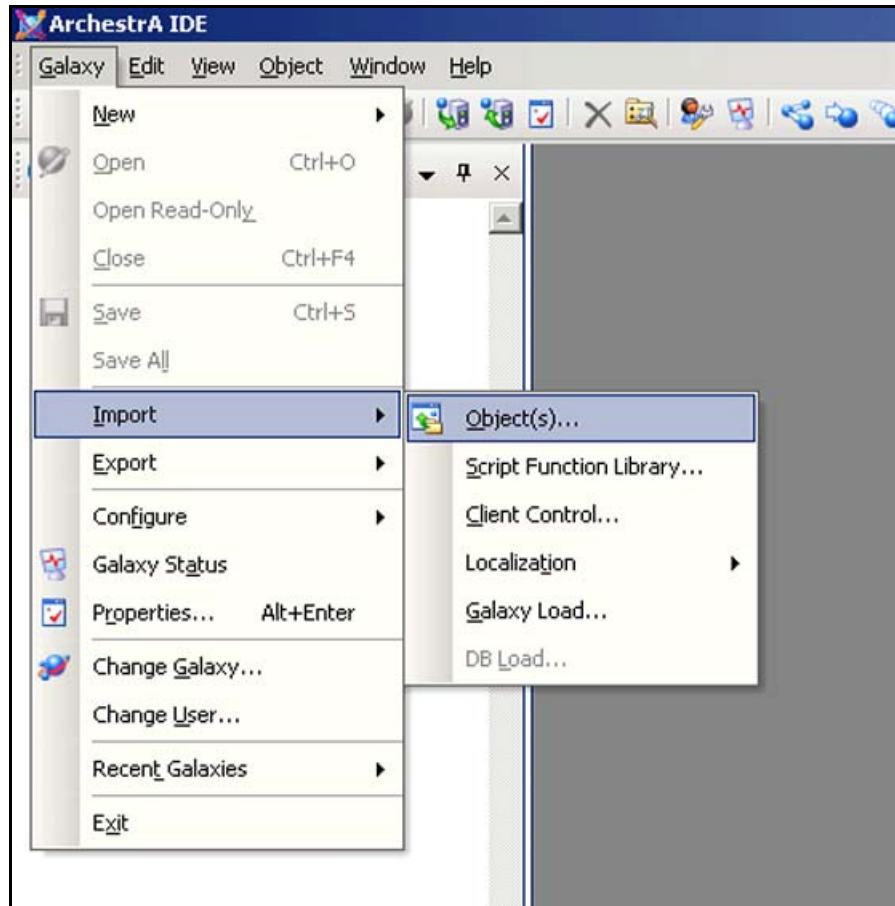
After a few moments, the Arcestra IDE opens.



Import the Plant Objects and Configure the WinPlatform Object

Now, you will import the plant model of the mixed nut factory into the Galaxy. All the components of the plant model will be imported from an .aaPKG file, **Operations 2012 Training.aaPKG**.

7. On the **Galaxy** menu, click **Import | Object(s)**.

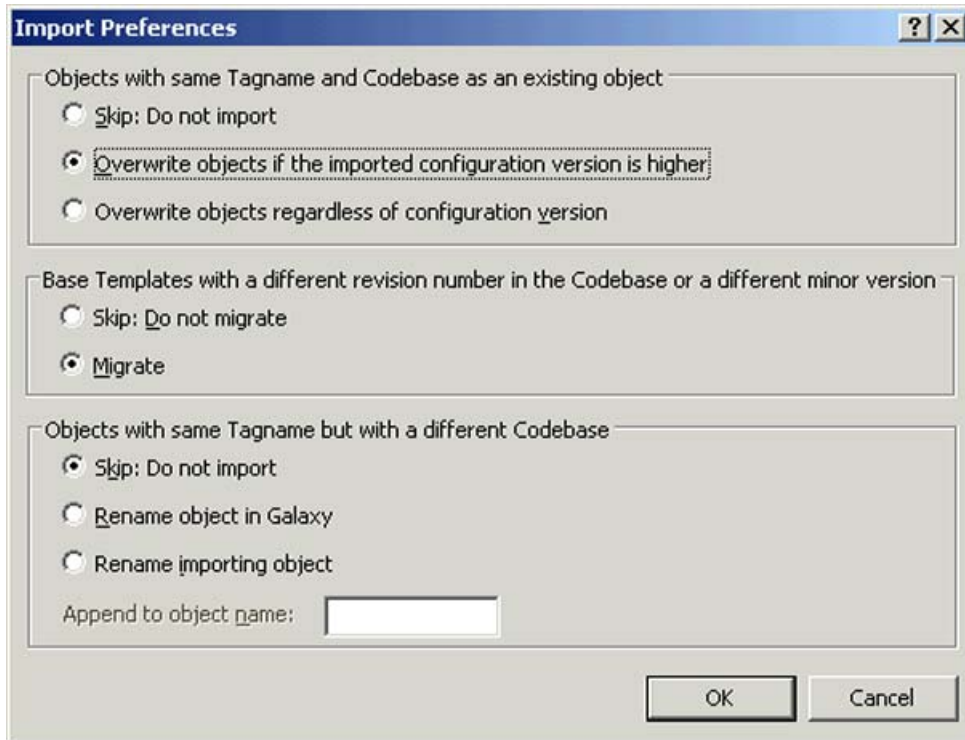


3-12 Module 3 – Define the Basic Operations Model

The **Import Automation Object(s)** dialog box appears.

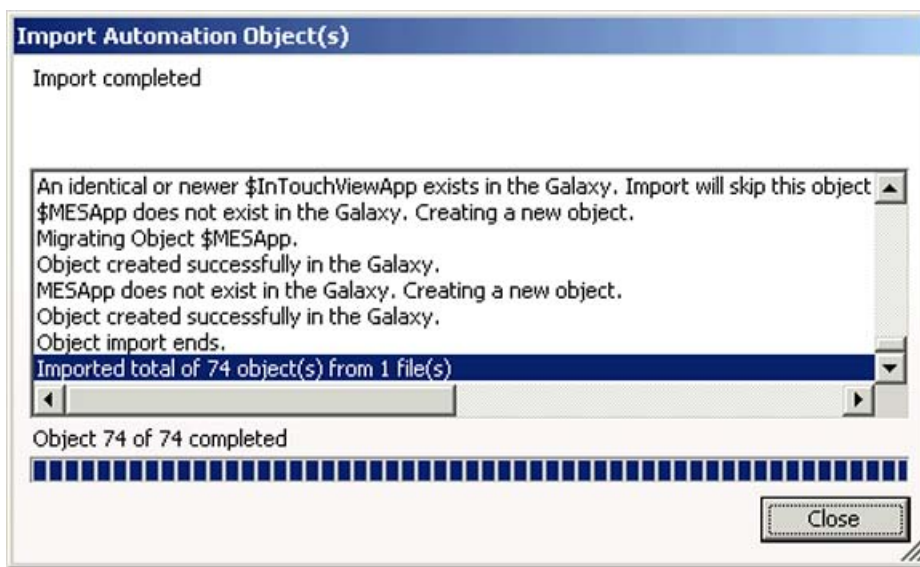
8. Search in the **C:\Training** folder and select the **Operations 2012 Training.aaPKG** file.
9. Click **Open**.

The **Import Preferences** dialog box appears.



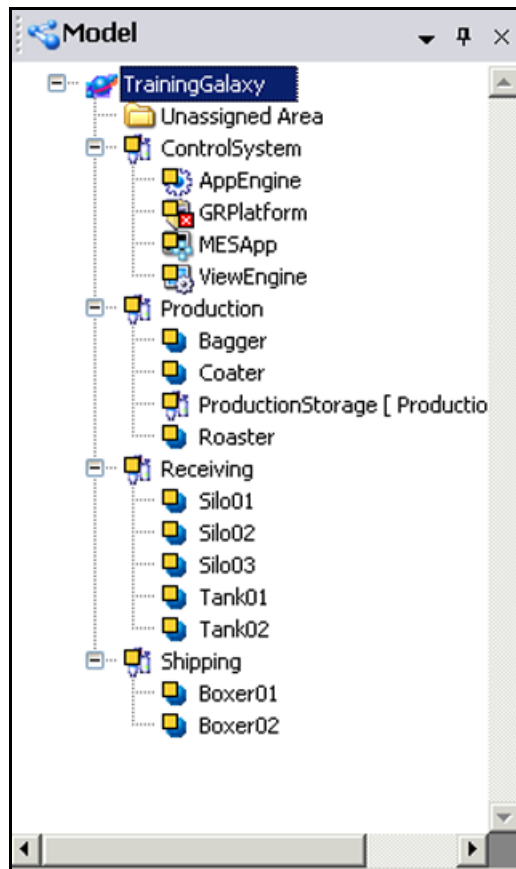
10. Leave the default settings and click **OK**.

After a few moments, the **Import Automation Object(s)** progress displays **Import completed** and the **Close** button is enabled.



11. Click **Close**.

12. In the **Model** view, press asterisk * on the keypad to expand the entire **TrainingGalaxy**.

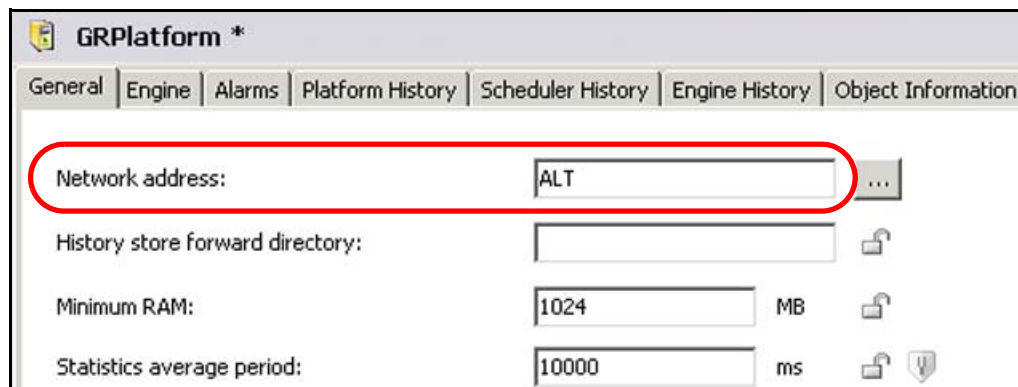


The red error icon  next to the **GRPlatform** object indicates a configuration error.

Now, you will configure a node name for the WinPlatform object.

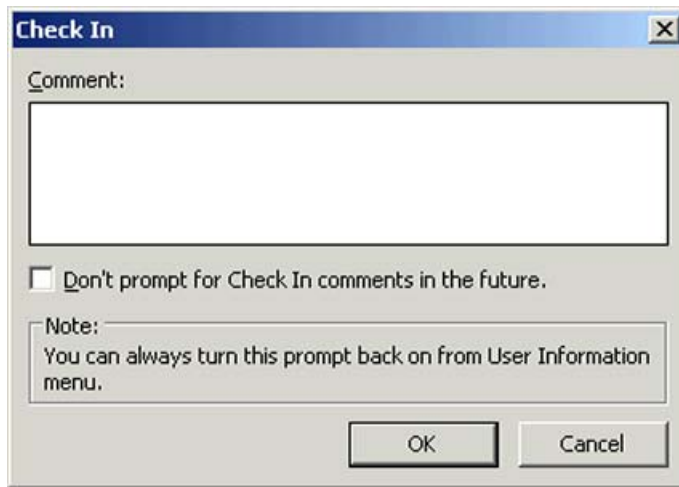
13. Double-click **GRPlatform**.

In the **GRPlatform** configuration editor, **Network address** field, enter your **<local node name>**. In this example, **ALT** is the local node name.



14. In the top-right corner, click the **Save and Close** button  to save the changes and close the configuration editor.

The **Check In** dialog box appears.



15. Click **OK** to check in the object.

The red error icon is no longer displayed.

Section 2 – Entity Model

This section describes physical entities, how they are defined and configured, and how to grant user access to them.

Overview

Entities are plant assets that are used for the production, consumption, and storage of goods. An entity can be a building, a location in a building, a production line, or a single machine. The entity model for the MES application is driven by the plant model in the ArchemstrA Galaxy. You can create a logical representation of entities and applications objects in the ArchemstrA IDE to control and monitor production activities on a plant floor.

The Operations Capability Object is an ArchemstrA automation object that allows you to configure entities to perform the following tasks:

- Start, stop, and run jobs
- Record the amount of material that is produced or consumed while executing a job
- Store and transfer inventory items
- Load, upload, and download job specifications

You can add the Operations Capability Object under an application object in the ArchemstrA IDE and configure it. The configured Operations Capability Object attributes are used by the Entity Model Builder to create an entity in the MES database corresponding to the application object. The created entity can be used to perform different operations as per the information configured in the Operations Capability Object.

The Operations Capability Object extends the ArchemstrA IDE equipment model to trigger events and log associated data into the MES database.

This includes material events related to material consumption, material production, and material movement, as well as status events related to equipment, production data, and personnel.

Before configuring the Operations Capability Object, you must import the aaPKG file. By default, this file can be located at **C:\Program Files\Wonderware\MES\AppObjects**.

MES Entity Model Builder

The Entity Model Builder is an Arcestra IDE extension for creating entities from your Arcestra equipment model that uses the Operation Capability object to configure job execution and storage execution capabilities

The installation of Entity Model Builder also provides you the capability to export existing Arcestra users and roles to create corresponding Wonderware MES users and groups. Although Entity Model Builder is not a comprehensive user/role synchronization tool, it provides the convenience to avoid reentering each Arcestra user/role into the MES database.

Creating Entities

The Entity Model Builder creates new entities and new entity hierarchies that do not exist. The Entity Model Builder can reparent an existing entity if the hierarchy is different in the Arcestra IDE. It can also update an existing entity. To delete an entity you must delete it from Configurator.

When you contain an Operations Capability Object under an application object in the Arcestra IDE Model View, the Entity Model Builder creates an entity for all the parent application objects and area objects as depicted in the Model view. Therefore, the basic equipment structure in the Galaxy is created with the intention of duplicating the same structure in the MES database.

If Wonderware MES already has an entity created in the database, the Entity Model Builder overwrites the entity information with the new configured information in an Operations Capability Object when you run the Entity Model Builder. The Entity Model Builder does not delete an existing entity or remove any capabilities. It can reparent entities at any level to reflect new structural changes to the Arcestra equipment model hierarchy. Additional exports check the JobExec configuration in the Arcestra Equipment model and in the MES Entity model. If there are any differences, the MES configuration is updated to match the Arcestra configuration.

The new entity model is defined in the database with the same structure as the Arcestra IDE model view. The job execution and storage information is extracted from the Operations Capability objects and stored in the corresponding entities. An application object can contain only one Operations Capability Object.

Lab 3 – Defining the MES Entity Model

Introduction

In the previous lab, you created the Galaxy and imported the plant objects for the mixed nut factory. Now, you will use the plant model to create the hierarchical entity model for Wonderware MES. In this lab, you will import the Operations Capability Object (OCO) into the plant model. Then, you will assign OCOs to equipment in the Production area of the plant. Next, you will use the Entity Model Builder to create the entity model in the MES database. Finally, you will grant access to entities in the Wonderware MES Client.

Objectives

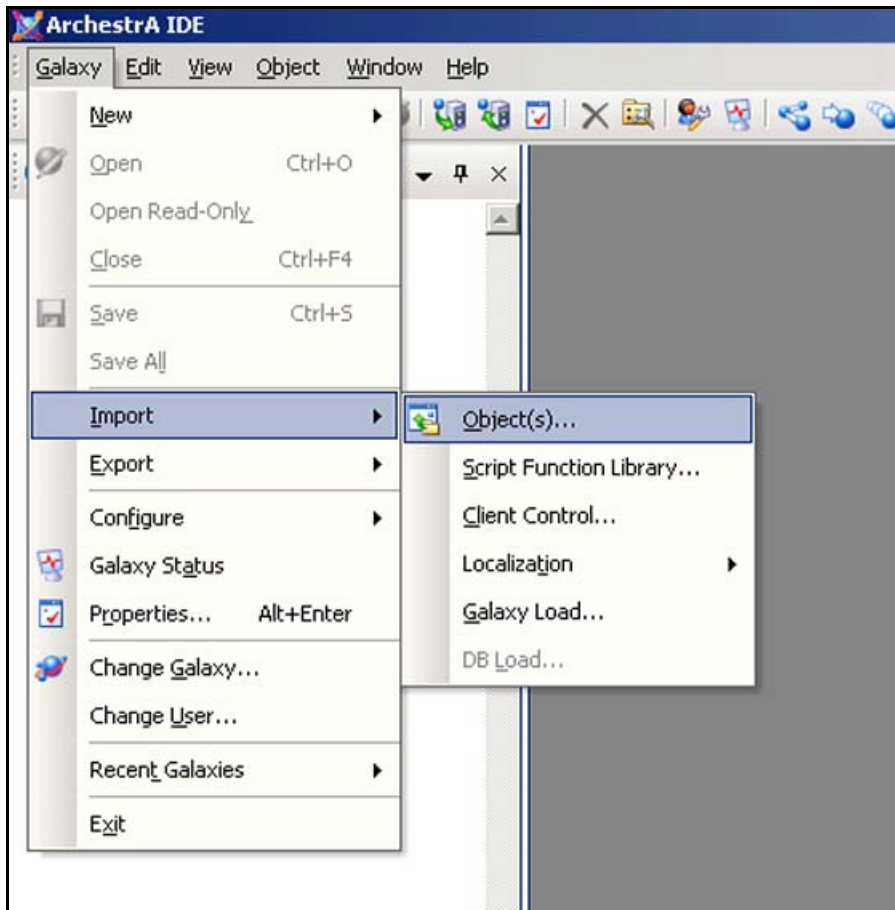
Upon completion of this lab, you will be able to:

- Import the Operations Capability Object
- Specify the location of the Operations Capability Object properly for entity discovery
- Build an Entity Model
- Grant entity access to all entities in the Wonderware MES Client

Import the Operations Capability Object

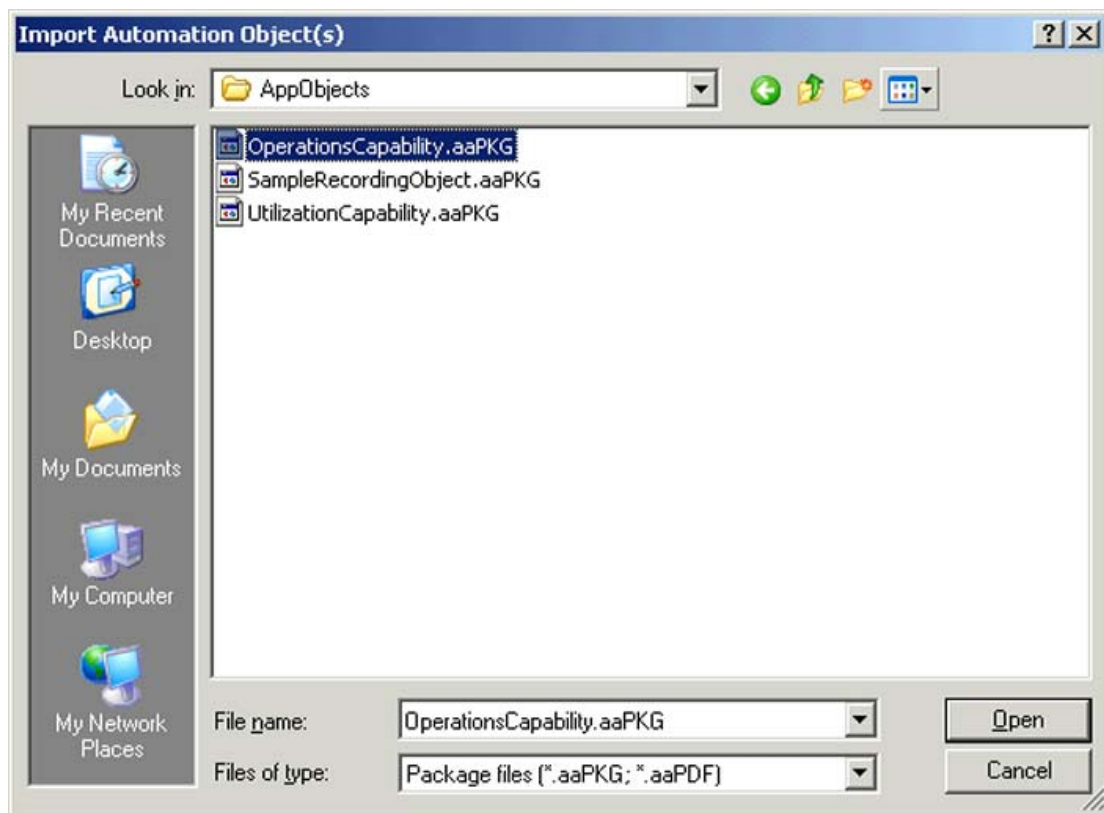
First, you will import **OperationsCapability.aaPKG** into the Galaxy.

1. In the ArchestrA IDE, on the **Galaxy** menu, click **Import | Object(s)**.



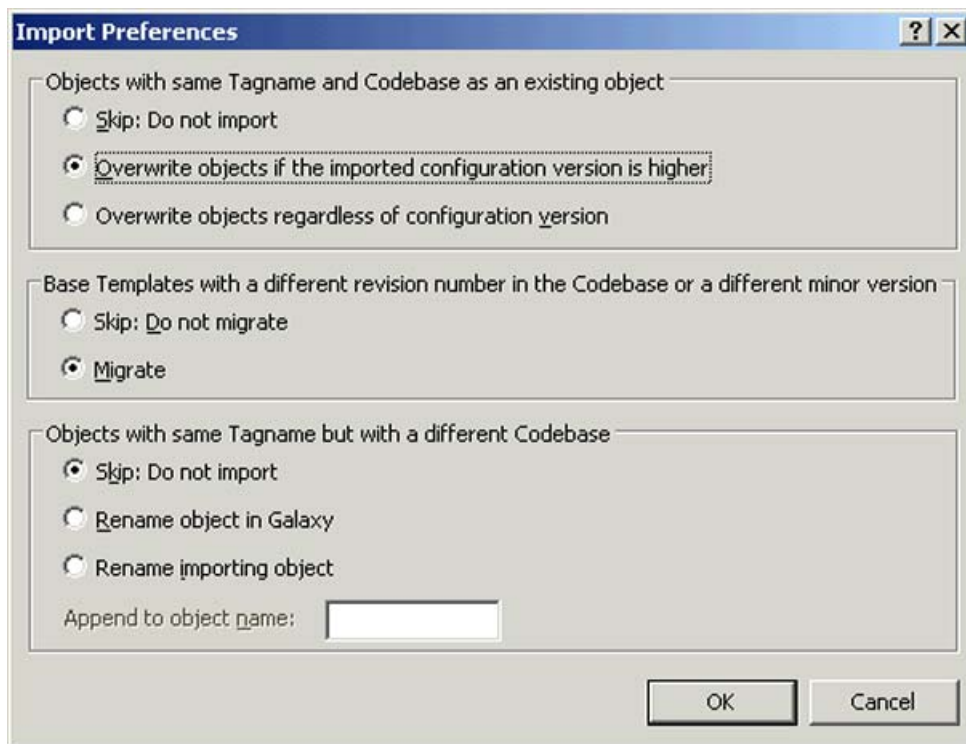
The **Import Automation Object(s)** dialog box appears.

2. Navigate to **C:\Program Files\Wonderware\MES\AppObjects** and select the **OperationsCapability.aaPKG** file.

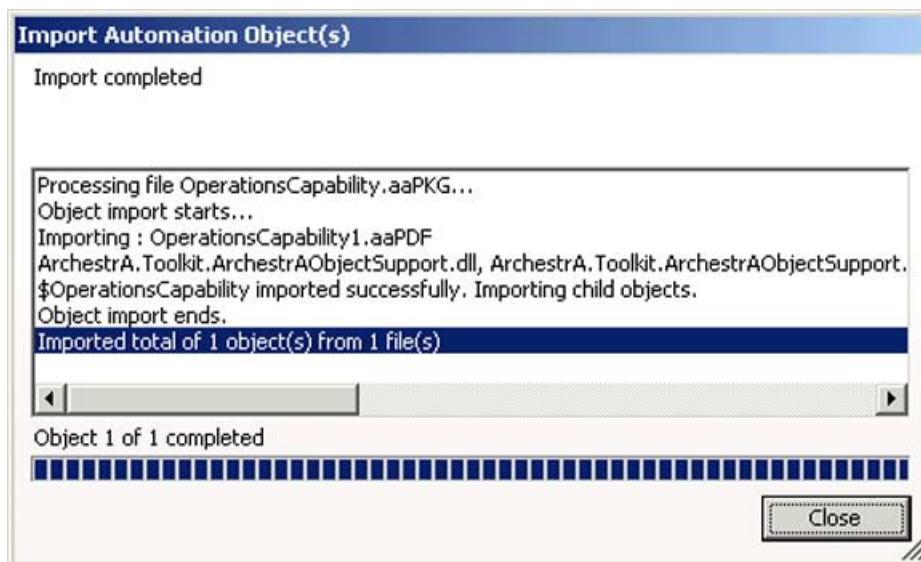


3. Click **Open**.

4. In the **Import Preferences** dialog box, keep the default settings and click **OK**.



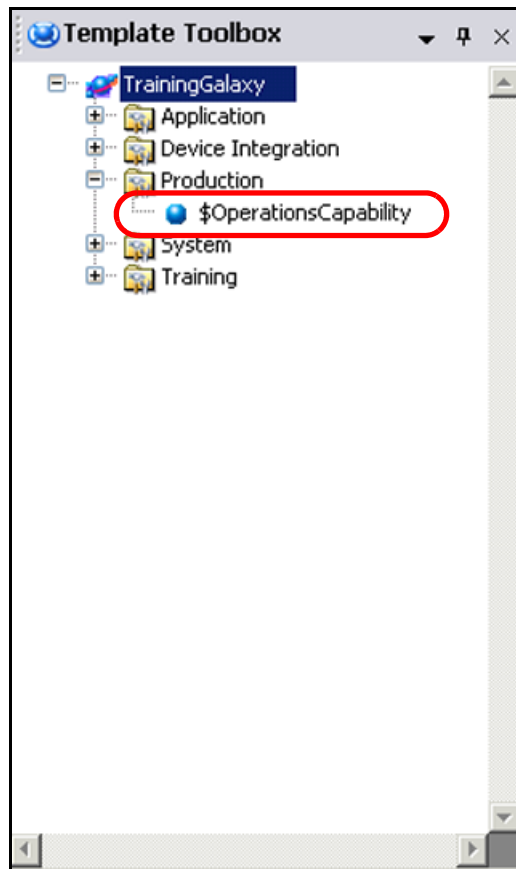
5. When the **Import Automation Object(s)** progress displays **Import completed**, click **Close**.



The Operations Capability Object template, **\$OperationsCapability**, is now imported into the Galaxy.

6. In the **Template Toolbox**, expand **TrainingGalaxy** and **Production**.

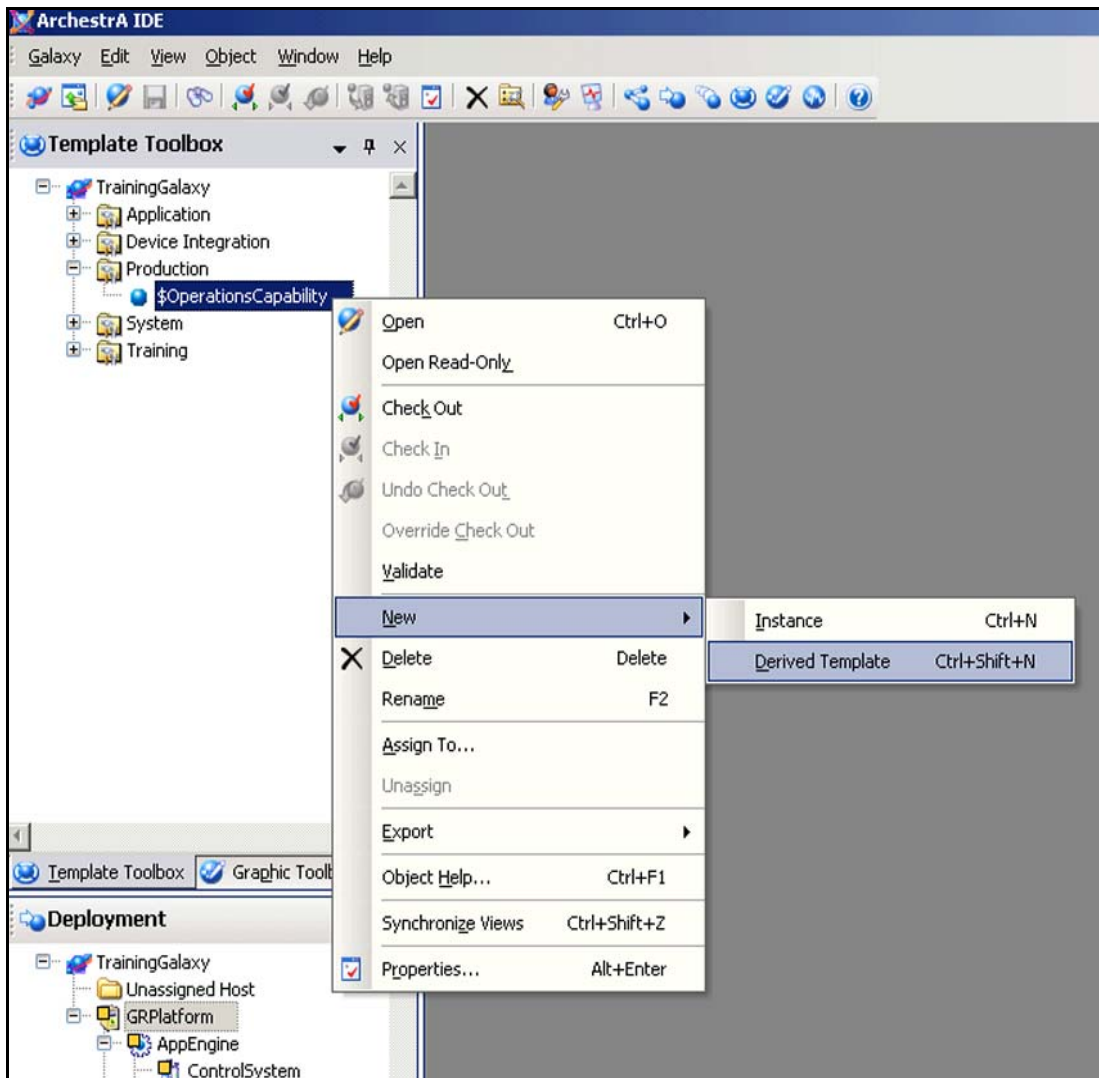
The **\$OperationsCapability** object is displayed.



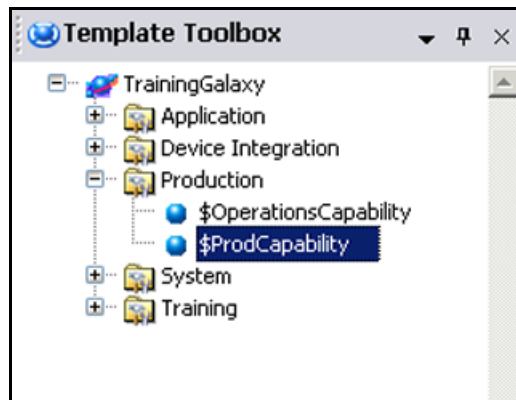
Assign Instances of the Operations Capability Object to Equipment in Production

You will now create a derived template of the Operations Capability Object.

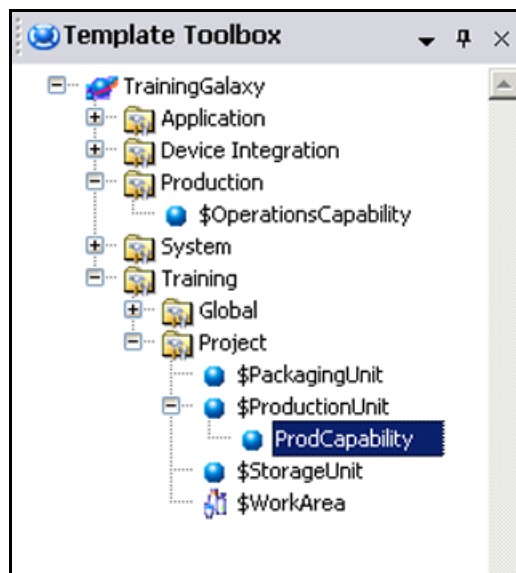
7. In the **Template Toolbox**, **Production** toolset, right-click **\$OperationsCapability** and select **New | Derived Template**.



8. Rename the derived template **\$ProdCapability**.

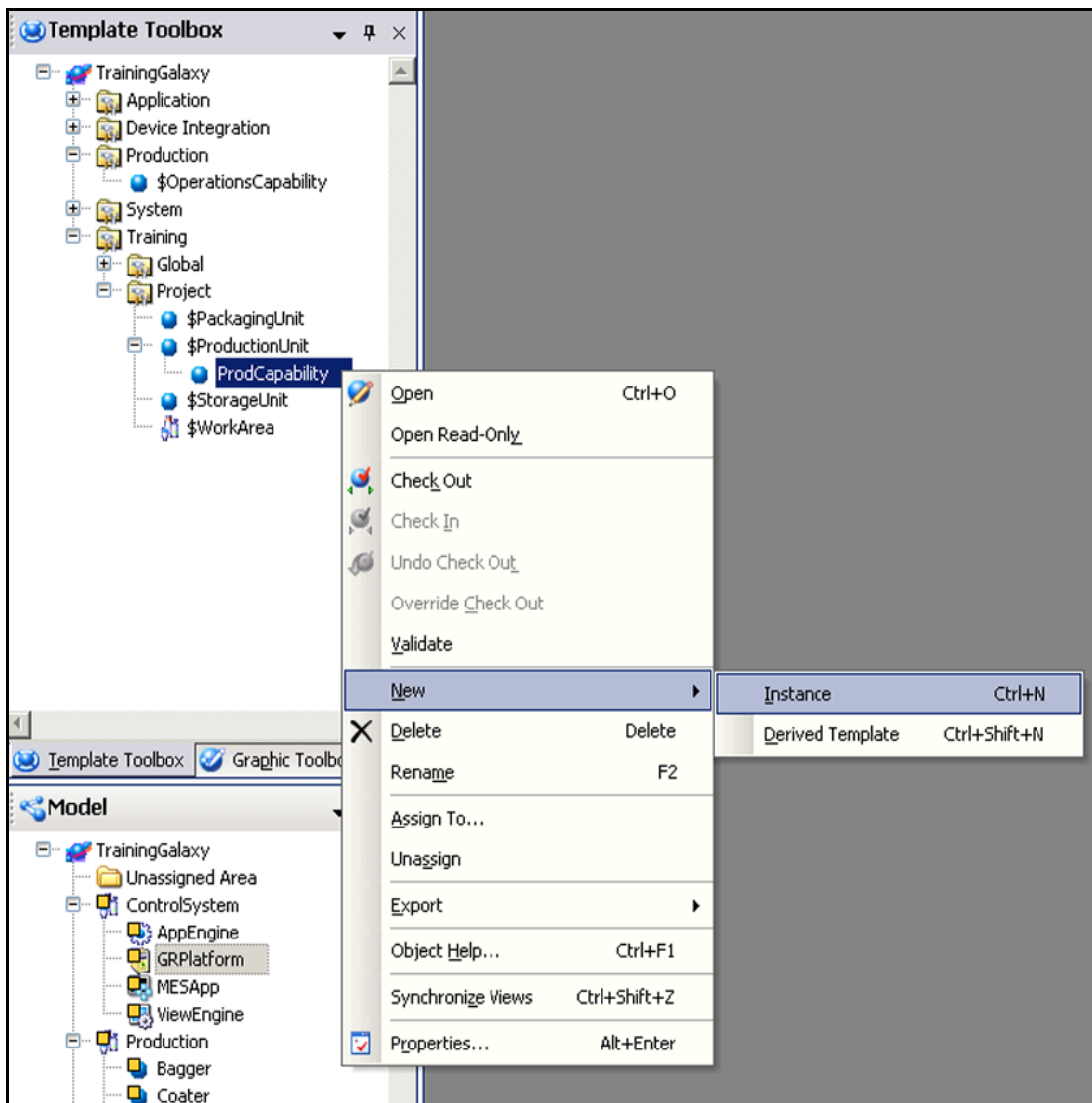


9. Expand **Training** and **Project**.
10. Drag the newly derived template, **\$ProdCapability**, to **\$ProductionUnit**.

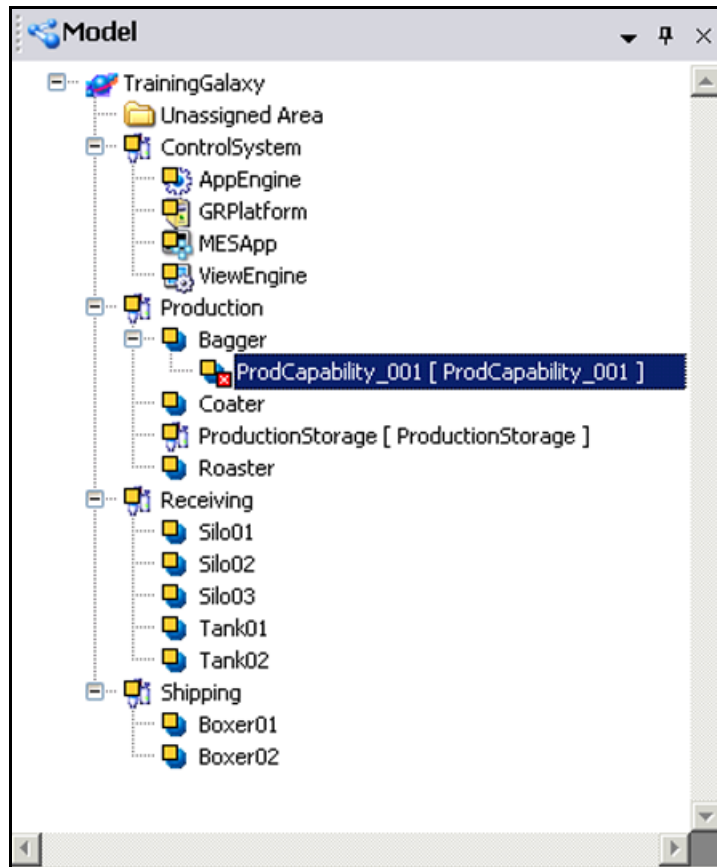


Now, you will create instances of **\$ProductionUnit.ProdCapability** and assign these instances to objects representing equipment in the **Production** area of the plant.

11. Right-click **\$ProductionUnit.ProdCapability** and select **New | Instance**.

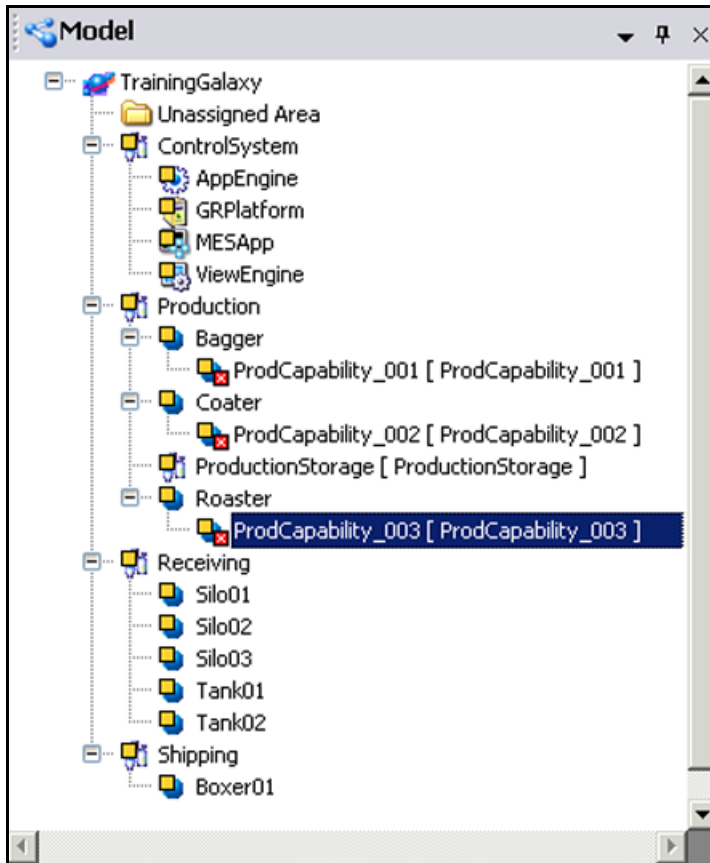


12. In the **Model** view, leave the default name and drag **ProdCapability_001** from **Unassigned Area** to **Bagger**.



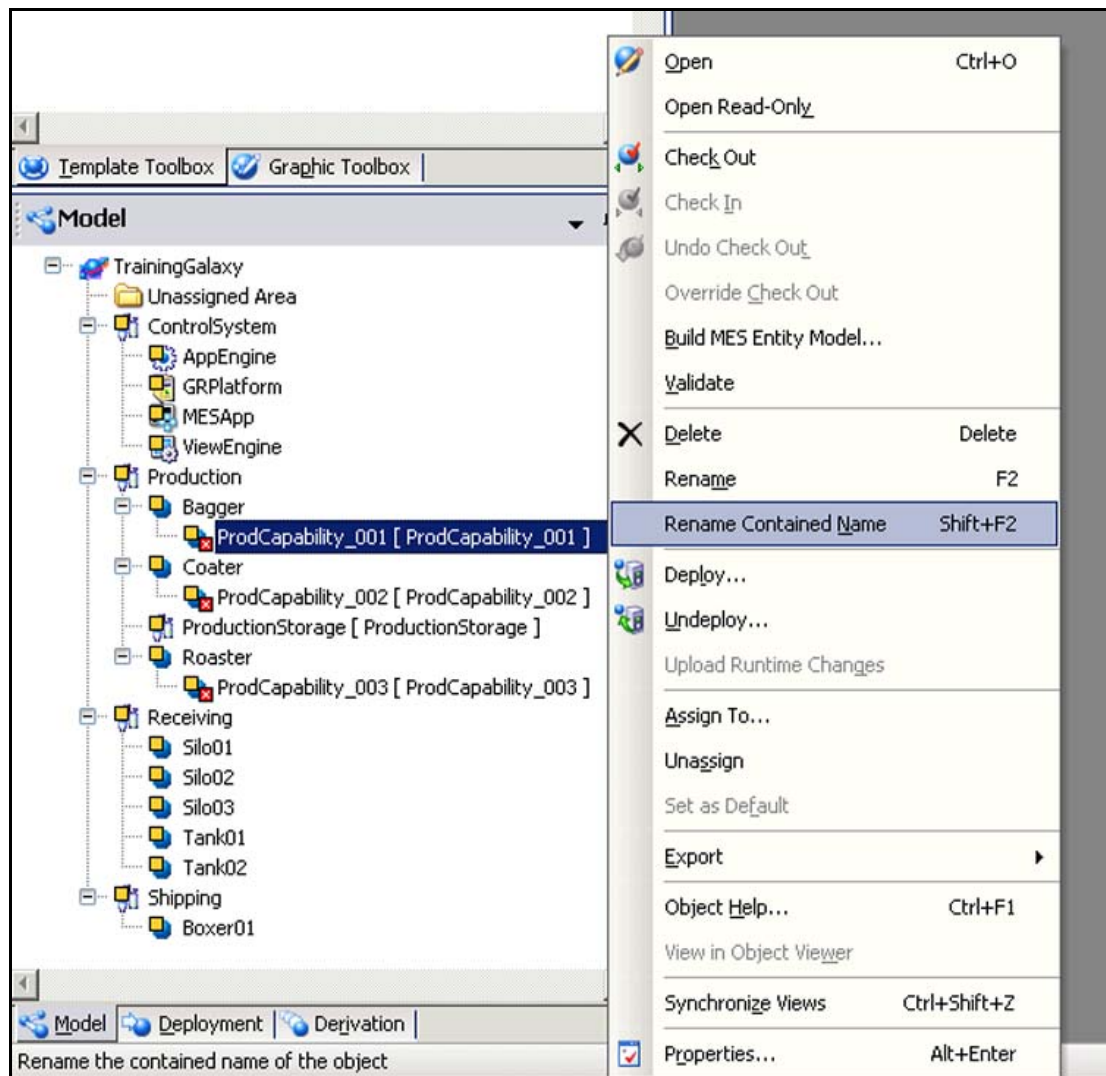
- Repeat Steps 11 and 12 two more times to create **\$ProductionUnit.ProdCapability** instances for the **Coater** and **Roaster** objects.

Note: You can assign these instances to their corresponding containers in any order because these objects are going to be referenced by their hierarchical names as opposed to their tag names.



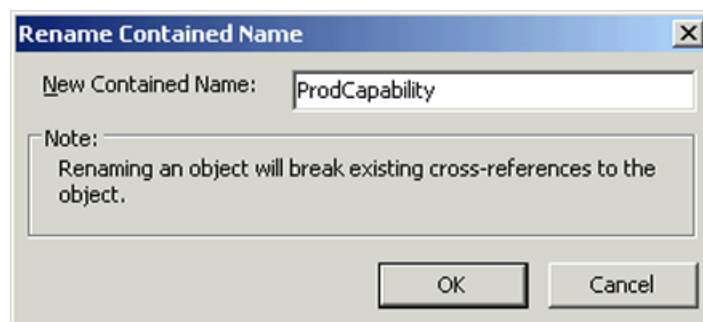
Now, you will change the contained names of the Operations Capability objects assigned to the **Bagger**, **Coater**, and **Roaster** objects.

14. Right-click the object contained by the **Bagger** object and select **Rename Contained Name**.



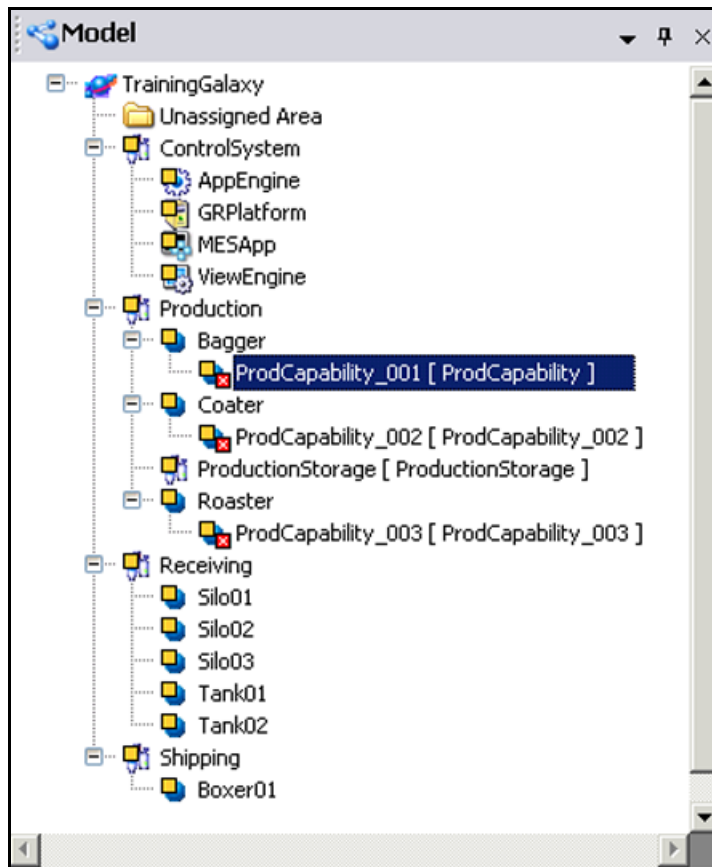
The **Rename Contained Name** dialog box appears.

15. In the **New Contained Name** field, rename the contained name **ProdCapability**.

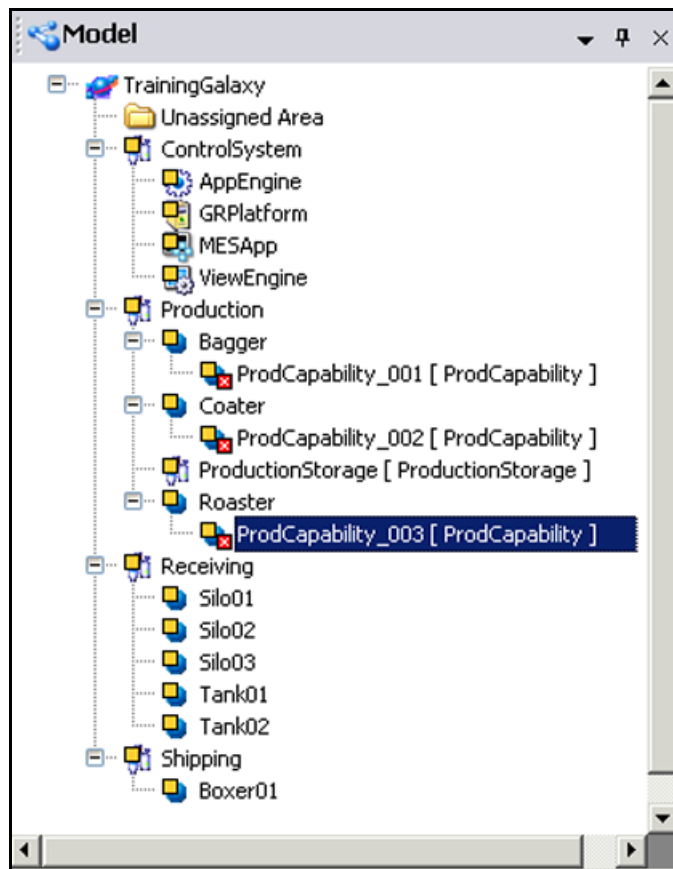


16. Click **OK**.

The new contained name is displayed.



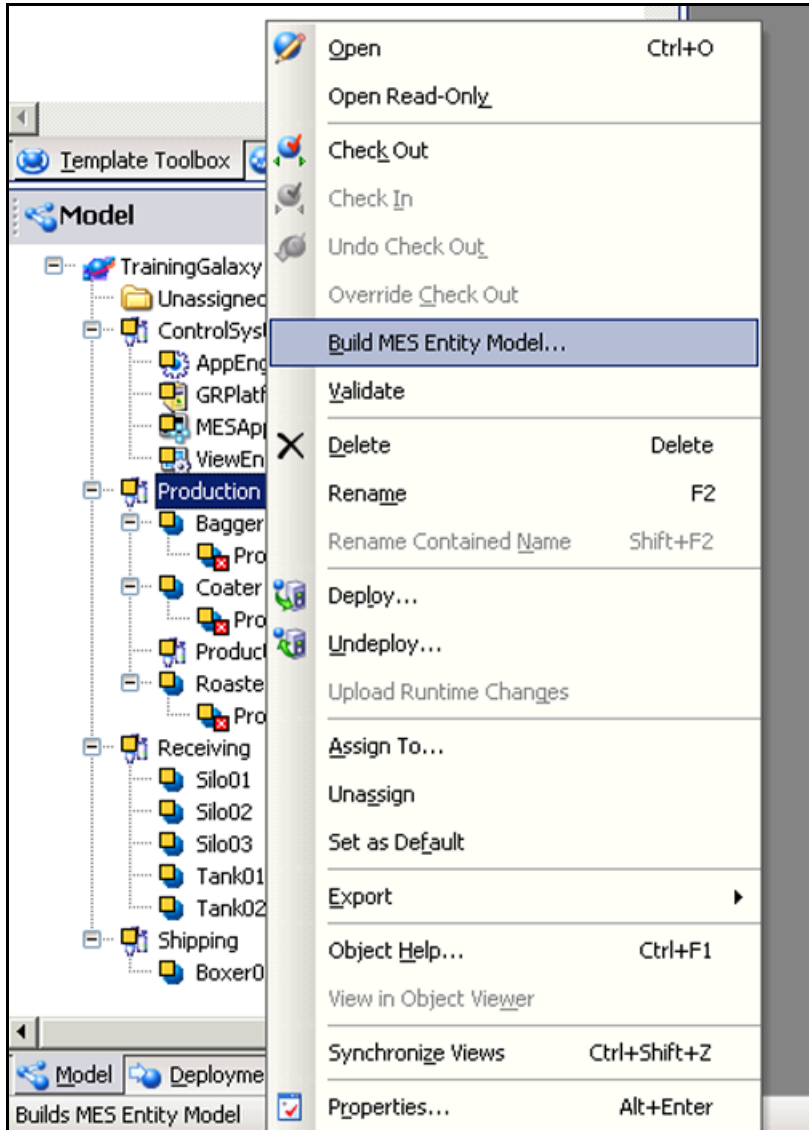
17. Repeat Steps 14 through 16 two more times to change the contained names of the objects contained by the **Coater** and **Roaster** objects to **ProdCapability**.



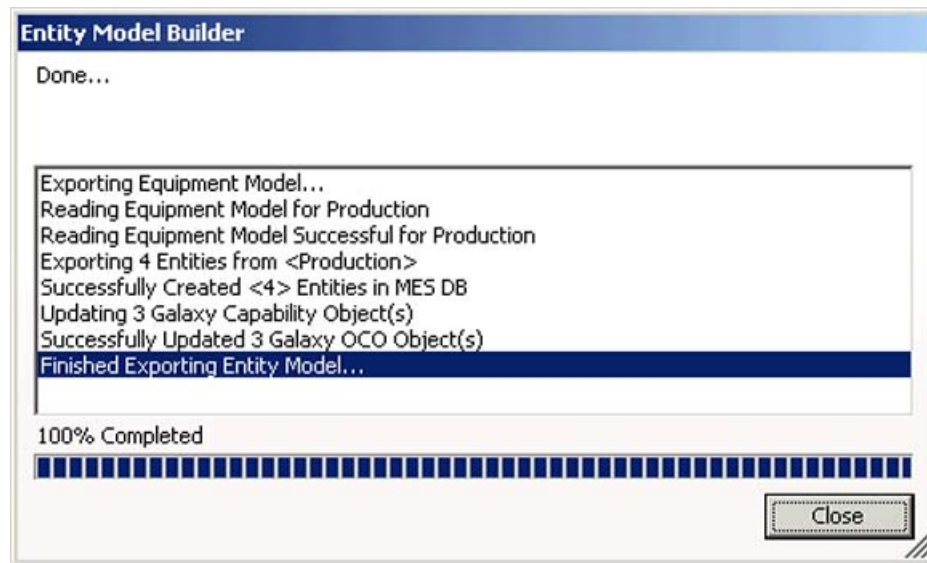
Create the MES Entity Model

You will now run the Entity Model Builder to replicate entities for each piece of equipment in the MES database.

18. In the **Model** view, right-click **Production** and select **Build MES Entity Model**.



After a few moments, the **Entity Model Builder** progress displays **100% Completed** and the **Close** button is enabled.



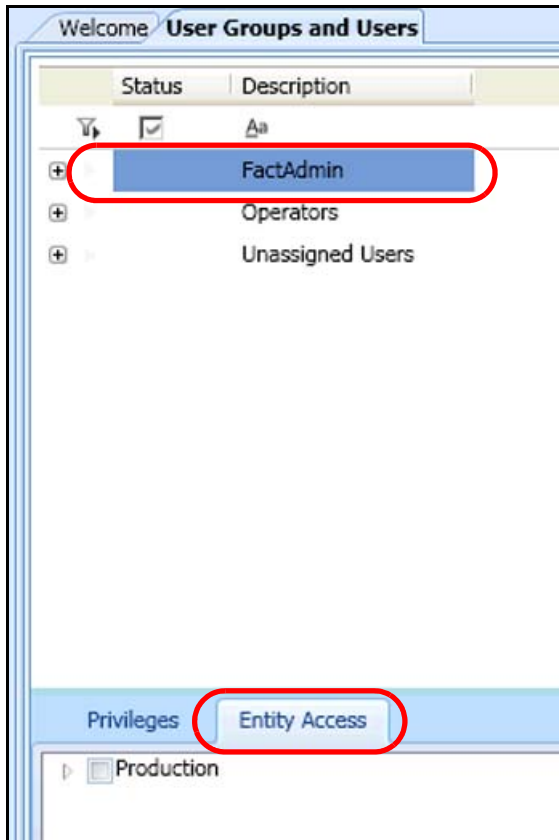
19. Click **Close**.

Grant Access to all Entities

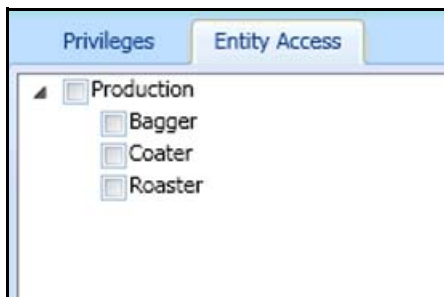
Now, you will grant access to all entities in the mixed nut factory.

20. In the Wonderware MES Client, **Master Data Config** group, click **User Groups and Users**.

21. On the **User Groups and Users** tab, click **FactAdmin**, and then click the **Entity Access** tab.



22. On the **Entity Access** tab, expand **Production**.



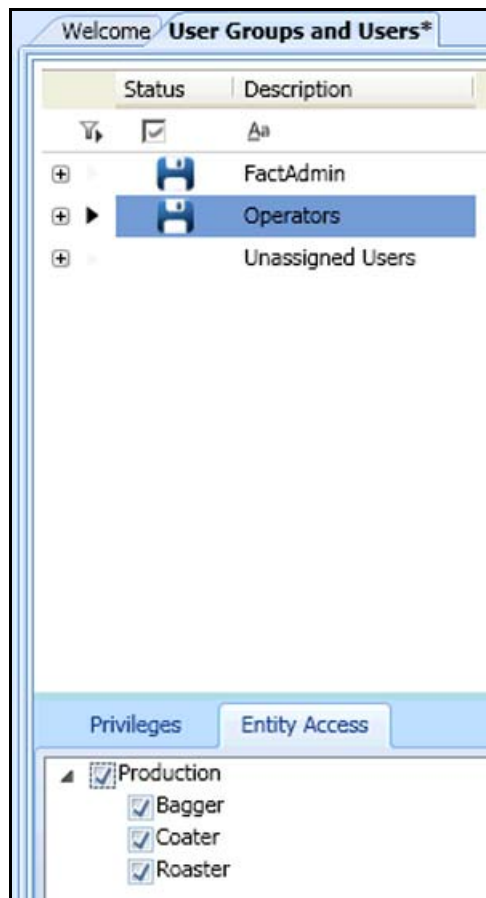
This displays the hierarchical entity model previously created from the Archastra IDE **Model** view.

23. Check the **Production** check box.



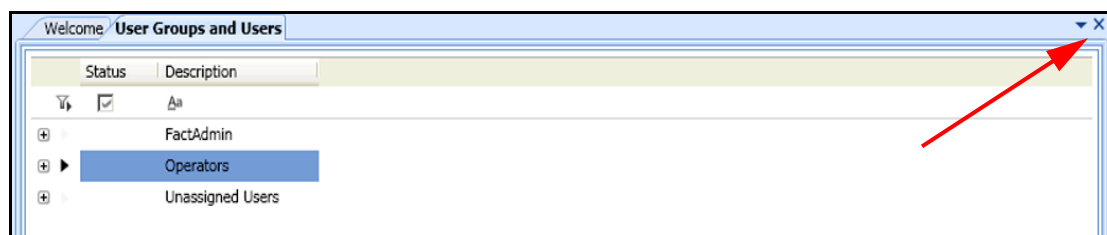
This grants access to the **Production** area and all entities contained within.

24. Repeat Steps 21 through 23 to grant access to the same entities for the **Operators** group.



25. On the **Quick Access Toolbar**, click **Save All**.

26. Close the **User Groups and Users** tab.



Section 3 – Entity Capabilities

This section discusses entity capabilities within the Operations Capability Object.

Overview

Capabilities define which functions the entity can perform such as, scheduling jobs or storing materials. As you progress through the labs in this training course, you will define several capabilities for entities. Descriptions of these capabilities are presented in the sections preceding the labs in which you use the capability.

On the **General** tab of the Operations Capability Object editor, you can specify which capabilities the object will have. You can use this tab to configure different properties of an entity to perform some action, such as creating jobs for this entity, capturing production and consumption counts, and storing items.

The capabilities of an Operations Capability Object correspond to the main options on the **General** tab:

- **Entity Can Run Jobs** – The **Job Defaults** and **Job Execution** tabs appear in the object editor. You can use the **Job Defaults** and **Job Execution** tabs to configure default attributes for a job and to execute jobs respectively.
- **Entity Can Store Items** – When you select this capability, a new **Storage Execution and Inventory Transfer** tabs appear in the object editor to configure the storage execution and inventory transfer attributes. Select this capability to allow entity to store items for tracking inventory. If you do not select this capability, the entity cannot store items. When an entity is designated not to store items and track inventory, it cannot store items and track inventory outside the Operations Capability Object as well.
- **Entity Can Schedule Jobs** – Select this capability to schedule jobs to the entity, and to indicate that jobs can be assigned to this entity, and a work queue is maintained. Child entities that do not have the option configured “can schedule jobs” generally inherit their schedule from a parent entity.
- **Enable Specifications** – When you select this capability, a new **Specifications** tab appears in the object editor to manage the specification attributes. If you do not select this capability, you cannot use specification values for external input or output devices.
- **Enable Production Events Module (PEM) Attributes** – The PEM functionality within the Operations Capability Object lets you monitor, report, and analyze production history and genealogy of lots, batches, and serial numbers without having to define the full MES model. The PEM functionality on the Operations Capability Object delivers information defined in the ISA-95 Production Performance category. This category includes the **Material Produced Actual, Material Consumed Actual, Material Consumable Actual, Personnel Actual, Equipment Actual, and Production Data**. You can use PEM attributes for creating new work orders, jobs, or items and generating genealogy ID to trace all the source material of a product. When you select the **Enable PEM Attribute** capability, a new PEM Attributes tab appears in the object editor. You can use this tab to configure **Common Data Attributes, Genealogy, Production Attributes, and Extended Production Attributes**. Select this capability to add production and consumption, log consumable, capture production data, capture equipment data and capture personnel data.

The **General** tab contains the following sections:

- **Job Execution** – You can enable capabilities to create and configure work orders and jobs.
- **Miscellaneous** – You can enable capabilities to store inventory, schedule jobs, manage specifications, and PEM usage.
- **Event Settings** – You can select the response type capabilities.

Each of these capabilities will be discussed at greater length on the following pages.

Job Execution

When you select the **Entity Can Run Jobs** option the **Job Defaults** and **Job Execution** tabs appear in the object editor. You can use the **Job Defaults** and **Job Execution** tabs to configure default attributes for a job and to execute jobs respectively.

The following options are enabled in the **Job Execution** section when the **Entity Can Run Jobs** option is selected:

Field Name	Description
Enable Create Job Attributes	<p>When you select this option, a new Create Job Attributes tab appears in the object editor to configure the job properties.</p> <p>This tab allows you to configure attribute values to create new work orders and jobs. If this option is not selected, you will not be able to create jobs for an object instance.</p>
Enable Production Counters	<p>When you select this option, a new Production Counters tab appears in the object editor to configure the production counters.</p> <p>This tab allows you to configure attribute values for a production request.</p>
Enable Consumption Counters	<p>When you select this option, a new Consumption Counters tab appears in the object editor to configure the consumption counters. This tab allows you to configure attribute values for a consumption request.</p> <p>When this option is disabled, you cannot add production for a job for an object instance in the Operations Capability Object, but the consumption request can be processed and items can be consumed for a job when the request is made outside this object.</p>

Miscellaneous

The **Miscellaneous** section, you can select the following options:

Field Name	Description
Entity Can Store Items	<p>When you select this option, new Storage Execution and Inventory Transfer tabs appear in the object editor to configure the storage execution and inventory transfer attributes. Select this option to allow entity to store items for tracking inventory. If you do not select this option, the entity cannot store items.</p> <p>When an entity is designated not to store items and track inventory, it cannot store items and track inventory outside the Operations Capability Object as well.</p>
Entity Can Schedule Jobs	<p>Select this option to schedule jobs to the entity, and to indicate that jobs can be assigned to this entity, and a work queue is maintained.</p>
Enable Specifications	<p>When you select this option, a new Specifications tab appears in the object editor to manage the specification attributes.</p> <p>If you do not select this option, you cannot use specification values for external input or output devices.</p>
Enable PEM Attributes	<p>When you select this option, a new PEM Attributes tab appears in the object editor to configure the PEM attributes.</p> <p>Select this option to add production and consumption, log consumable, capture production data capture equipment data, and capture personnel data.</p>

Event Settings

In the **Event Settings** section, you can select one of the following modes in the **ResponseType** list:

Field Name	Description
With Response	<p>Click this mode to receive notifications about the delivery status of messages for the Operations Capability Object calls. If you select this mode, you will receive notifications, such as messages are successfully delivered or messages are not delivered due to system or communication error.</p>
Without Response	<p>Click this mode if you do not want to receive the notifications about the delivery status of messages for the Operations Capability Object calls. The messages that are rejected by the middleware are stored in the Rejected Messages table in the MES database.</p>

Section 4 – Product and Process Definition

This section discusses items and item classes, and describes how to link a process to a production item.

Overview

Items are the basic units produced or consumed during production. Items can be referred to as a part, component, piece, and so on in different manufacturing environments. Define all products, components, and by-products as items for use in the Wonderware MES system.

You can create an item and assign it to an item class and move an item from one class to another and define certifications for an item. To create an item, select the **Items** module in the **Product Definition Group** of the Wonderware MES Client. The tabbed workspace shows fields such as **Item ID**, **Item Description**, or **Item Class**.

You can also include the ability to associate a file with an item or assign a certification to an item that is configured in the Wonderware MES Configurator application in the Items module.

Item Classes

Items belong to item classes. An item class is a logical group of items that share common characteristics, such as physical properties and whether they are produced, consumed, or both. Use the **Item Classes** module to create and maintain an item class. Some examples of item classes are:

- Raw Materials
- WIP Materials
- Finished Goods

Each item can only exist in one item class. Therefore, the organization of the items into classes should be logical to make it easy to filter or search for the items.

When you open the **Item Classes** module, a list of all the existing item classes is shown in the tabbed workspace. By default, the **Item Classes** module is grouped under the **Product Definition** group in the **Navigation** pane.

Processes and Operations

A process, also known as a route, is the method of producing an item. It is the defined path of manufacturing operations through the plant that will produce a specific final product or by-product. A process definition will link the item to be produced with operations, steps, specifications, physical entities, and routings that determine the flow of material between entities and operations.

An operation defines a task used in the production of an item. It defines the item or items consumed and produced as a result of the task. An operation includes one or more entities used to complete the task and may include labor and machine time estimates. It may also include job specifications and steps. When a work order is created, a job is created for each operation/entity combination.

Processes

A process is a logical representation of the performance of one or more operations utilizing one or more physical entities for the purpose of producing an item. You can create a process to define the

production method to produce an item, and instantiate the work orders. Select the **Processes** module in the Wonderware MES Client **Process Definition** group to create and maintain a process and an operation.

A process describes operations and steps required to manufacture an item. A process links an item that needs to be produced with operations, steps, specifications, entities, and routings and determines the flow of material between entities and operations.

Work orders are used to manufacture an item. The use of processes in MES is optional as you can create a work order directly using the **Work Orders and Jobs** module. Processes are required in the Wonderware MES Client to assign certifications as you cannot assign a certification to a work order.

Operations

An operation represents a phase of a process and specifies the consumption and production proportion. One or more entities are utilized to perform an operation. An operation can have specifications and suboperation step groups. Standard operations are used as templates in the Wonderware MES Client to quickly and easily create similar operation definitions throughout a process.

You can add an operation directly to a process without referring to a standard operation. Standard operations save configuration time when the same operation is used multiple times within a process or the same operation is used by multiple processes.

Select the **Standard Operations** module in the Wonderware MES Client **Process Definition** group to create and maintain a standard operation. Standard operations do not have items associated with them, so you cannot assign BOM definitions, BOM item specifications, or item specifications to a standard operation.

You must assign at least one entity to an operation. Each entity assigned to an operation has an estimated production rate, which you may set. The estimated production rate is used with the batch size to schedule an entity, while creating a work order from a process. The required finish date is assigned to the jobs in the last operation and the estimated production rate is used to determine the start time of a job. This process runs until all jobs get a start date and a finish date. If an operation is the first in a process, the batch size specifies the initial amount that is sent to an entity if there is more than one entity in the operation.

Linking items to a process

Production items can be linked to a process. Each item that is linked to a process has its own process status. By default, the status of a linked item is the same as the status of a process. The status of an item must have the minimum required status before a work order is created. An item can have the status as certified for the process while another item has the status as experimental.

By default, status of a process is assigned to an item. You cannot assign a higher status to an item than the status of linked process. If the status of a process is lower than status of the linked item, then status of all items that have higher status is lowered to match the status of the process. For example, if you change status of the process from **Approved** to **Disabled**, then status of all the items associated to that process is changed to **Disabled** regardless of the original status.

A process rank specifies the capability of a process to produce an item. If an item is linked to more than one process, the process with lowest rank for that item is considered as the most preferred process for producing the item.

Lab 4 – Defining Products and Processes

Introduction

In this lab, you will use the Wonderware MES Client to define the production process and its corresponding operations for making packages of barbeque flavored mixed nuts. First, you will configure the scheduling capabilities for the entities associated with operations in the production process. Then, you will create and configure the items required to make mixed nut packages. Finally, you will define the process and its corresponding operations to produce flavored mixed nuts.

Objectives

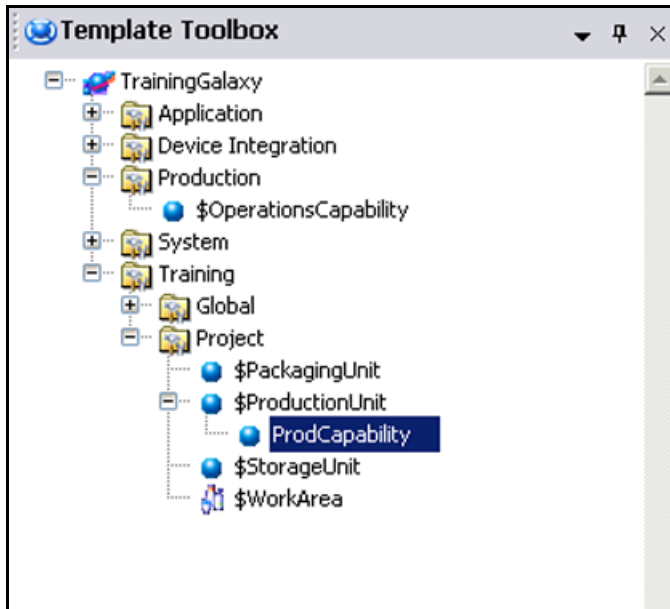
Upon completion of this lab, you will be able to:

- Assign job scheduling capabilities to entities
- Create a unit of measure
- Create an item and an item class
- Define a process and its corresponding operations

Enable a Job Scheduling Capability for Entities in the Production Area

First, you will enable the job scheduling capability for all of the entities in the **Production** area.

1. In the ArchestrA IDE, **Template Toolbox**, double-click **\$ProductionUnit.ProdCapability**.



2. On the **General** tab, in the **Miscellaneous** area, check **Entity Can Schedule Jobs**, and then click the lock icon.

The screenshot shows the configuration editor for the **\$ProductionUnit.ProdCapability** object. The **General** tab is selected. The **Miscellaneous** section contains the following options:

- ☐ Entity Can Run Jobs (locked)
- ☐ Enable Create Job Attributes (locked)
- ☐ Enable Production Counters (locked)
- ☐ Enable Consumption Counters (locked)
- ☒ Entity Can Schedule Jobs (locked) - This option is highlighted with a red circle.
- ☐ Enable Specifications (locked)
- ☐ Enable PEM Attributes (locked)

The **Event Settings** section shows:

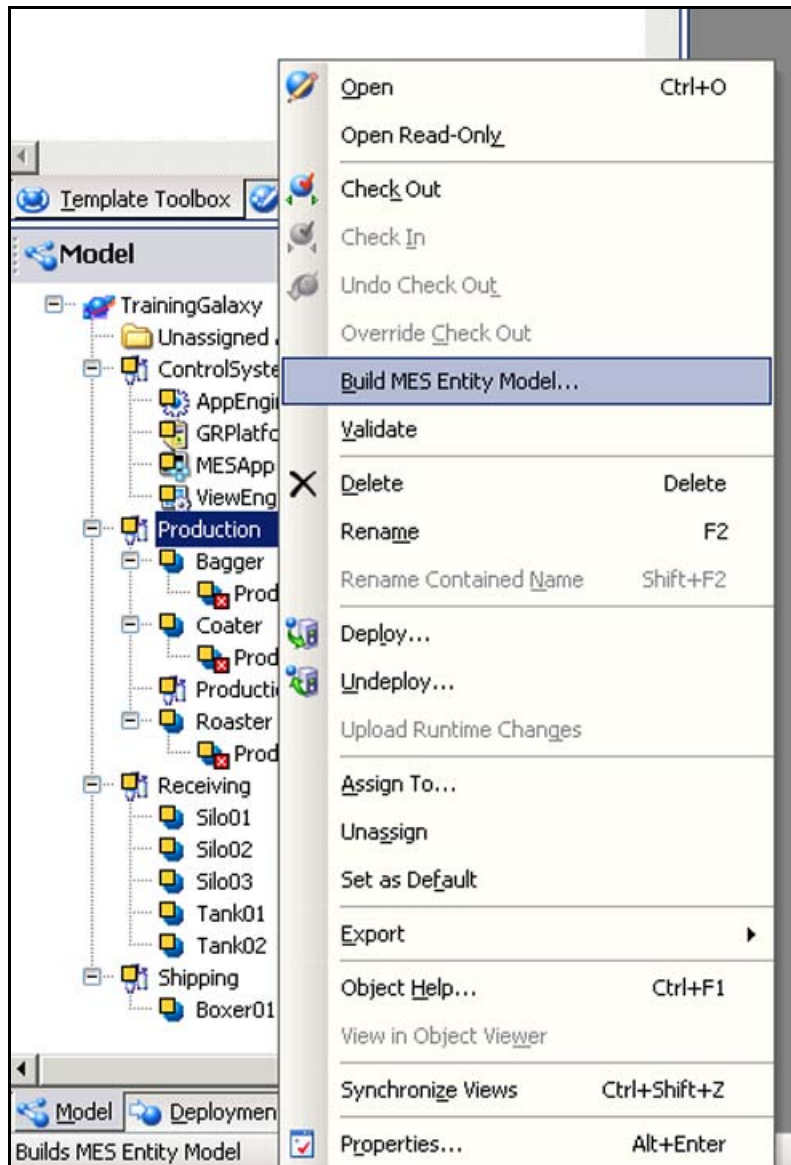
ResponseType: With Response (locked)

This will enable the job scheduling capability for all entities containing instances of the **\$ProductionUnit.ProdCapability** object. This is an important step because after this step is performed, jobs and operations can be assigned to entities in a process.

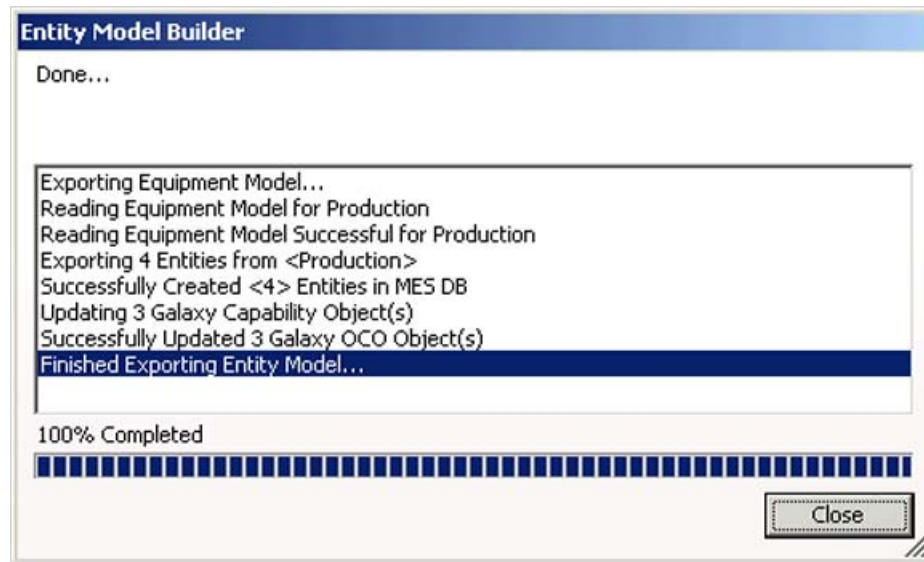
3. Save and close the configuration editor, and then check in the object.

The instances of the **\$ProductionUnit.ProdCapability** template display errors because the model is out of sync with the MES database. You will now run the **Entity Model Builder** to synchronize the modified configuration with the MES database.

4. In the **Model** view, right-click **Production** and select **Build MES Entity Model**.



5. When the process is complete, click **Close**.

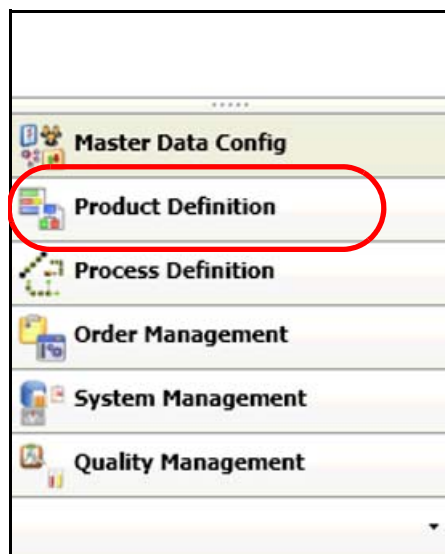


In the **Model** view, the error icons are no longer displayed.

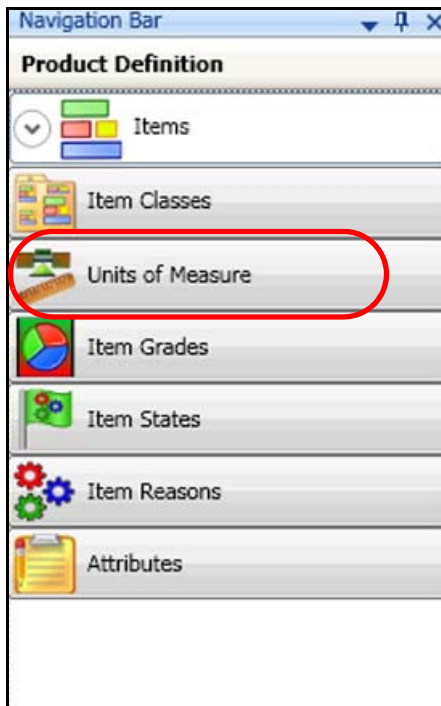
Create Units of Measure for the Mixed Nut Process

Now, you will create items in the MES database. Before creating items, you will create the units of measure for these items.

6. In the Wonderware MES Client, click the **Product Definition** group.

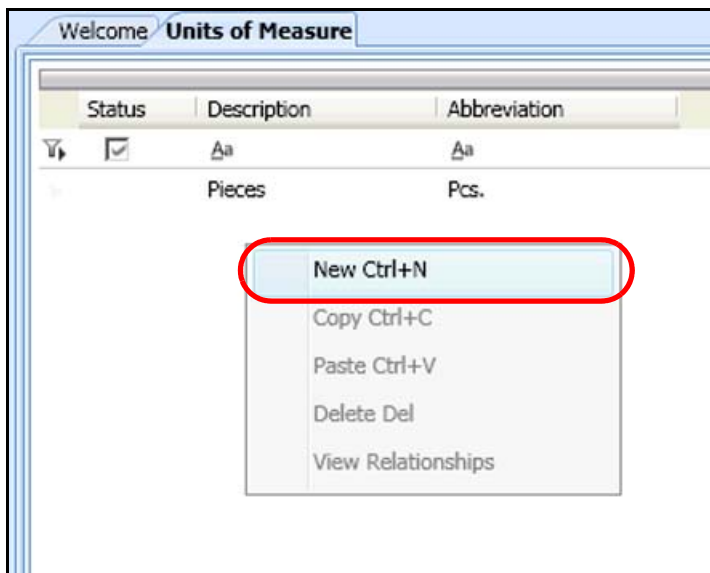


7. In the **Product Definition** group, click **Units of Measure**.



The **Units of Measure** tabbed workspace appears.

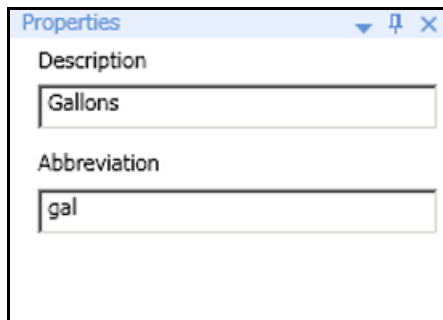
8. On the **Units of Measure** tab, right-click the empty workspace and select **New**.



9. In the **Properties** pane, configure the new unit of measure as follows:

Description: Gallons

Abbreviation: gal



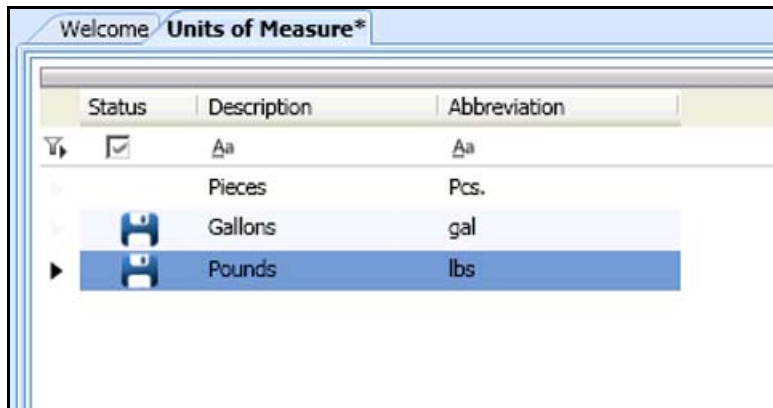
The screenshot shows a 'Properties' dialog box with two text input fields. The first field is labeled 'Description' and contains the text 'Gallons'. The second field is labeled 'Abbreviation' and contains the text 'gal'.

10. Create another unit of measure and configure the new unit of measure as follows:

Description: Pounds

Abbreviation: lbs

Both new units of measure appear in the tabbed workspace.



The screenshot shows a 'Units of Measure' tabbed workspace. It contains a table with the following data:

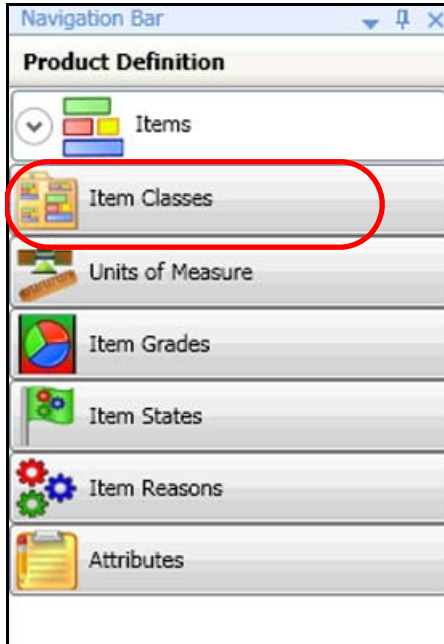
Status	Description	Abbreviation
<input checked="" type="checkbox"/>	Pieces	Pcs.
<input type="checkbox"/>	Gallons	gal
<input type="checkbox"/>	Pounds	lbs

11. Save all changes and close the **Units of Measure** tab.

Create the Item Classes

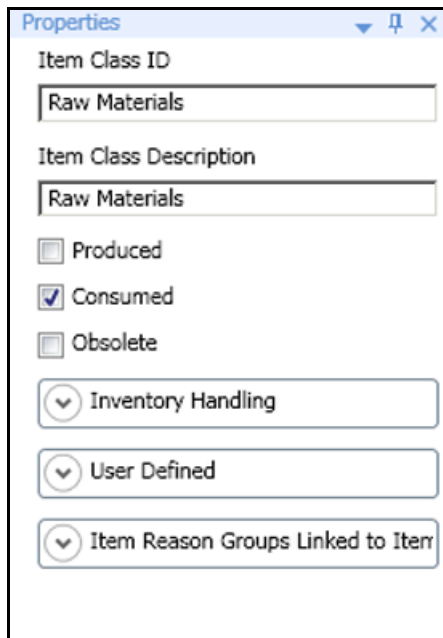
All items in the Wonderware MES Client are organized into item classes. For our example, you will create three item classes: **Raw Materials**, **Intermediate Materials**, and **Finished Goods**.

12. In the **Product Definition** group, click **Item Classes**.



13. On the **Item Classes** tab, right-click the empty workspace and select **New**.
14. In the **Properties** pane, configure the new item class as follows:

Item Class ID: Raw Materials
Item Class Description: Raw Materials
Produced: *unchecked (default)*
Consumed: *checked*



Properties

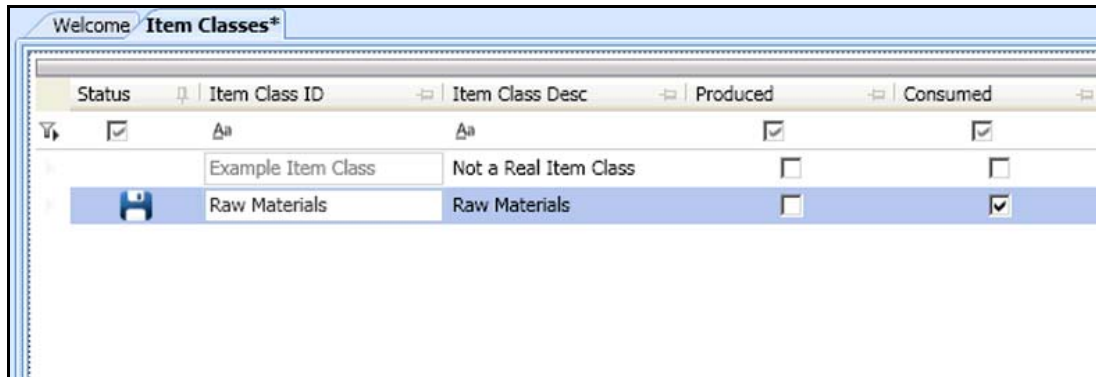
Item Class ID
Raw Materials

Item Class Description
Raw Materials

☐ Produced
☒ Consumed
☐ Obsolete

Inventory Handling
 User Defined
 Item Reason Groups Linked to Item

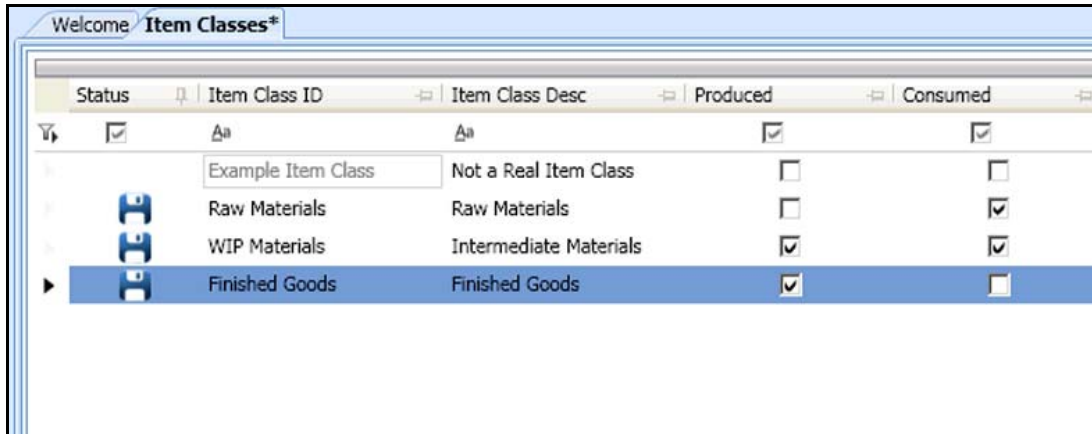
This creates a new item class, **Raw Materials**, which will be used to group items to be consumed in the process.



Status	Item Class ID	Item Class Desc	Produced	Consumed
<input checked="" type="checkbox"/>	Example Item Class	Not a Real Item Class	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	Raw Materials	Raw Materials	<input type="checkbox"/>	<input checked="" type="checkbox"/>

15. Repeat the Steps 13 and 14 to configure two more new item classes as follows:

Item Class ID	Item Class Description	Produced	Consumed
WIP Materials	Intermediate Materials	<i>checked</i>	<i>checked</i>
Finished Goods	Finished Goods	<i>checked</i>	<i>unchecked (default)</i>

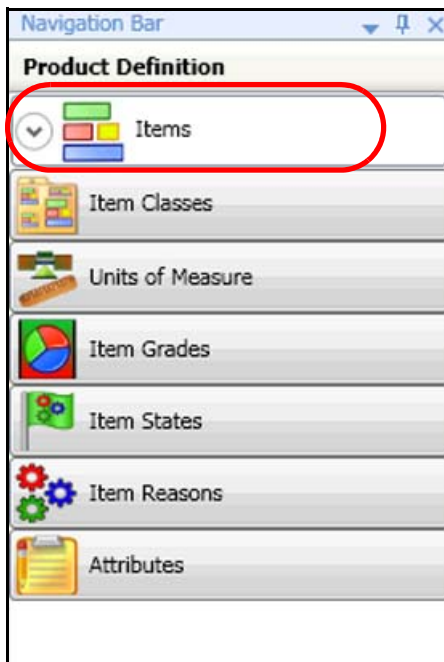


16. Save all changes and close the **Item Classes** tab.

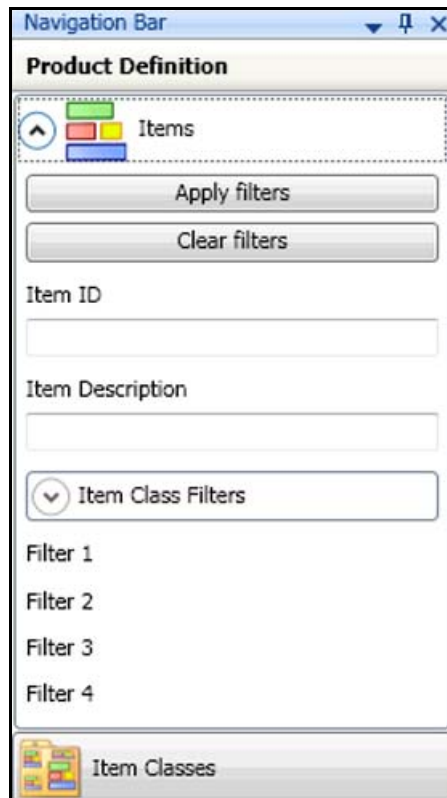
Create the Items

Now, you will create the items for the production process of the mixed nut factory.

17. In the **Product Definition** group, click **Items**.

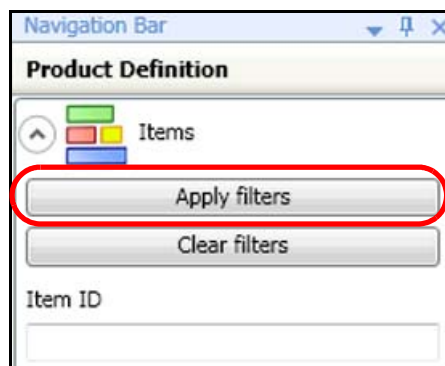


The filter panel appears. All filters are blank by default.



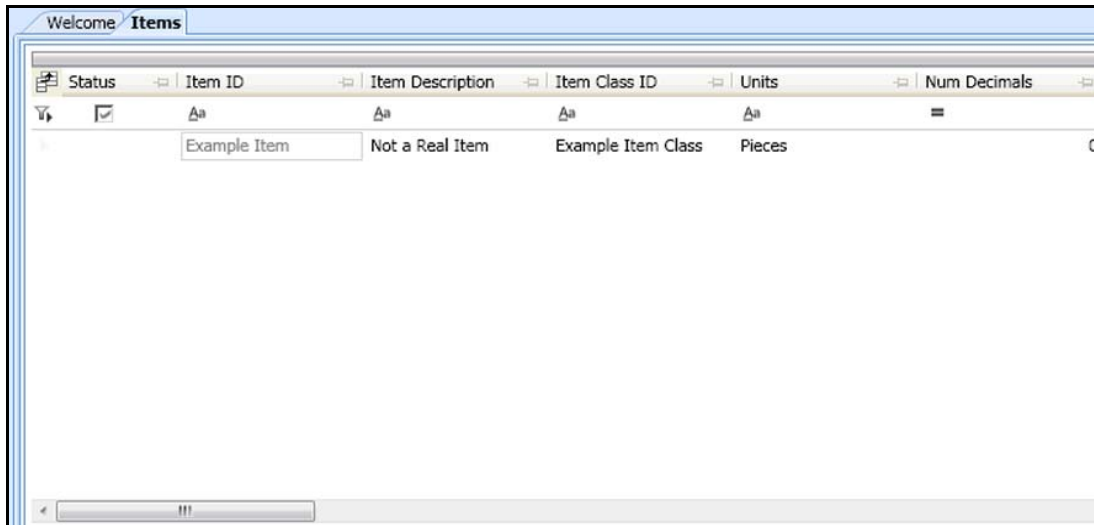
The screenshot shows a software window titled "Navigation Bar" with a sub-header "Product Definition". Below the header, there is a section labeled "Items" with three colored squares (green, yellow, blue) and an upward arrow icon. Below this are two buttons: "Apply filters" and "Clear filters". Underneath these buttons are three input fields: "Item ID", "Item Description", and "Item Class Filters" (which has a dropdown arrow). Below the input fields are four labels: "Filter 1", "Filter 2", "Filter 3", and "Filter 4". At the bottom of the panel is a folder icon labeled "Item Classes".

18. Click **Apply filters**.



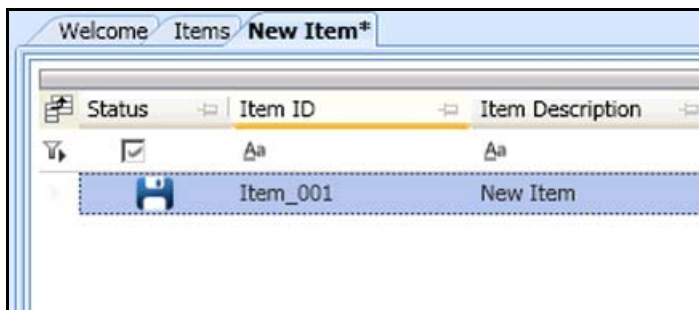
This screenshot is identical to the previous one, but the "Apply filters" button is highlighted with a red oval, indicating the action to be performed.

The **Items** tab appears.



19. On the **Items** tab, right-click the empty workspace and select **New**.

The **New Item** tab appears.



20. In the **Properties** pane, configure the new item as follows:

Item ID: BMX-BBQ
Item Class ID: Finished Goods
Item Description: Bag of Mixed Nut - BBQ
Units: Pieces
Num Decimals: 0 (*default*)



The screenshot shows a 'Properties' dialog box with the following fields and values:

Field	Value
Item ID	BMX-BBQ
Item Class ID	Finished Goods
Item Description	Bag of Mixed Nut - BBQ
Units	Pieces
Num Decimals	0

21. Repeat Steps 19 and 20 to create eight more items as follows:

Note: You do not have to go back to the **Items** tab to add these items, as you can do this directly within the **New Item** tab.

Item ID	Item Class ID	Item Description	Units	Num Decimals
AMD-BLK	Raw Materials	Almonds Bulk	Pounds	3
CSW-BLK	Raw Materials	Cashews Bulk	Pounds	3
PNT-BLK	Raw Materials	Peanuts Bulk	Pounds	3
OIL-LQD	Raw Materials	Coating Oil	Gallons	3
BBQ-FLA	Raw Materials	BBQ Flavoring	Pounds	3
BAG-BBQ	Raw Materials	BBQ Mixed Nut - Empty	Pieces	0
RMX-BLK	WIP Materials	Roasted Mixed Nut	Pounds	3
FMX-BBQ	WIP Materials	Flavored Mixed Nut - BBQ	Pounds	3

On the **New Item** tab, all the new items are displayed.

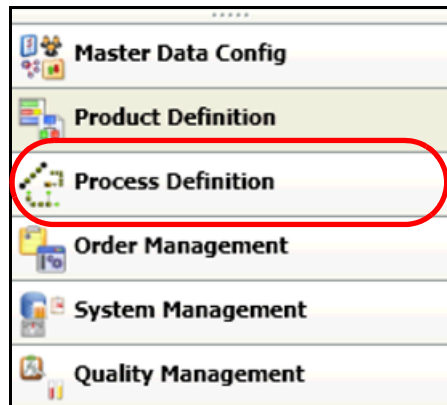
Status	Item ID	Item Description	Item Class ID	Units	Num Decimals	Lifetime
	BMX-BBQ	Bag of Mixed Nut - BBQ	Finished Goods	Pieces	0	
	AMD-BLK	Almonds Bulk	Raw Materials	Pounds	3	
	CSW-BLK	Cashews Bulk	Raw Materials	Pounds	3	
	PNT-BLK	Peanuts Bulk	Raw Materials	Pounds	3	
	OIL-LQD	Coating Oil	Raw Materials	Gallons	3	
	BBQ-FLA	BBQ Flavoring	Raw Materials	Pounds	3	
	BAG-BBQ	BBQ Mixed Nut - Empty	Raw Materials	Pieces	0	
	RMX-BLK	Roasted Mixed Nut	WIP Materials	Pounds	3	
	FMX-BBQ	Flavored Mixed Nut - BBQ	WIP Materials	Pounds	3	

22. Save all changes and close the **Items** tab.

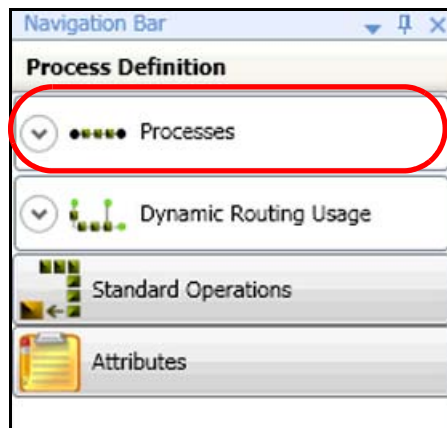
Define the Mixed Nut Process

Now, you will define the process associated with mixed nut production.

23. Click the **Process Definition** group.



24. In the **Process Definition** group, click **Processes**.

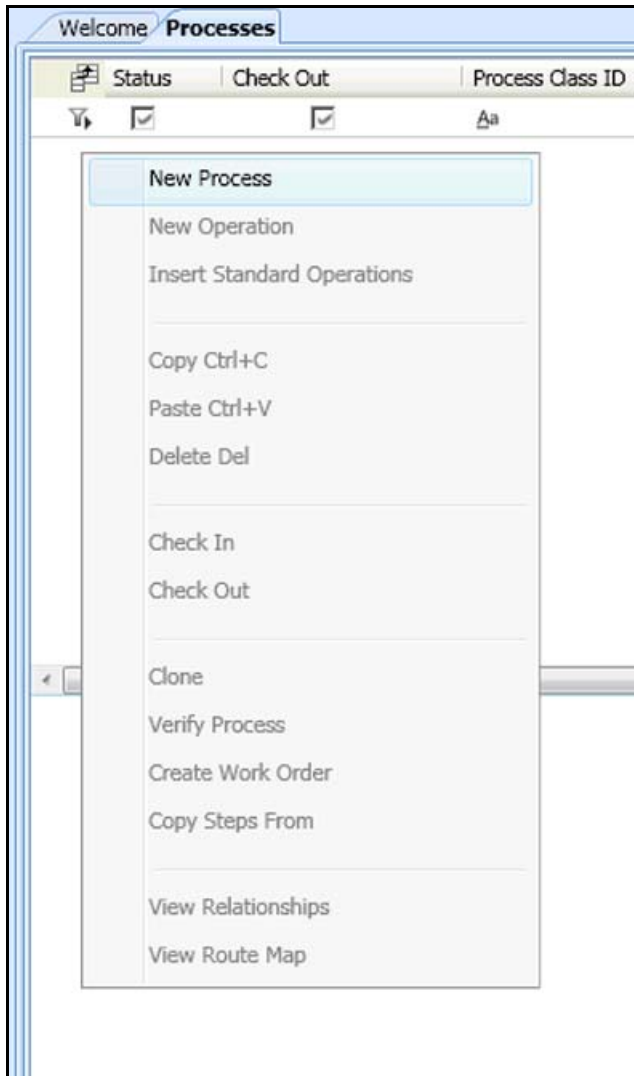


25. Click **Apply filters**.



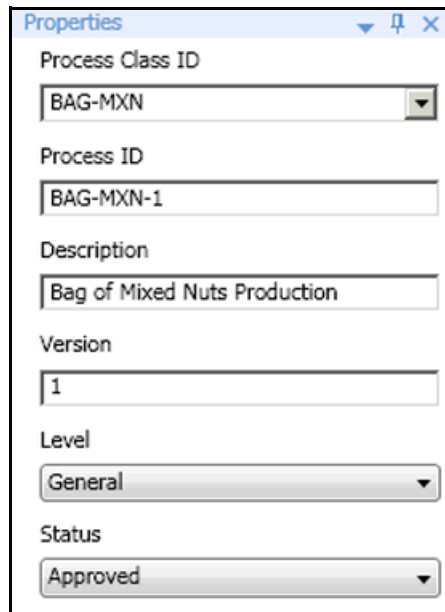
The **Processes** tabbed workspace appears.

26. On the **Processes** tab, right-click the empty workspace and select **New Process**.



27. In the **Properties** pane, configure the new process as follows:

Process Class ID: BAG-MXN
Process ID: BAG-MXN-1 (*default*)
Description: Bag of Mixed Nuts Production
Version: 1 (*default*)
Level: General (*default*)
Status: Approved



The screenshot shows a 'Properties' dialog box with the following fields and values:

Field	Value
Process Class ID	BAG-MXN
Process ID	BAG-MXN-1
Description	Bag of Mixed Nuts Production
Version	1
Level	General
Status	Approved

Important: Verify **Status** is set to **Approved**, as you cannot create work orders if this is not set correctly.

You will now link the barbeque mixed nut production process to the finished good, **Bag of Mixed Nut - BBQ**.

28. In the bottom portion of the **Properties** pane, click **Items to Produce**.

The screenshot shows a 'Properties' pane with the following elements: a 'Level' dropdown menu set to 'General', a 'Status' dropdown menu set to 'Approved', a 'Notes' text area, a 'Dynamic Routing' checkbox, and a button labeled 'Items to Produce' with a downward arrow. The 'Items to Produce' button is circled in red.

The **Items to Produce** area expands.

29. Click the **Add** button.

The screenshot shows the expanded 'Items to Produce' area. It includes a title bar with an expand/collapse arrow and the text 'Items to Produce'. Below the title bar is an 'Add Item' section with a '+' button and a '-' button. The '+' button is circled in red. Below the 'Add Item' section is a table with the following columns: 'Item ID', 'Status', 'Process Rank', and 'Last Edit Comment'. The table has one row with the following values: 'Aa', '=', '=', and 'Aa'.

Item ID	Status	Process Rank	Last Edit Comment
Aa	=	=	Aa

The **Add Item** dialog box appears.

30. Click **Apply filters**.

The screenshot shows the 'Add Item' dialog box. The title bar is 'Add Item' with a close button. The main area contains several input fields: 'Item ID', 'Item Description', 'Units' (a dropdown menu), 'Unit Cost', 'Lifetime', and 'Num Decimals'. Below these fields is a section titled 'Item Class Filters' with a dropdown arrow. To the right of this section are two buttons: 'Apply filters' (circled in red) and 'Clear filters'. At the bottom right of the dialog are 'OK' and 'Cancel' buttons.

Only items that can be produced appear.

31. In the **Select Item** column, check the **BMX-BBQ** item.

Add Item

Items

Item ID: Item Description:
 Units: Unit Cost:
 Lifetime: Num Decimals:

Item Class Filters

Item Class ID: Item Class Description:
 Consumed: All

Apply filters Clear filters

Select Item	Item	Item Class
<input checked="" type="checkbox"/>	BMX-BBQ(Bag of Mixed Nut - BBQ)	Finished Goods(Finished Goods)
<input type="checkbox"/>	FMX-BBQ(Flavored Mixed Nut - BBQ)	WIP Materials(Intermediate Materials)
<input type="checkbox"/>	RMX-BLK(Roasted Mixed Nut)	WIP Materials(Intermediate Materials)

OK Cancel

32. Click **OK**.

The process is now linked with the finished good, **BMX-BBQ**.

Items to Produce

Add Item

Item ID	Status	Process Rank	Last Edit Comment
BMX-BBQ	Approved	1	

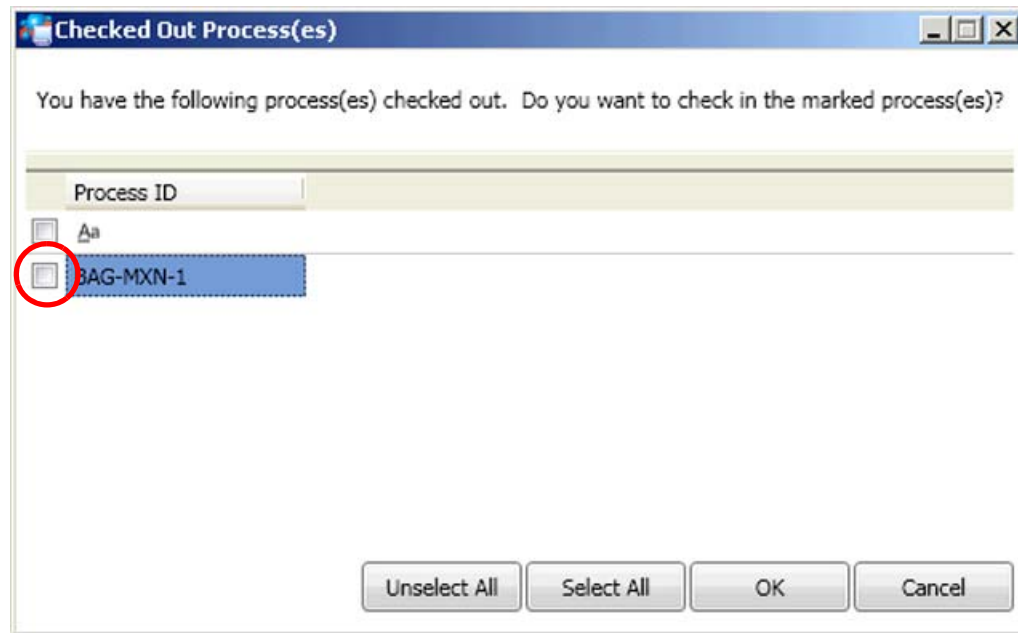
Now, you will save the process so that you can add operations to it.

33. Save all changes.

The **Checked Out Process(es)** dialog box appears.

You will not check in the process now because additional configuration is required.

34. In the **Checked Out Process(es)** dialog box, uncheck **BAG-MXN-1**.

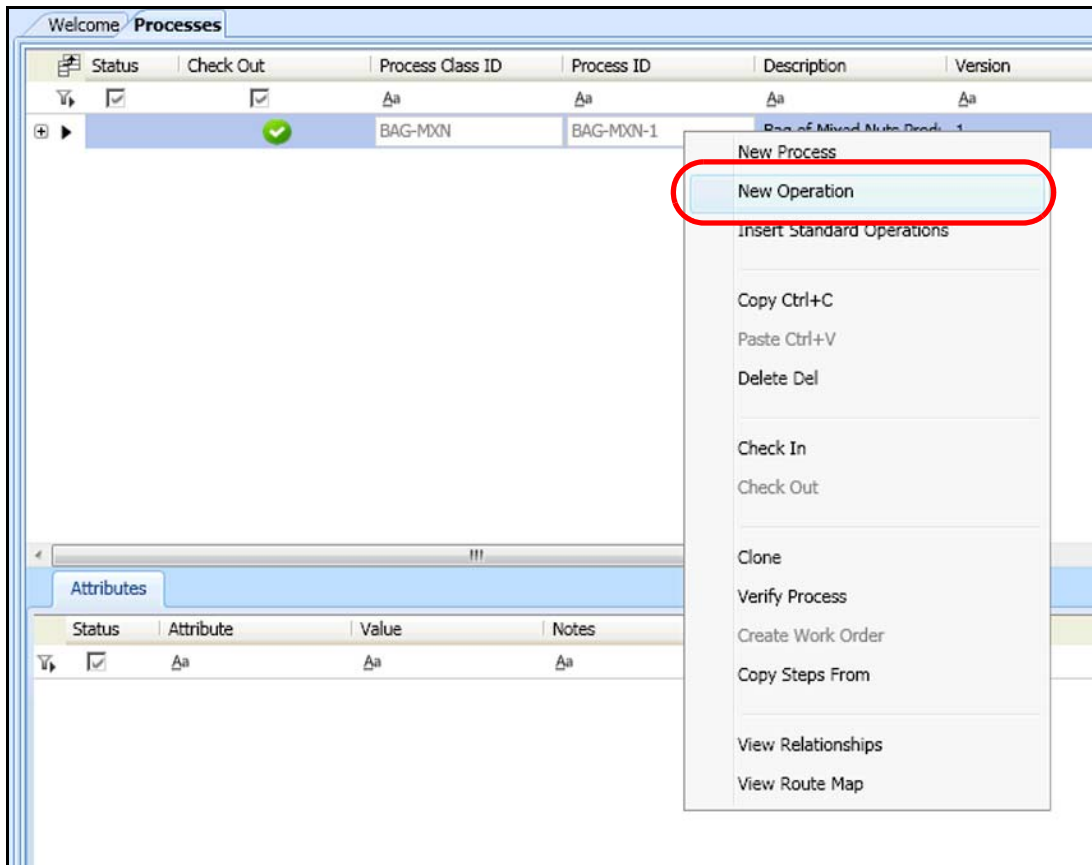


35. Click **OK**.

Define Operations for the Process

You will now create the operations that define the parts of the process.

36. On the **Processes** tab, right-click the **BAG-MXN-1** process and select **New Operation**.

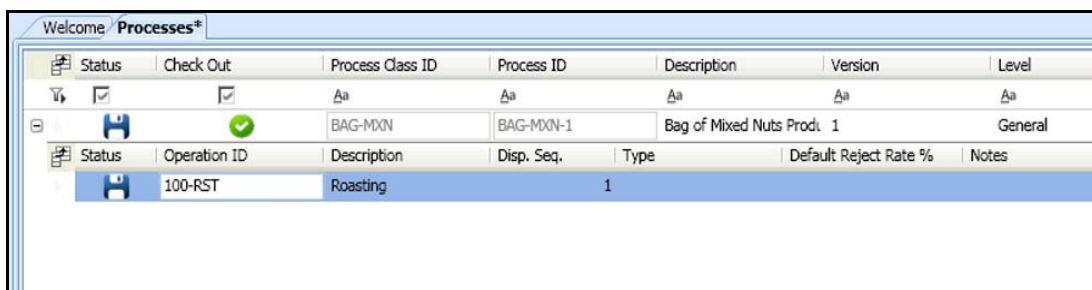


37. In the **Properties** pane, configure the operation as follows:

Operation ID: 100-RST

Description: Roasting

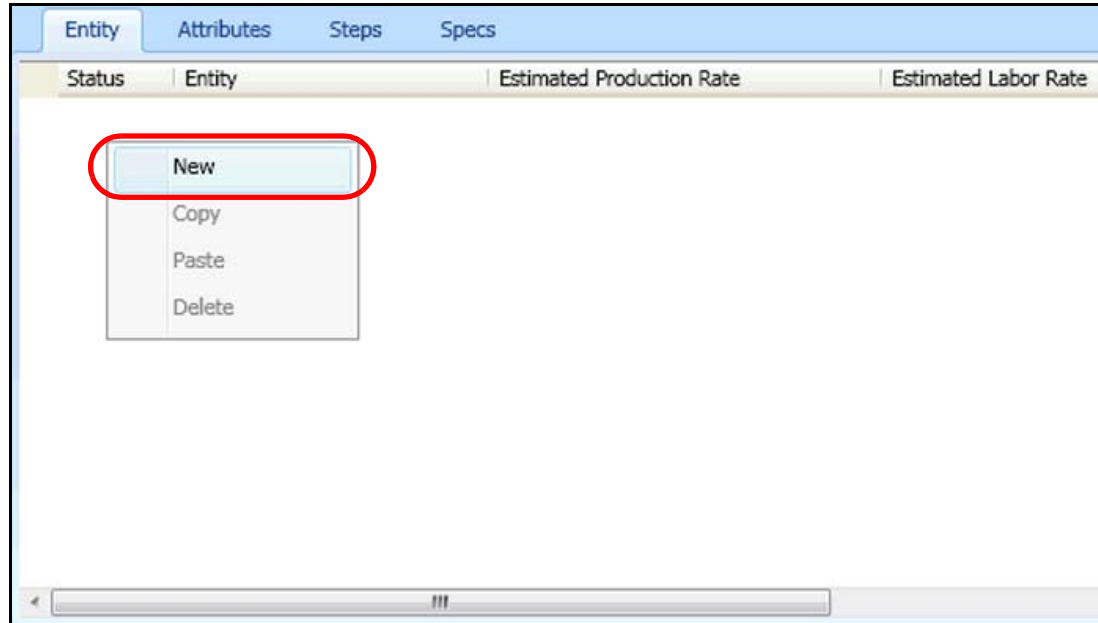
The configured operation appears in the tabbed workspace.



38. Save all changes.

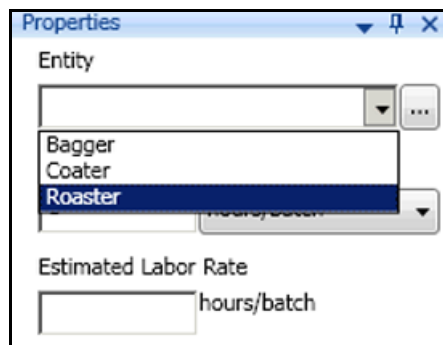
Each operation is assigned to one or more entities. When a new operation is created, the **Entity** tab is automatically activated in the bottom portion of the tabbed workspace. Now, you will assign an entity to the **100-RST** operation.

39. With the **100-RST** operation selected, on the **Entity** tab, right-click the empty workspace and select **New**.

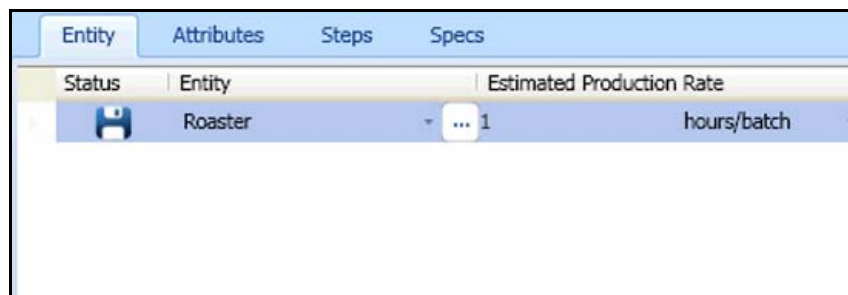


Now, you can assign **Roaster** to this operation because schedule jobs is enabled on the entities.

40. In the **Properties** pane, **Entity** drop-down list, click **Roaster**.



The **Entity** tab displays the added entity.

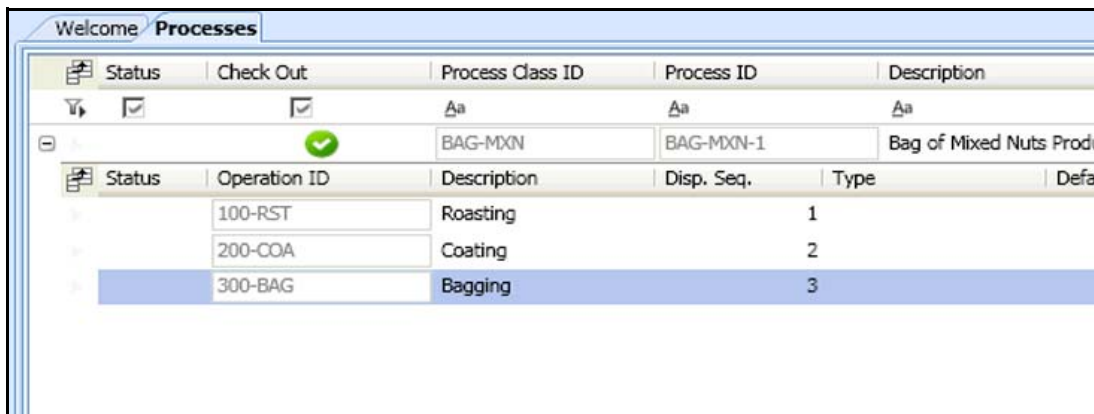


41. Save all changes.

42. Repeat Steps 36 through 41 two more times to configure two new operations as follows:

Operation ID	Description	Entity
200-COA	Coating	Coater
300-BAG	Bagging	Bagger

On the **Processes** tab, the newly created operations are displayed.



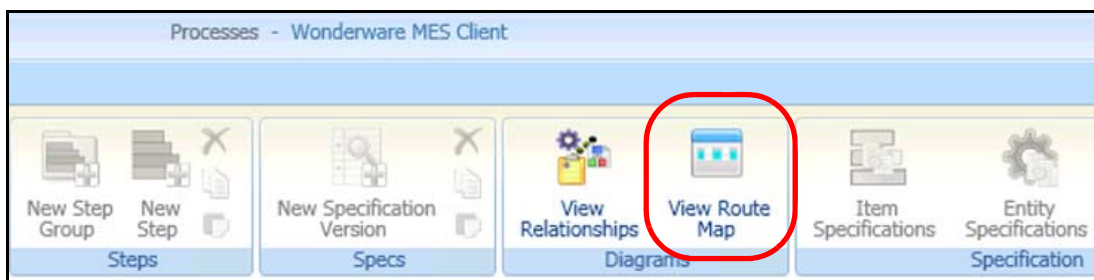
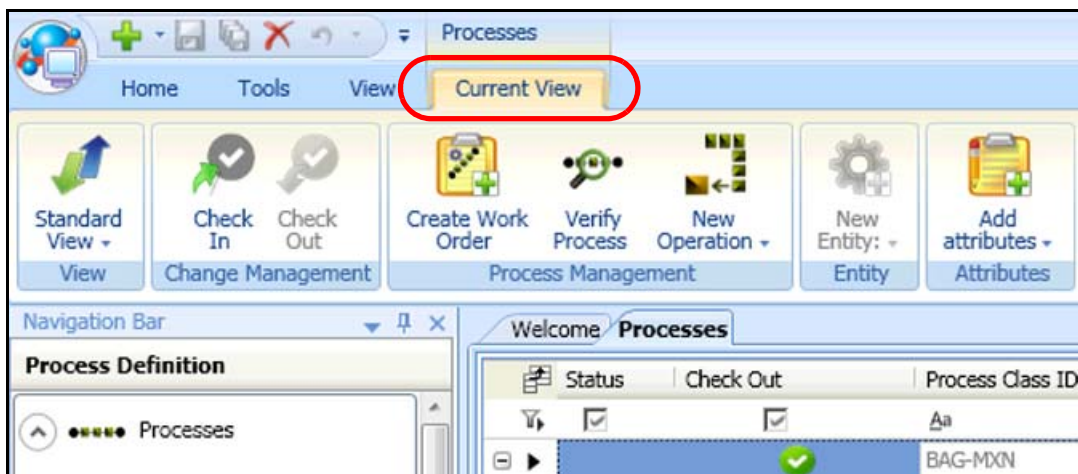
Status	Check Out	Process Class ID	Process ID	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	BAG-MXN	BAG-MXN-1	Bag of Mixed Nuts Product

Status	Operation ID	Description	Disp. Seq.	Type	Default
<input checked="" type="checkbox"/>	100-RST	Roasting		1	
<input checked="" type="checkbox"/>	200-COA	Coating		2	
<input checked="" type="checkbox"/>	300-BAG	Bagging		3	

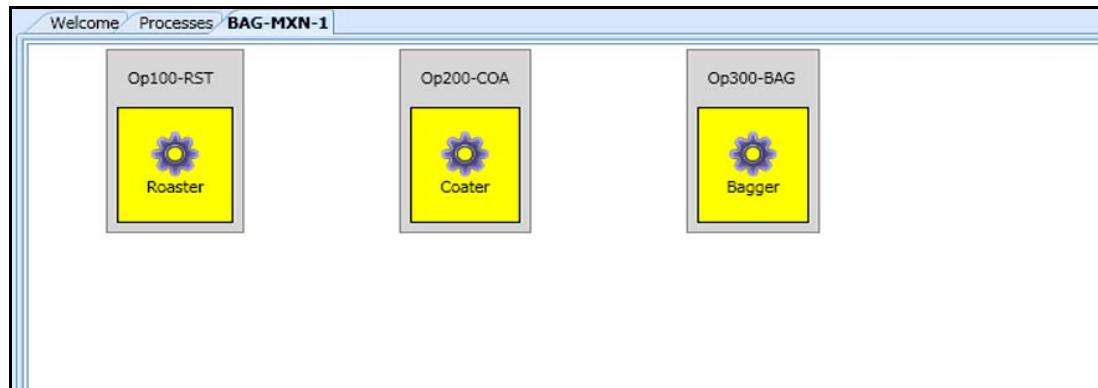
If there is more than one operation in a process, you have to specify the flow of materials from one operation to the other. To do this, you create a route map in the Wonderware MES Client.

43. Click the **BAG-MXN-1** process.

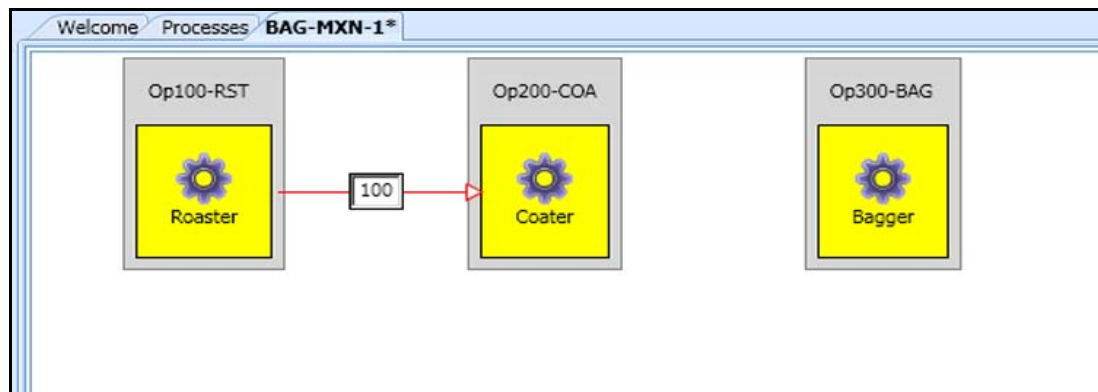
44. On the **Ribbon**, click the **Current View** tab, and then click **View Route Map**.



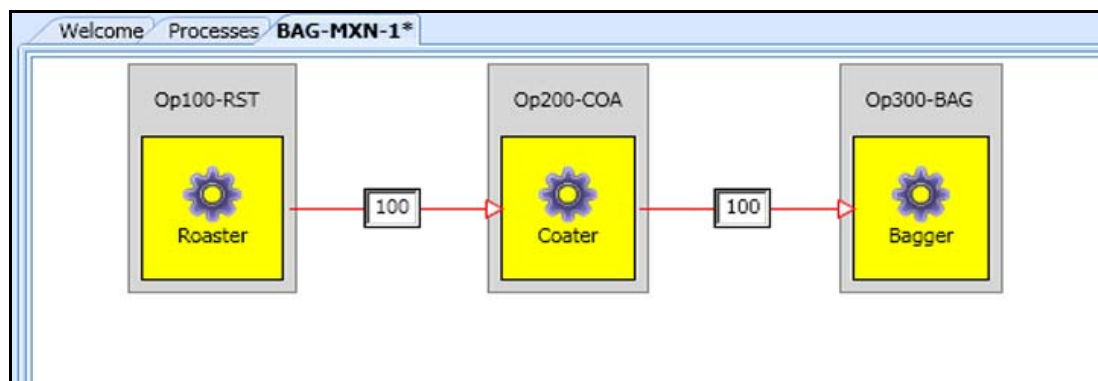
This will open a new route map tab in the workspace, showing all operations already created for the selected process.



45. Drag the **Roaster** entity to the **Coater** entity.



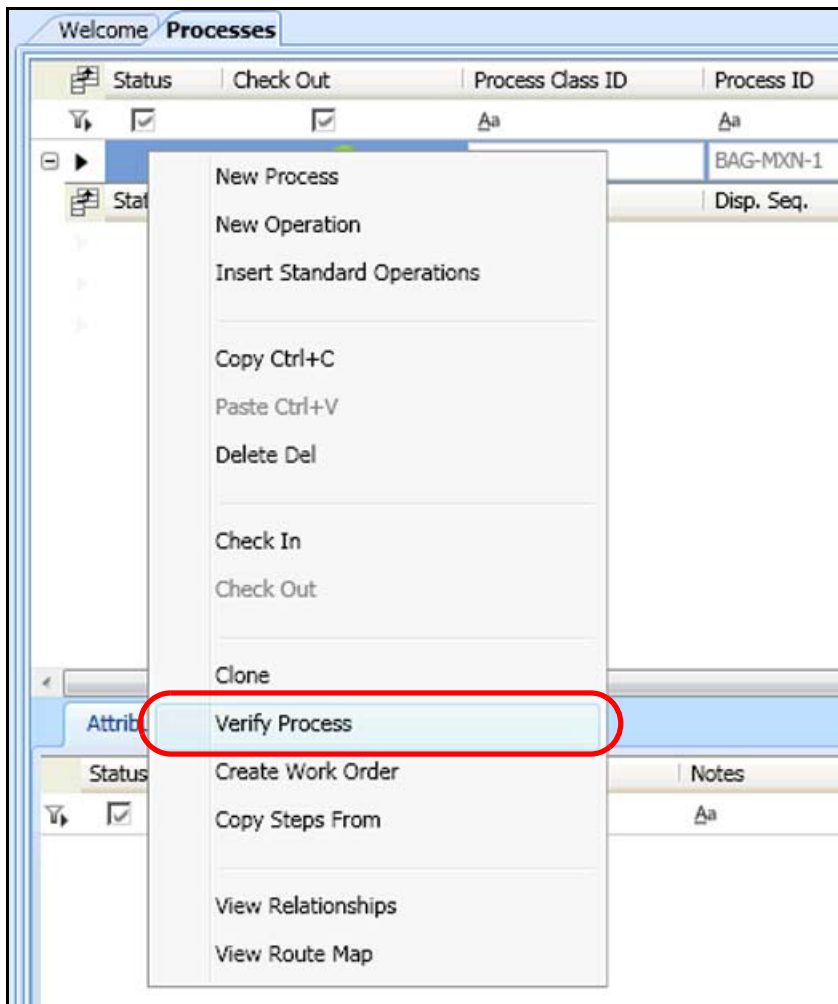
46. Drag the **Coater** entity to the **Bagger** entity.



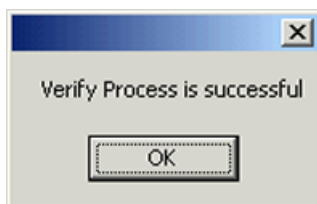
Arrows are drawn between each entity to indicate the flow of material in the process. Arrows allocate 100 percent of the output material from one operation to the other.

47. Save all changes and close the **BAG-MXN-1** tab.

48. On the **Processes** tab, right-click the **BAG-MXN-1** process and select **Verify Process**.

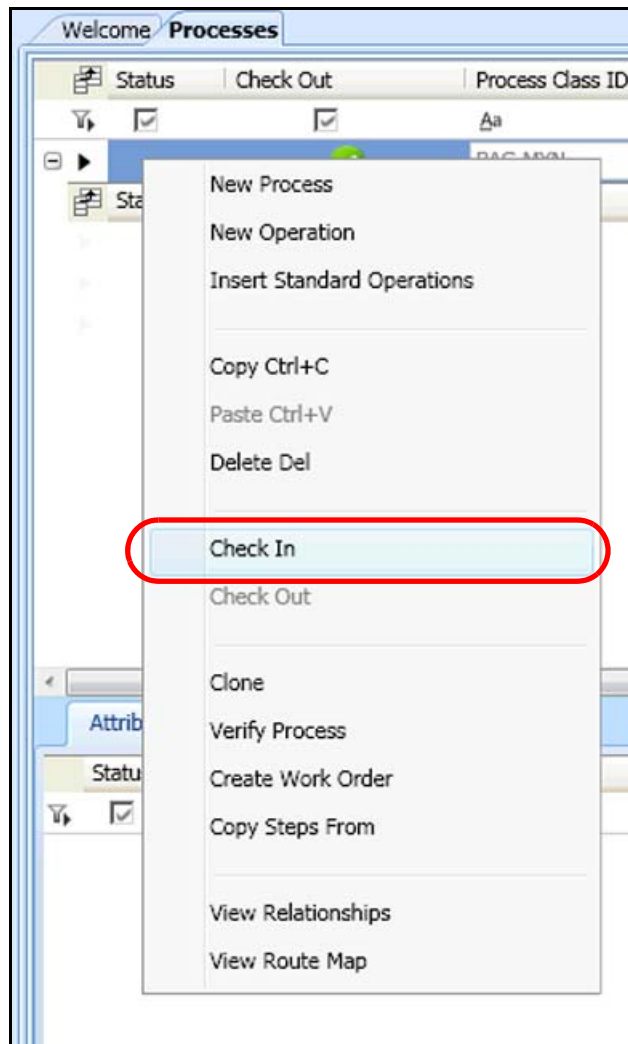


This displays the message **Verify Process is successful**. This means that all operations are configured properly.



49. Click **OK**.

50. On the **Processes** tab, right-click the **BAG-MXN-1** process and select **Check In**.



Note: Do not close the **Processes** tab because it will be used in subsequent labs.

Section 5 – Work Order Execution

This section discusses work orders, jobs, production counters, and examines the runtime JobExec in the Operations Capability Object.

Overview

A work order is a request for some quantity of an item to be produced on or before a due date. A work order may be generated in-house to restock inventory for an item that your company produces and then later uses as a component for another item.

A work order may be comprised from a collection of jobs that produce an item. A job is a list of steps or procedures that is executed to produce an item or a version of an item. Multiple jobs can be performed to produce a single item.

The **Work Order and Jobs** module is available by accessing the **Order Management** group in the Wonderware MES Client. When you open the **Work Order and Jobs** module, a list of all the existing work orders is shown in the tabbed workspace. Expand the work orders to see the job assigned to each of them.

You can also create a work order from a process. Processes are templates for work orders. All entities, step groups, steps, BOM, folders, data log, and certifications linked to the process becomes a part of the new work order.

You can import a work order from a ERP system. After importing a work order from a ERP, you may need to customize the work order for production. However, you can also use the **Work Order and Jobs** module to create a work order with a process or ERP information.

Job Execution

In the Operations Capability Object, you can specify details of a job that you want to run on an entity such as work order, operation IDs, and commands to specify the action to be performed on the entity when the job is run.

To view **Job Executions** tab in the object editor, select the **Entity Can Run Jobs** check box on the **General** tab. The **Job Execution** tab appears in the object editor.

Use the **Job Execution** tab to configure the job execution attributes and trigger the job execution commands.

You can control the execution of a job using job commands configured to perform the following changes to jobs on the entity for this Operations Capability Object instance.

- Start an existing job on the entity
- Pause or end a running job on the entity
- Start a job that is next in the queue for the entity
- Reset the command to start a job that is next in the queue for an entity after an error has occurred

Job Execution Attributes

You must specify the work order, operation, and sequence number to identify the job you want start, pause, or end on an entity.

To configure attributes to run a job, in the **Job Execution Attributes** tab, do the following:

- In the **Work Order**, **Sequence Number**, and **Operation** boxes, type the respective values or provide references.
- In the **Job Position** box, type the job position that indicates the position at which a job is currently running on the entity. The default value for this attribute is zero.

If an entity has one job position, then the value for the job position attribute must be zero (default value). If the entity is capable of running multiple jobs at a time, then you must specify the job position to identify where the job should start, pause or end on an entity.

- In the **Operator** box, type the name of the operator who preforms an action on a job, such as starting a job, ending a job, and adding production to a job.

The operator attribute is used to track the user who performs an action on a job. If the operator name is not specified, the default operator name that is configured in the system, **User ID for background tasks** attribute is used. If the default operator name cannot be retrieved from the system, the user name that is used to connect the database from the middleware server is used as the operator for a request that is initiated from Operations Capability Object.

Job Attributes Available at Runtime

The job attributes that are available at runtime are described in the following table.

You must select the **This entity can run jobs** and **Enable Create Job Attributes** check boxes on the **General** tab to view the following attributes in the tabbed workspace.

Attribute Name	Description	Configuration	Runtime (Access)
JobExec.CreateJobAttrs.WorkOrder	Specifies the work order that is currently associated with this job.Specifies the class of the item that is being produced by a job.	Yes	User
JobExec.CreateJobAttrs.ItemClass *	Specifies the class of the item that is being produced by a job.	Yes	User
JobExec.CreateJobAttrs.Item *	Specifies the item that is being produced by a job.	Yes	User
JobExec.CreateJobAttrs.ItemUOM *	Specifies the textual unit of measure for an item.	Yes	User
JobExec.CreateJobAttrs.Operation *	Specifies the operation that is currently associated with this job.	Yes	User
JobExec.CreateJobAttrs.ManufacturingOrder *	Specifies the manufacturing order that is currently associated with this job.	Yes	User
JobExec.CreateJobAttrs.BatchSize *	Specifies the batch size that is currently associated with a job.	Yes	User
JobExec.CreateJobAttrs.StartQuantity *	Specifies the start quantity that is currently associated with a job.	Yes	User
JobExec.CreateJobAttrs.RequiredQuantity *	Specifies the required quantity that is currently associated with a job.	Yes	User

Attribute Name	Description	Configuration	Runtime (Access)
JobExec.CreateJobAttrs.TargetJobProdRate *	Specifies the target job production rate that is currently associated with a job.	Yes	User
JobExec.CreateJobAttrs.TargetJobProdRateUOM *	Specifies the target job production rate UOM that is currently associated with a job. 0 = hours/batch (default) 1 = minutes/batch 2 = seconds/batch, 3 = batches/hour 4 = batches/minute 5 = batches/second	Yes	User
JobExec.CreateJobAttrs.Operator	Specifies the operator who performs this operation.	Yes	User
JobExec.CreateJobAttrs.UpdateInventory *	Specifies the update inventory flag that identifies whether to update the inventory when the required quantity of items are produced or consumed for the job.	Yes	User
JobExec.CreateJobAttrs.ProductionSchedule *	Specifies the schedule for production.	Yes	User
JobExec.CreateJobAttrs.Process *	Specifies the process that is associated with this work order.	Yes	User
JobExec.CreateJobAttrs.BomVersion *	Specifies the BOM Version of the process that is associated to create this work order.	Yes	User
JobExec.CreateJobAttrs.CreateNewJobCmd *	Creates a new job in the database.	No	Read-Only
JobExec.CreateJobAttrs.ResetCmd *	Resets an entity status and errors that occur while executing the create new job command.	No	Read-Only
JobExec.CreateJobAttrs.CreateNewJobsFromProcessCmd *	Creates a new job in the database based on the specified process.	No	Read-Only
JobExec.CreateJobAttrs.ErrorCode	Represents the error value that occurs while processing the call. If the last call succeeds, the value of this attribute is set to 0.	No	Read-Only
JobExec.CreateJobAttrs.ErrorMessage	Provides a message about the error that has occurred while processing the middleware call to start, pause, or end a job.	No	Read-Only
JobExec.CreateJobAttrs.Status	Indicates the status of the request sent to the middleware. The following are the different statuses: Ready: If the object is ready to process the request. Busy: If the call is currently being processed. Error: If there is an error during the last call.	No	Read-Only

* Quality is calculated when an input source is used, and the result of the quality will be BAD if an attribute it is unable to read the input source.

Job Execution Commands

You can control the execution of a job using job commands. You can configure the job execution commands to perform the following changes to jobs on the entity for this Operations Capability Object instance.

To trigger the job execution commands, in the **Job Execution Commands** section, do the following:

- In the **Start Job Command** box, provide a reference to a trigger command to start the existing job on the entity.
- In the **Pause Job Command** box, provide a reference to a trigger command to pause the running job on the entity.
- In the **End Job Command** box, provide a reference to a trigger command to end the running job on the entity.
- In the **Start Next Job Command** box, provide a reference to start the next ready job in the queue for this entity. This command starts the job to run on the entity if there is a job position available.

Production Counters

In the Operations Capability Object, you can use production counters to track the production of a material for an entity. You can configure up to 20 production counters for an entity in the **Production Counters** tab.

When you configure multiple production counters for an Operations Capability Object instance, all the job positions contain the same number of production counters at runtime.

For example, if you configure three production counters for the particular Operations Capability Object instance and there are four job positions, each job position will have three production counters, and a total of 12 production counters are created at runtime.

To view the **Production Counters** tab in the object editor, select the **Entity Can Run Jobs** and **Enable Production Counters** check boxes in the **General** tab.

Job Position

A job position is a number that indicates a position on an entity to run a job. You must specify job positions if you want to simultaneously run multiple jobs on an entity. When you run a job at the specified job position, the configured production counters are used to log the produced item count.

You can configure production counter attributes for each job position.

General Counter Attributes

The item configured in this section is used as the production item for the job. You can override the production item by configuring a different item and BOM position configured for the job.

A value zero for the BOM position indicates a produced item and a negative value indicates a by-product.

Rolling Counter Attributes

You can configure a rolling counter to count the number of items produced and update the production count when items are being produced at runtime.

A rollover counter is typically used in manufacturing operations where a value for production or consumption is needed using a device like a PLC or other counting device that, either through manual or automatic action, resets its value to zero.

At a certain point the counter would reset to a lower number between update intervals in the Operations Capability Object. The Operations Capability Object understands this resetting and it knows how to calculate the counts required based on the last known value and the current value. The Operations Capability Object also handles the case where you want a counter to reset at the start of a shift in order for the production crew to understand their production for the shift.

Absolute Counter Attributes

You can configure absolute counter attributes to specify the quantity of items consumed by an entity. When the **Add Cons Quantity Abs Command** is triggered, the specified consumption quantity is logged for the entity.

You can use **Absolute Consumption Counters** to specify the quantity of consumed items if any errors in the consumption count were automatically recorded or if an additional quantity that is consumed needs to be logged.

Lab 5 – Tracking Work Order Execution

Introduction

In this lab, you will issue work orders against the production process defined in the previous lab. This will allow you to track jobs associated with each operation defined for the **Production** process. First, you will enable the **Entity Can Run Jobs** capability for all the entities in the **Production** area. Next, you will enable a production counter to report good production for running jobs. Then, you will create a work order and track its progress in runtime. You will use a prebuilt InTouch application to run this work order. Finally, you use Wonderware Information Server to verify the completion of the jobs and view the MES reports.

Objectives

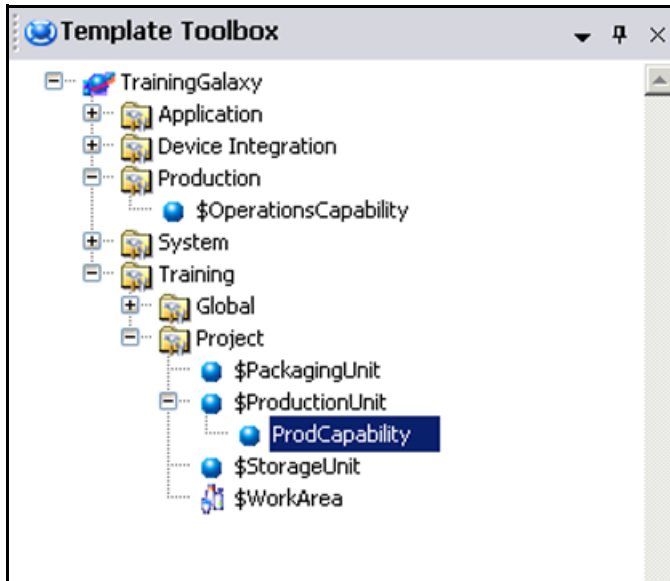
Upon completion of this lab, you will be able to:

- Enable job running capabilities for entities
- Create and configure an absolute production counter
- Create a work order
- Track runtime progress of a work order in InTouch
- View a Wonderware MES report in Wonderware Information Server

Enable the Entity Can Run Jobs Capability and Production Counters

You will enable the **Entity Can Run Jobs** capability at the template level for all the entities in the **Production** area of the factory.


1. In the ArchestrA IDE, **Template Toolbox**, double-click **\$ProductionUnit.ProdCapability**.





2. On the **General** tab, **Job Execution** area, check the **Entity Can Run Jobs** check box and lock it.


\$ProductionUnit.ProdCapability *


General | Job Defaults | Job Execution | Object Information | Scripts | UDAs | E

Job Execution 


☒ Entity Can Run Jobs 


☐ Enable Create Job Attributes 


☐ Enable Production Counters 


☐ Enable Consumption Counters 


Miscellaneous


☐ Entity Can Store Items 

☒ Entity Can Schedule Jobs 

☐ Enable Specifications 

☐ Enable PEM Attributes 

Event Settings 

ResponseType: With Response 

Now, you will enable the option to report production in runtime.

3. In the **Job Execution** area, check the **Enable Production Counters** check box and lock it.

The screenshot shows the configuration editor for **\$ProductionUnit.ProdCapability ***. The **Production Counters** tab is selected. The **Job Execution** section contains the following options:

- ☒ Entity Can Run Jobs (locked)
- ☐ Enable Create Job Attributes (locked)
- ☒ **Enable Production Counters** (locked and highlighted with a red circle)
- ☐ Enable Consumption Counters (locked)

The **Miscellaneous** section contains the following options:

- ☐ Entity Can Store Items (locked)
- ☒ Entity Can Schedule Jobs (locked)
- ☐ Enable Specifications (locked)
- ☐ Enable PEM Attributes (locked)

The **Event Settings** section contains the following option:


- ResponseType: **With Response** (locked)


The **Production Counters** tab appears in the configuration editor.


4. Leave the default value for **ResponseType** and lock the **Event Settings** area.


\$ProductionUnit.ProdCapability *


General | Job Defaults | Job Execution | Production Counters | Object Information

Job Execution 


☒ Entity Can Run Jobs 


☐ Enable Create Job Attributes 


☒ Enable Production Counters 


☐ Enable Consumption Counters 


Miscellaneous


☐ Entity Can Store Items 

☒ Entity Can Schedule Jobs 

☐ Enable Specifications 

☐ Enable PEM Attributes 

Event Settings 

ResponseType: With Response 

Create and Configure an Absolute Production Counter

You will now configure an absolute production counter. This counter will report good production in the **Production** area in runtime.

5. Click the **Production Counters** tab.

The screenshot shows the configuration window for **\$ProductionUnit.ProdCapability ***. The **Production Counters** tab is selected and highlighted with a red circle. The window contains several sections:

- Production Counter Name :** Includes a **Job Position** dropdown menu.
- Production Counters:** A table with a header **Name** and several empty rows for adding new counters.
- Inherited Production Counters:** A table with a header **Name** and several empty rows for listing inherited counters.
- General Counter Attributes:** A section containing a **Counter Attributes** table with columns **Attribute Name**, **Use Input Source**, and **Value**. The table lists attributes: **BOM Position**, **Item**, **Production Reason**, **To Location**, **To Lot**, and **To Sublot**. Each row has a checkbox for **Use Input Source** and a text field for **Value**.
- Event Data:** A section with an **Event DateTime:** label, a checkbox for **Use Input Source**, and a text field containing **Set Attribute At Runtime**.

6. Click the **Add** button to add a production counter.
7. Name the new counter **GoodProduction** and press **Enter**.

\$ProductionUnit.ProdCapability *

General | Job Defaults | Job Execution | **Production Counters** | Object Information | Scripts | UDAs | Extensions | Graphics

Production Counter Name : GoodProduction

Job Position: 0

Production Counters:

Name
GoodProduction

General Counter Attributes

Counter Attributes

Attribute Name	Use Input Source	Value or Input Source
BOM Position	<input type="checkbox"/>	0
Item	<input type="checkbox"/>	
Production Reason	<input type="checkbox"/>	
To Location	<input type="checkbox"/>	

8. In the **General Counter Attributes** group, click the **Production Reason** ellipsis button.

General Counter Attributes

Counter Attributes

Attribute Name	Use Input Source	Value or Input Source
BOM Position	<input type="checkbox"/>	0
Item	<input type="checkbox"/>	
Production Reason	<input type="checkbox"/>	
To Location	<input type="checkbox"/>	
To Lot	<input type="checkbox"/>	
To Sublot	<input type="checkbox"/>	

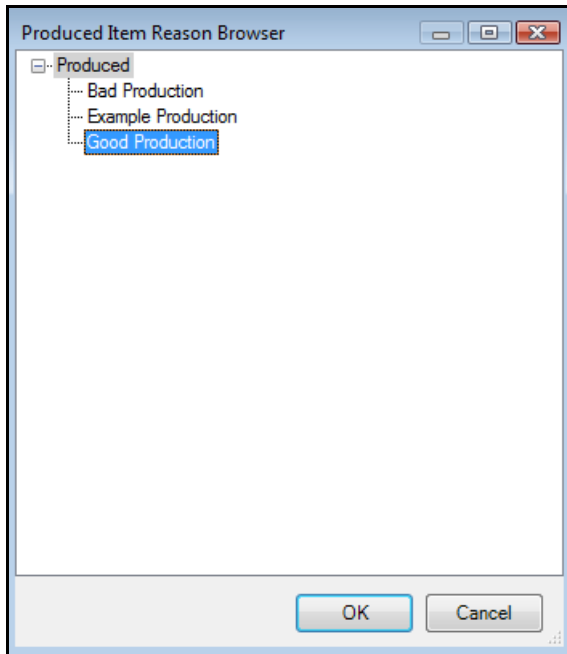
Event Data

Event DateTime:

☐ Use Input Source ☒ Auto Generate

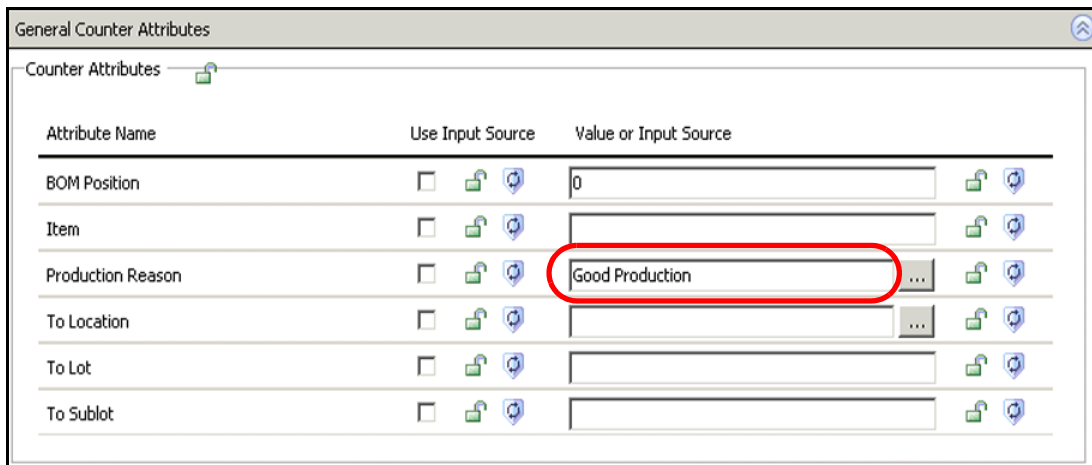
The **Produced Item Reason Browser** dialog box appears.

9. Click **Good Production**.



10. Click **OK**.

The item reason appears in the **Production Reason** field.

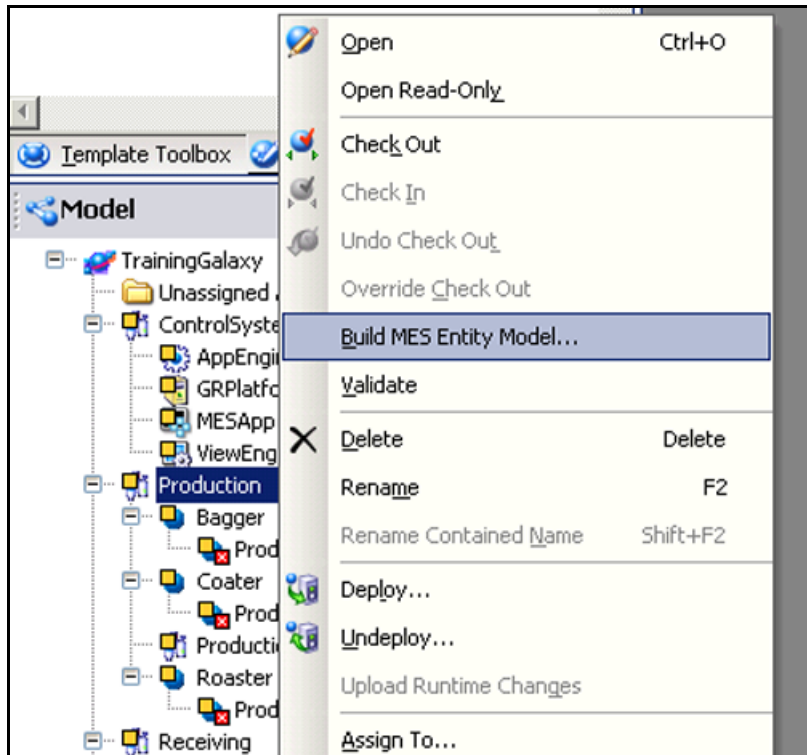


For the purpose of this lab, retain the default values for the rest of the attributes. The **Absolute Counter Attributes** are enabled by default.

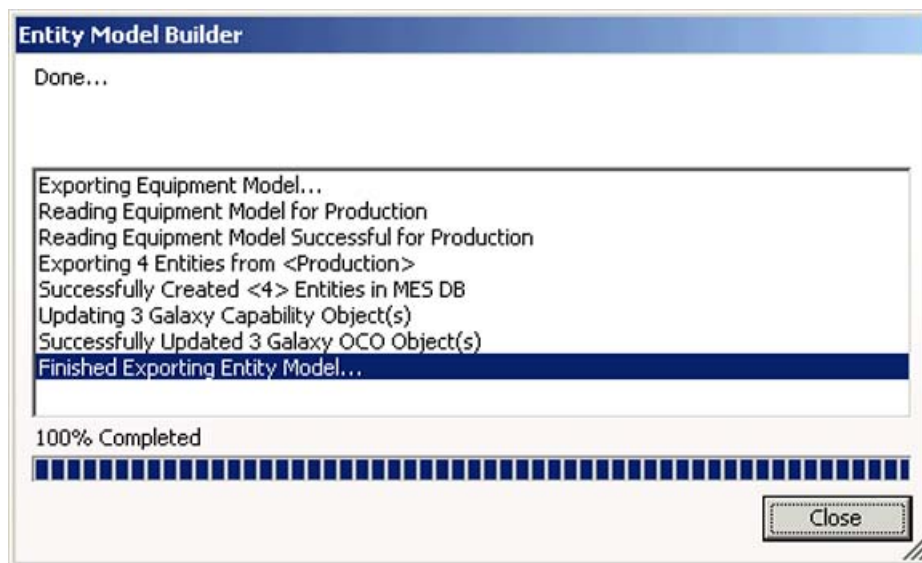
11. Save and close the configuration editor, and then check in the object.

Now, you will run the **Entity Model Builder** to synchronize the object with the Wonderware MES database. You need to synchronize the Wonderware MES database after configuring capabilities.

12. In the **Model** view, right-click **Production** and select **Build MES Entity Model**.

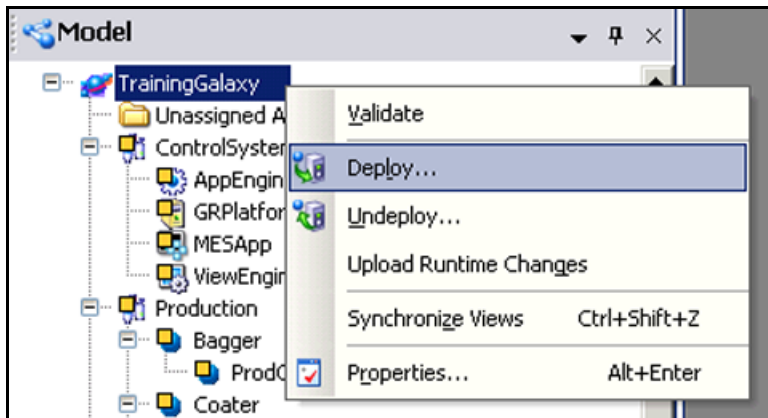


13. When the process is complete, click **Close**.

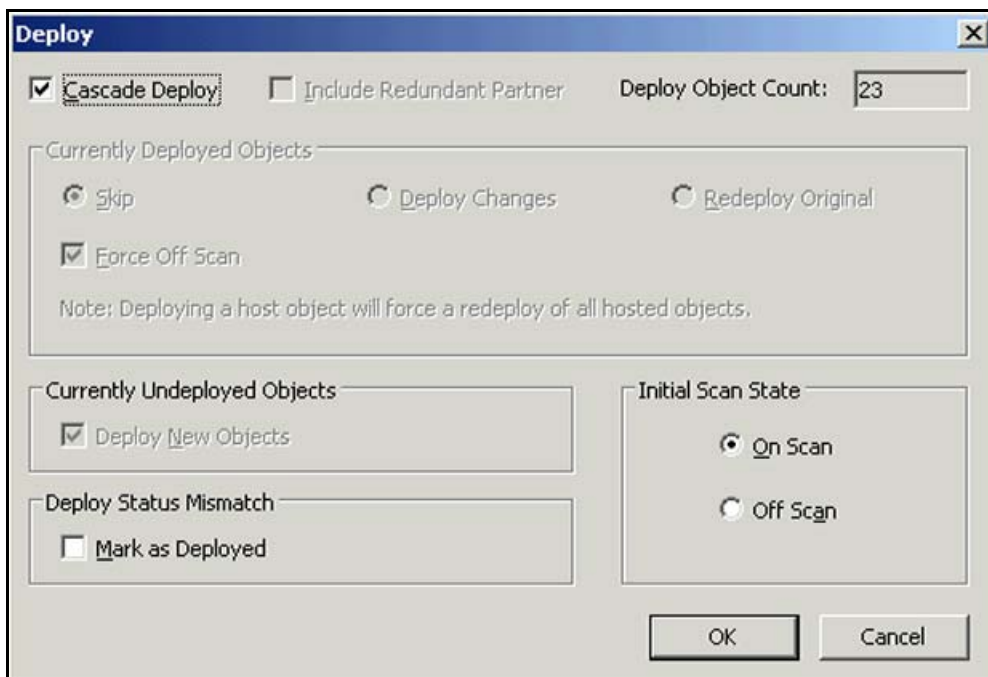


The **\$ProductionUnit.ProdCapability** object and all its instances in the **Production** area of the factory are now configured successfully in the Galaxy. However, before using the Operations Capability Object in runtime, you must deploy the Galaxy.

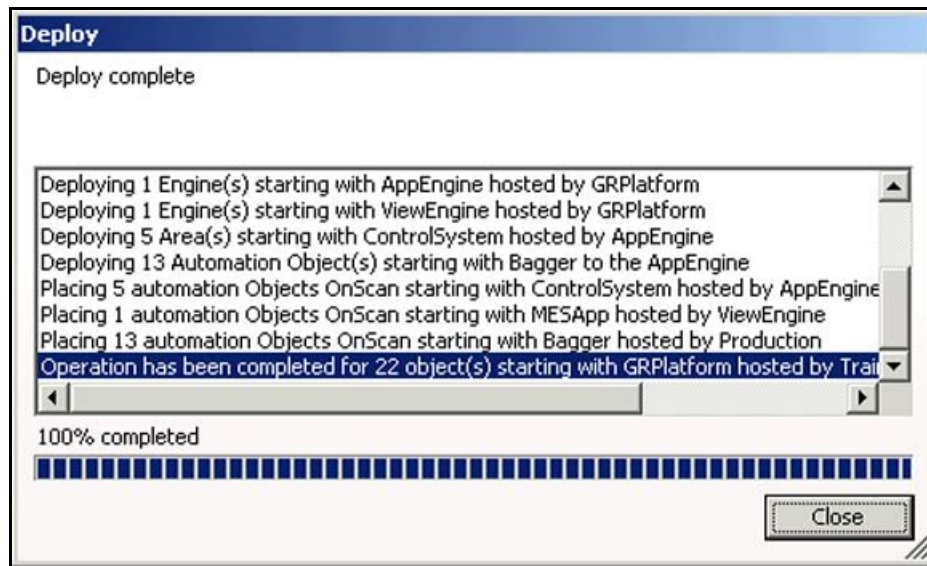
14. In the **Model** view, right-click **TrainingGalaxy** and select **Deploy**.



15. In the **Deploy** dialog box, leave the default values and click **OK**.



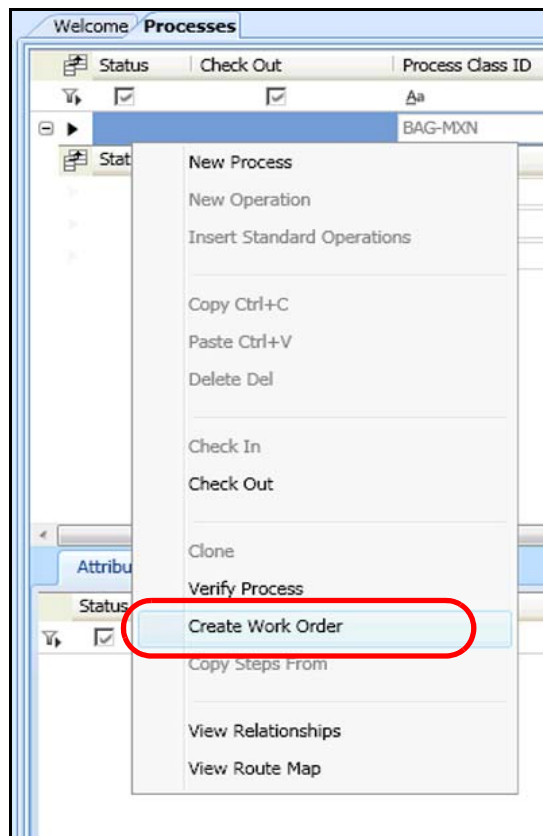
16. When the process is complete, click **Close**.



Create a Work Order

You will now create a work order in the Wonderware MES Client.

17. In the Wonderware MES Client, on the **Processes** tab, right-click the **BAG-MXN-1** process and select **Create Work Order**.



18. In the **Create Work Order from Process** dialog box, configure the work order as follows:

Work Order ID: WO-010
Description: First Work Order
Required Quantity: 100

The screenshot shows the 'Create Work Order from Process' dialog box. The fields are as follows:

Field	Value
Process ID	BAG-MXN-1
Spec. Version	
Work Order ID	WO-010
Description	First Work Order
Item	BMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	100 Pcs.
Release Date/Time	04/24/2013 12:00 AM
Due Date/Time	04/24/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

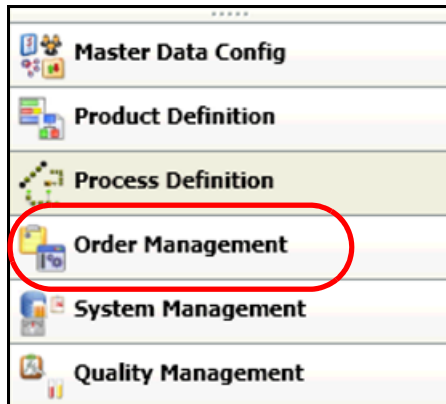
At the bottom of the dialog box are two buttons: **OK** and **Cancel**.

Note: The **Starting Quantity** will automatically match the **Required Quantity** after you click **OK**.

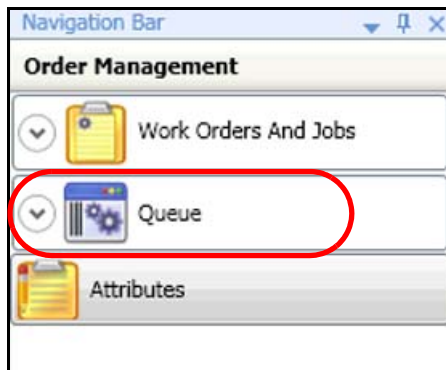
19. Click **OK** to create the work order.

Now, you will view the jobs associated with the new work order in the job queue.

20. Click the **Order Management** group.



21. In the **Order Management** group, click the **Queue** module to expand it.



22. Click **Apply filters**.

The jobs associated with the newly created work order appear on the **Queue** tab.

A screenshot of the 'Queue' tab showing a table of work order jobs. The table has columns: Status, Work Order ID, Operation ID, Target Scheduled Entity ID, Running On, State, Scheduled Start Date/Time, and Required Finish Date. The 'State' column is highlighted in blue for all rows.

Status	Work Order ID	Operation ID	Target Scheduled Entity ID	Running On	State	Scheduled Start Date/Time	Required Finish Date
	WO-010	100-RST	2		NEW		04/15/2013 04:00
	WO-010	200-COA	3		NEW		04/19/2013 08:00
	WO-010	300-BAG	4		NEW		04/24/2013 12:00

23. Close the **Queue** tab.

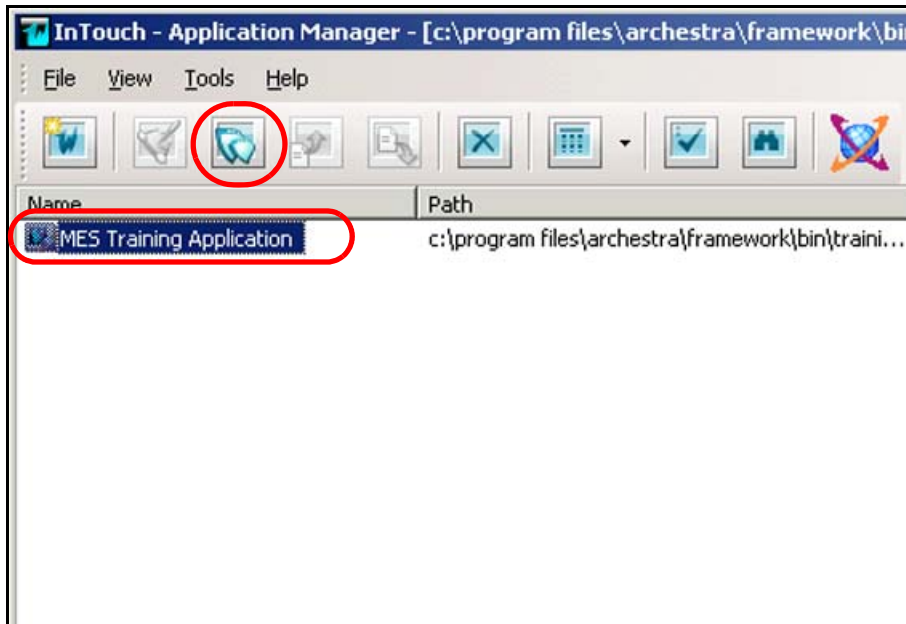
Running the Work Order

You will now track the running of the jobs associated with **WO-010** in runtime. For this, you will use a prebuilt InTouch application that contains the logic needed to manipulate the attributes of the Operations Capability Object.

24. Open the InTouch application (**Start | All Programs | Wonderware | InTouch**).

The InTouch window appears.

25. Ensure **MES Training Application** is selected, and then click the **WindowViewer** button.



After a few moments, WindowViewer opens with the default **Production** window. You will use this window to track the three jobs associated with the production process of the factory: roasting, coating, and bagging. The **Roaster** entity is selected by default.

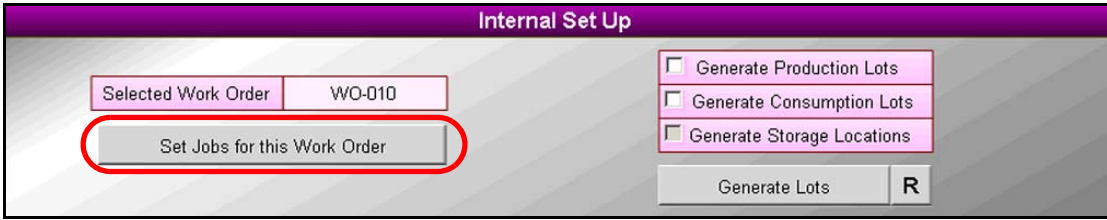
The screenshot shows the InTouch - WindowViewer application. The title bar indicates the file path: C:\DOCUMENTS AND SETTINGS\ALL USERS\APPLICATION DATA\ARCHESTRA\MANAGEDAPP. The window is titled "Production". The main interface includes a menu bar (File, Logic, Special) and a toolbar (Production, Shipping, Manual, Specs, Inventory, DB Views, Create Job). The central area is divided into several panels. The "Internal Set Up" panel at the top has a "Selected Work Order" field and buttons for "Set Jobs for this Work Order" and "Generate Lots". The "Roaster - Job Commands" panel on the left has fields for Work Order, Operation, and Sequence No, and buttons for Start Job, End Job, Pause Job, and Status. The "Receiving", "Roasting", "Coating", and "Bagging" panels show a process flow diagram. The "Roaster" panel at the bottom has a "Currently Running Job" section, a "GOOD Prod Counter" section, and an "Enable Options" section.

26. Towards the top of the window, in the **Internal Set Up** panel, **Selected Work Order** field, enter **WO-010**.

Note: Press **Enter** after any text entry in WindowViewer.

This is a close-up of the "Internal Set Up" panel. The "Selected Work Order" field is highlighted with a red circle and contains the text "WO-010". Below it is a button labeled "Set Jobs for this Work Order". To the right are three checkboxes: "Generate Production Lots", "Generate Consumption Lots", and "Generate Storage Locations". At the bottom right is a button labeled "Generate Lots" and a red "R" button.

27. Click **Set Jobs for this Work Order**.




The 'Internal Set Up' dialog box has a purple header. On the left, a 'Selected Work Order' field contains 'WO-010'. Below it, the 'Set Jobs for this Work Order' button is circled in red. On the right, there are three unchecked checkboxes: 'Generate Production Lots', 'Generate Consumption Lots', and 'Generate Storage Locations'. At the bottom right, there is a 'Generate Lots' button and a button labeled 'R'.



This will automatically set the work order, operation, and sequence number in the Operation Capability objects in the **Production** area.

Now, you will run the roasting job.

28. In the **Roaster - Job Commands** panel, **Start Job** field, click the **Cmd** button to start the job.



The 'Roaster - Job Commands' panel has a blue header. It contains a table with the following data:

Work Order	WO-010	
Operation	100-RST	
Sequence No	0	
Start Job	Cmd	
End Job	Cmd	
Pause Job	Cmd	
Status	Ready	R

The 'Cmd' button in the 'Start Job' row is circled in red.

The **Status** changes to **Busy** after you click the **Cmd** button and then resets to **Ready** as soon as the transaction ends.

Once the **Currently Running Job** panel shows the job running for the **Roaster** entity, the Operations Capability Object is ready to accept values.

Currently Running Job	
Work Order	WO-010
Operation	100-RST
Sequence No	0
Item ID	BMX-BBQ
Required Qty	100.00
Start Qty	100.00
Total Good Prod	0.00
Total Bad Prod	0.00

29. In the **GOOD Prod Counter** panel, **Quantity** field, enter **100.00**.

GOOD Prod Counter	
Quantity	100.00
Add Quantity	Cmd <input type="checkbox"/>
Status	Ready R

30. In the **Add Quantity** field, click the **Cmd** button.

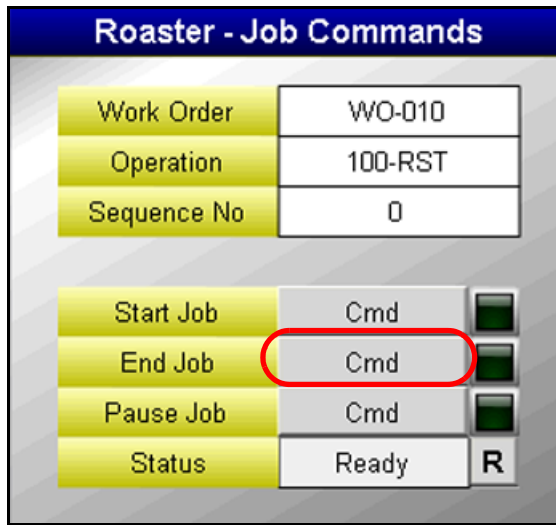
This reports good production of **100.00** against the roasting job.

GOOD Prod Counter	
Quantity	100.00
Add Quantity	Cmd
Status	Ready R

The **Status** changes to **Busy** after you click the **Cmd** button, and then resets to **Ready** as soon as the transaction ends. Also, in the **Currently Running Job** panel, the value in the **Total Good Prod** field increases to **100.00**.

Currently Running Job	
Work Order	WO-010
Operation	100-RST
Sequence No	0
Item ID	BMX-BBQ
Required Qty	100.00
Start Qty	100.00
Total Good Prod	100.00
Total Bad Prod	0.00

31. In the **Roaster - Job Commands** panel, **End Job** field, click the **Cmd** button to end the job associated with the roasting entity.



The screenshot shows the 'Roaster - Job Commands' panel. It contains a table with the following data:

Field	Value
Work Order	WO-010
Operation	100-RST
Sequence No	0

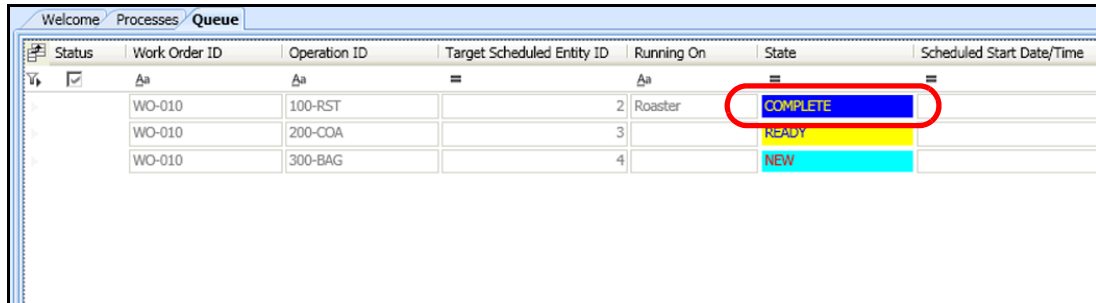
Action	Command	Status
Start Job	Cmd	<input type="checkbox"/>
End Job	Cmd	<input checked="" type="checkbox"/>
Pause Job	Cmd	<input type="checkbox"/>
Status	Ready	R

The 'End Job' row is highlighted with a red circle.

This completes the roasting job. You can check the status of this job on the **Queue** tab of the Wonderware MES Client.

32. In MES Client, **Queue** module, click **Apply filters**.

When the job completes successfully, the **State** column displays **COMPLETE**.



The screenshot shows the 'Queue' module in the MES Client. It displays a table with the following data:

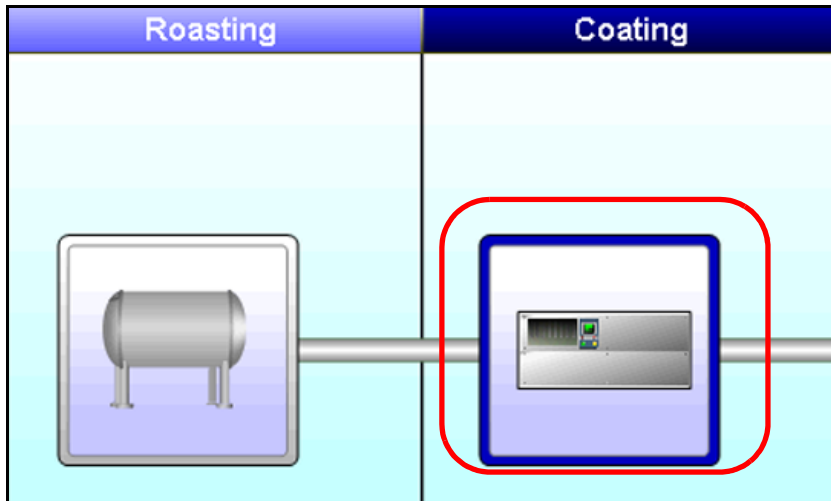
Status	Work Order ID	Operation ID	Target Scheduled Entity ID	Running On	State	Scheduled Start Date/Time
<input checked="" type="checkbox"/>	WO-010	100-RST		2 Roaster	COMPLETE	
<input type="checkbox"/>	WO-010	200-COA		3	READY	
<input type="checkbox"/>	WO-010	300-BAG		4	NEW	

The 'COMPLETE' state in the first row is highlighted with a red circle.

33. Close the **Queue** tab.

Now, you will run the coating job.

34. In WindowViewer, to the right of the **Roasting** panel, in the **Coating** panel, click the **Coater** entity.



The **Coater - Job Commands** panel automatically displays the job associated with the **Coater** entity.

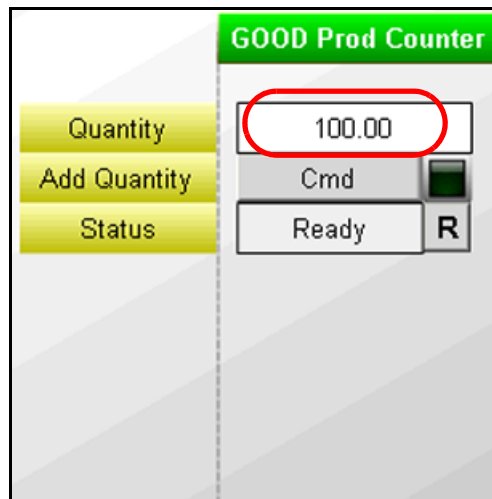
Coater - Job Commands		
Work Order	WO-010	
Operation	200-COA	
Sequence No	0	
Start Job	Cmd	<input type="checkbox"/>
End Job	Cmd	<input type="checkbox"/>
Pause Job	Cmd	<input type="checkbox"/>
Status	Ready	R

35. In the **Start Job** field, click the **Cmd** button to start the coating job.



Coater - Job Commands	
Work Order	WO-010
Operation	200-COA
Sequence No	0
Start Job	Cmd
End Job	Cmd
Pause Job	Cmd
Status	Ready R

36. Ensure the **Currently Running Job** panel fields have updated with the values associated with the coating job.
37. In the **GOOD Prod Counter** panel, **Quantity** field, enter **100.00**.



GOOD Prod Counter	
Quantity	100.00
Add Quantity	Cmd
Status	Ready R

38. In the **Add Quantity** field, click the **Cmd** button.

The screenshot shows a control panel titled "GOOD Prod Counter". On the left, there are three yellow buttons: "Quantity", "Add Quantity", and "Status". To the right of these buttons is a control area. At the top of this area is a display showing "100.00". Below the display is a button labeled "Cmd", which is circled in red. Below the "Cmd" button is a button labeled "Ready". To the right of the "Ready" button is a small square button labeled "R".


In the **Currently Running Job** panel, the value in the **Total Good Prod** field increases to **100.00**.

The screenshot shows a panel titled "Currently Running Job". It contains a table with the following data:

Work Order	WO-010
Operation	200-COA
Sequence No	0
Item ID	BMX-BBQ
Required Qty	100.00
Start Qty	100.00
Total Good Prod	100.00
Total Bad Prod	0.00

The "Total Good Prod" row is highlighted with a green background, and the value "100.00" is circled in red.

39. In the **Coater - Job Commands** panel, **End Job** field, click the **Cmd** button.

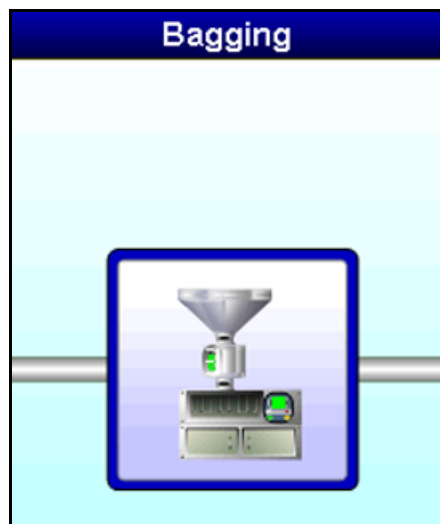


The screenshot shows the 'Coater - Job Commands' panel. It contains a table with job details and a set of control buttons. The 'End Job' button, which contains the text 'Cmd', is circled in red.

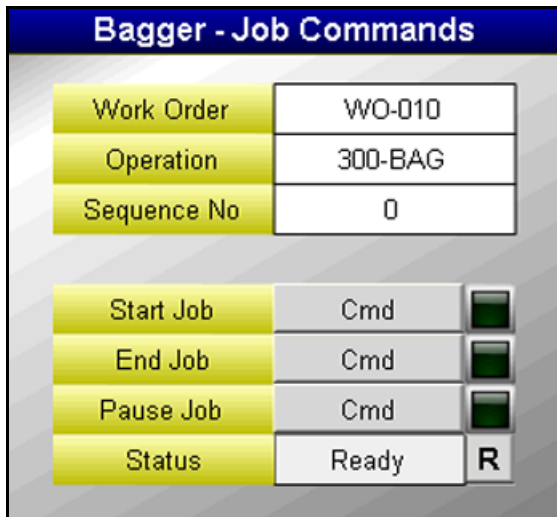
Coater - Job Commands	
Work Order	WO-010
Operation	200-COA
Sequence No	0
Start Job	Cmd
End Job	Cmd
Pause Job	Cmd
Status	Ready

You will now run the bagging job.

40. In the **Bagging** panel, click the **Bagger** entity.



The **Bagger - Job Commands** panel automatically sets up the job associated with the **Bagger** entity.



The screenshot shows the 'Bagger - Job Commands' panel. It contains a table with the following data:

Work Order	WO-010
Operation	300-BAG
Sequence No	0

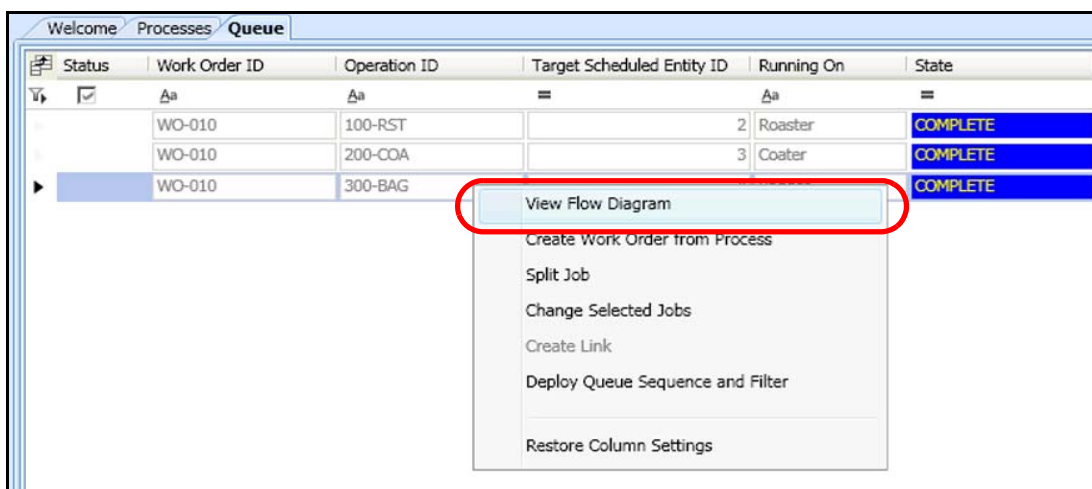
Start Job	Cmd	<input type="button" value="Cmd"/>
End Job	Cmd	<input type="button" value="Cmd"/>
Pause Job	Cmd	<input type="button" value="Cmd"/>
Status	Ready	R

41. In the **Bagger - Job Commands** panel, **Start Job** field, click the **Cmd** button.
42. Ensure the **Currently Running Job** panel fields have updated with the values associated with the bagging job.
43. In the **GOOD Prod Counter** panel, **Quantity** field, enter **100.00**.
44. In the **Add Quantity** field, click the **Cmd** button.
45. In the **Bagger - Job Commands** panel, **End Job** field, click the **Cmd** button to end the **Bagging** job.

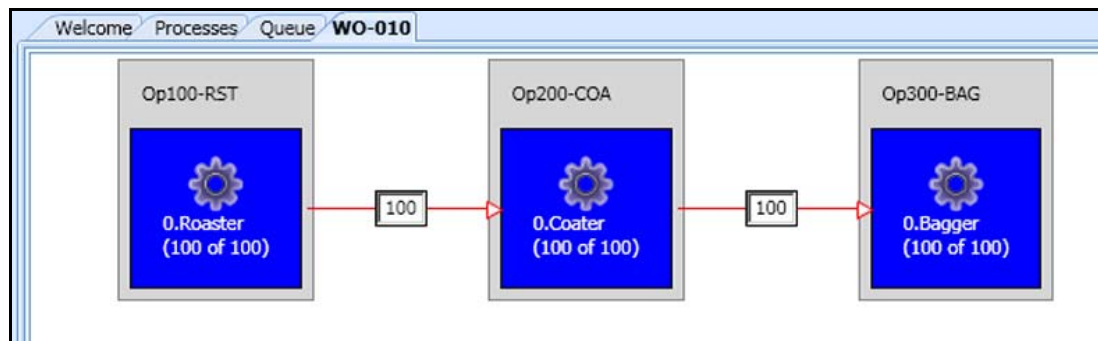
Verify Completion and View Reports

Now, you will view the status of the completed jobs in the Wonderware MES Client.

46. In the Wonderware MES Client, **Queue** module, click **Apply filters**.
47. On the **Queue** tab, right-click any job and select **View Flow Diagram**.



The diagram shows that the three jobs are complete with production of 100 pieces in each operation.



48. Close the **WO-010** tab.

Note: Leave the **Queue** tab open, as it will be used in the next lab.

3-100 Module 3 – Define the Basic Operations Model

49. Open Wonderware Information Server (Start | All Programs | Wonderware | Information Server | Home Page).
50. In the **System** panel, expand **Reports**.

Note: This may take a while, as the required report services must start.

51. Expand **MES** and click the **Production by Entity** report.



By default, the report will display the last 24 hours of data in the **Date Time** area.

Production by Entity

Date Time

4/16/2013 12:00:00 AM [1] 00:00:00.000 4/17/2013 12:00:00 AM

Time zone: (GMT-08:00) Pacific Time (US & Canada); Tijuana

Filter

Do not auto-populate list boxes: ☒ True ☐ False

Entity Pattern:

Select Specific Entity Name: ☒ True ☐ False

Entities List: ALL

Items List: ALL

Show Expanded: Collapsed

Show Data Filtering Criteria: On

Execute

52. In the **Date Time** area, select a start date and time that corresponds to the beginning of the week and an end date and time that corresponds to the end of the week.

53. Click **Execute**.

This displays a report with production details of every entity.

Production by Entity

1 of 1 100%

Data Filtering Criteria

Time Period: 4/15/2013 12:00:00 AM - 4/19/2013 12:00:00 AM

Time Zone: (GMT-08:00) Pacific Time (US & Canada); Tijuana

Entities List:

Items List:

Outlining: Collapsed

Entity: Bagger

Entity: Coater

Entity: Roaster

54. Expand the entities and view the details of the report.

Data Filtering Criteria

Time Period:

4/15/2013 12:00:00 AM - 4/19/2013 12:00:00 AM

Time Zone:

(GMT-08:00) Pacific Time (US & Canada); Tijuana

Entities List:

Items List:

Outlining:

Collapsed

Entity: Bagger

Item	Item Description	Units	Production	Rejects	%Quality
BMX-BBQ	Bag of Mixed Nut - BBQ	Pieces	100.0	0.0	100.0

Entity: Coater

Item	Item Description	Units	Production	Rejects	%Quality
BMX-BBQ	Bag of Mixed Nut - BBQ	Pieces	100.0	0.0	100.0

Entity: Roaster

Item	Item Description	Units	Production	Rejects	%Quality
BMX-BBQ	Bag of Mixed Nut - BBQ	Pieces	100.0	0.0	100.0



Module 4 – More on the Operations Model

Section 1 – Rejected Production	4-3
Lab 6 – Tracking Rejected Production	4-5
Section 2 – Storage Capability	4-25
Lab 7 – Tracking Storage Locations	4-27
Section 3 – Bill of Materials	4-45
Lab 8 – Defining a Bill of Materials	4-47
Lab 9 – Tracking Genealogy	4-79
Section 4 – Item Grades, States, and Reasons	4-91
Lab 10 – Defining Item Grades, States, and Reasons	4-93
Section 5 – By-Products	4-119
Lab 11 – Tracking By-Products	4-121
Section 6 – Schedule Jobs at a Parent Entity	4-131
Lab 12 – Scheduling Jobs at a Parent Entity	4-133
Section 7 – Job Management	4-167
Lab 13 – Managing Jobs	4-169
Section 8 – Job Creation	4-181

Module Objectives

- Discuss Rejected Production, Bill of Materials (BOM) configuration, and Product Genealogy
- Describe the use of Item Grades, States, and Reasons
- Identify job management concepts

Section 1 – Rejected Production

This section discusses how to create Item Reasons and how they relate to the concept of rejected production.

Overview

An item reason defines a reason for an item to be in any state and grade. Item reason groups are used to organize similar reasons. An item reason is selected when production or consumption of an item is reported and then this reason determines the state and grade of the lot of an item. A reason can be selected by PLC, I/O, or an operator.

Use the **Item Reasons** module by selecting the **Item Reasons** module in the **Product Definition** group of the Wonderware MES Client to create and maintain item reason groups and reasons. The item reason group and the reasons associated to that reason group are assigned to item classes and entities to specify which reasons are applicable to different item classes or entities.

When you open the **Item Reasons** module, a list of all the existing item reason groups is shown in the tabbed workspace. You cannot define a reason for an item before defining possible resultant states and grades for that item.

Rejected Production

Rejected production refers to items produced that must be withheld from normal production, often because the product does not meet quality standards. You can track rejected production by using attributes in the Operations Capability Object. This is done by creating a production counter for the rejected production in the **Production Counter** tab, associated with a **Bad Production Item Reason**. Use the counter created to track your rejected production.

Lab 6 – Tracking Rejected Production

Introduction

In the previous lab, you enabled job running capabilities and configured a good production counter for all entities in the **Production** area of the mixed nut factory. This helped you to track jobs and report good production in runtime using a prebuilt InTouch application. However, you did not track rejected production, which is an important task that an operator may be required to perform if the quality of production from any operation in the plant is not acceptable.

In this lab, you will track and report rejected production from the **Production** area of the mixed nut factory. For this, you will configure a rolling counter to report bad production. Finally, you will create a work order in Wonderware MES Client and use the InTouch application to track its progress.

Objectives

Upon completion of this lab, you will be able to:

- Create and configure a rolling production counter
- Configure production counters to track and report rejected production

Create and Configure a Rolling Counter for Bad Production

To report production in runtime, you will first create a second production counter by configuring the Operations Capability Object in the ArchestrA IDE.

1. In the ArchestrA IDE, **Template Toolbox**, double-click **\$ProductionUnit.ProdCapability**.
2. On the **Production Counters** tab, click the **Add** button, and then name the new counter **BadProduction** and press **Enter**.

The screenshot shows the ArchestrA IDE interface for configuring a production counter. The title bar reads '\$ProductionUnit.ProdCapability *'. The 'Production Counters' tab is selected. In the 'Production Counter Name' field, 'BadProduction' is entered. Below this, the 'Job Position' is set to '0'. On the left, a list of 'Production Counters' shows 'GoodProduction' and 'BadProduction', with 'BadProduction' highlighted. A red circle highlights the '+' button above the list. To the right, the 'General Counter Attributes' section is visible, showing a table of attributes with checkboxes for 'BOM Position', 'Item', 'Production Reason', and 'To Location'.

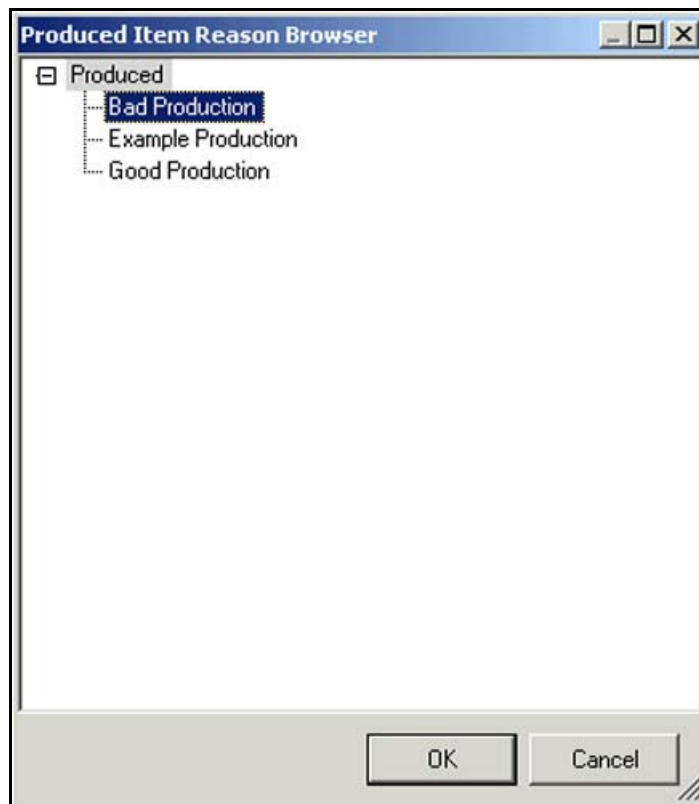
3. In the **General Counter Attributes** group, click the **Production Reason** ellipsis button.

The screenshot shows the 'General Counter Attributes' dialog box. It contains a table with columns for 'Attribute Name', 'Use Input Source', and 'Value or Input Source'. The 'Production Reason' row is highlighted, and its 'Value or Input Source' field is set to an empty text box. A red circle highlights the ellipsis button (three dots) next to the 'Production Reason' value field. Other attributes listed include 'BOM Position', 'Item', 'To Location', 'To Lot', and 'To Sublot'.

The **Produced Item Reason Browser** dialog box appears.

You will use this dialog box to specify the production reason associated with the bad or rejected production.

4. In the **Produced Item Reason Browser** dialog box, ensure **Bad Production** is selected.




5. Click **OK**.



6. In the configuration editor, scroll down to the **Rolling Counter Attributes** group, and then check the **Enable Rolling Counter** check box and lock it.

Rolling Counter Attributes

☒ Enable Rolling Counter




Rolling Counter Attributes


Attribute Name	Use Input Source	Value or Input Source
Add Production Quantity Counter	<input type="checkbox"/>  	0.0

Rolling Counter Data


Deadband:





Update Interval:



Max Value:





☐ Push Production Counts Upon Reset

Rolling Counter Commands

Reset Rolling Counter Command:

☐ Use Input Source

Now, you will configure the attributes for the rolling counter.

7. In the **Rolling Counter Data** area, configure and lock the attributes as follows:

Deadband: 1.0 (*default*)
Update Interval: 00:00:10.0000000 (*10 seconds*)
Max Value: 1000.0

Attribute Name	Use Input Source	Value or Input Source
Add Production Quantity Counter	<input type="checkbox"/>	0.0

Deadband:	1.0	
Update Interval:	00:00:10.0000000	
Max Value:	1000.0	

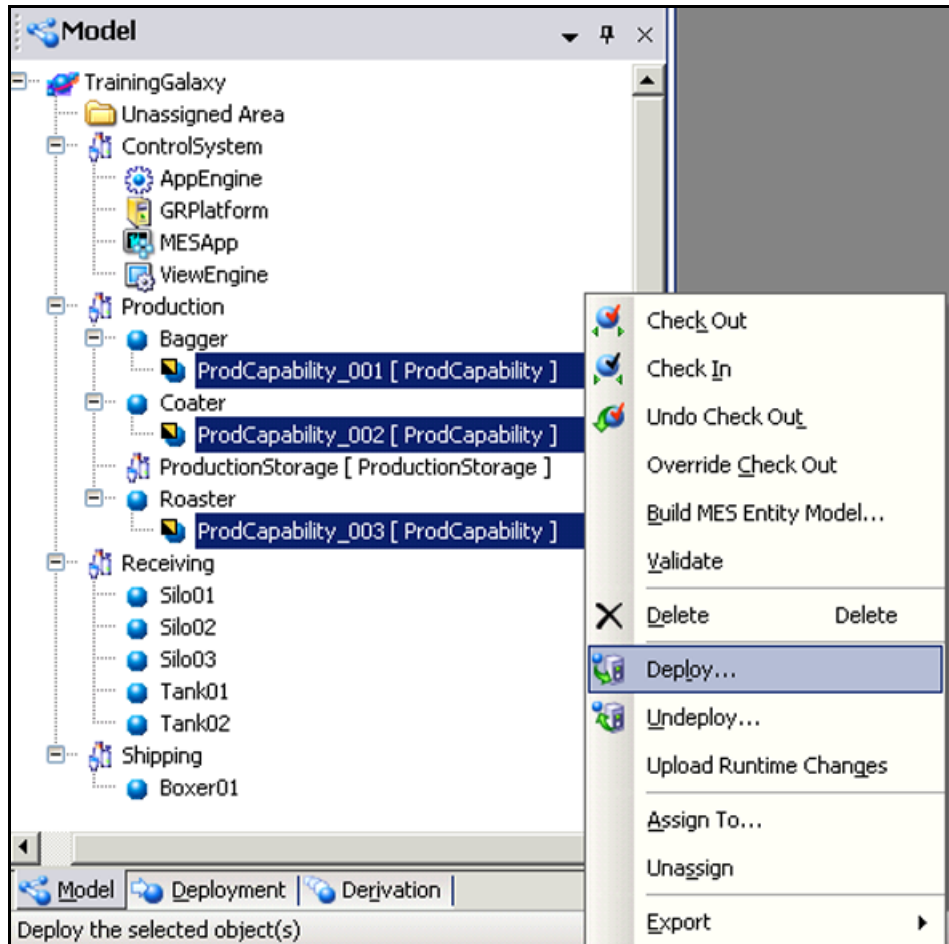
☐ Push Production Counts Upon Reset

Note: In a production environment, the value associated with the **Update Interval** attribute might dramatically impact the performance of your application. Therefore, if you change this value to less than one minute, understand its impact on your application. For training purposes, you will set a value less than one minute.

8. Save and close, and then check in the object.

You will now redeploy the objects because a new production counter has been added. However, you do not need to resynchronize these objects with the MES database. This is because resynchronization is required only when you change the capabilities of the object or any configuration attributes related to the capabilities.

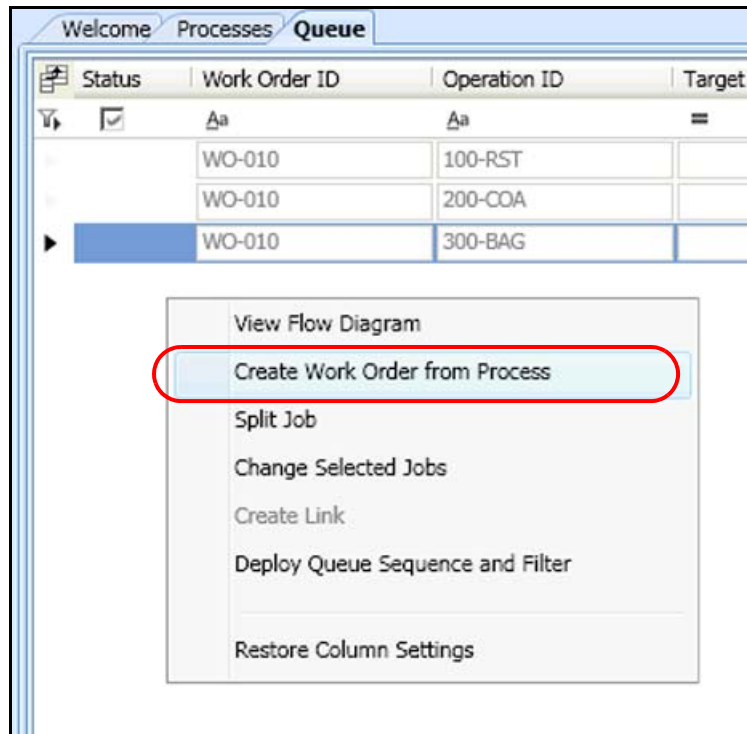
9. In the Model view, redeploy the **Roaster**, **Coater**, and **Bagger** production capability objects.



Create a Work Order from Process

Now, you will create a work order in Wonderware MES Client. This work order will then be used to track normal and rejected production in runtime.

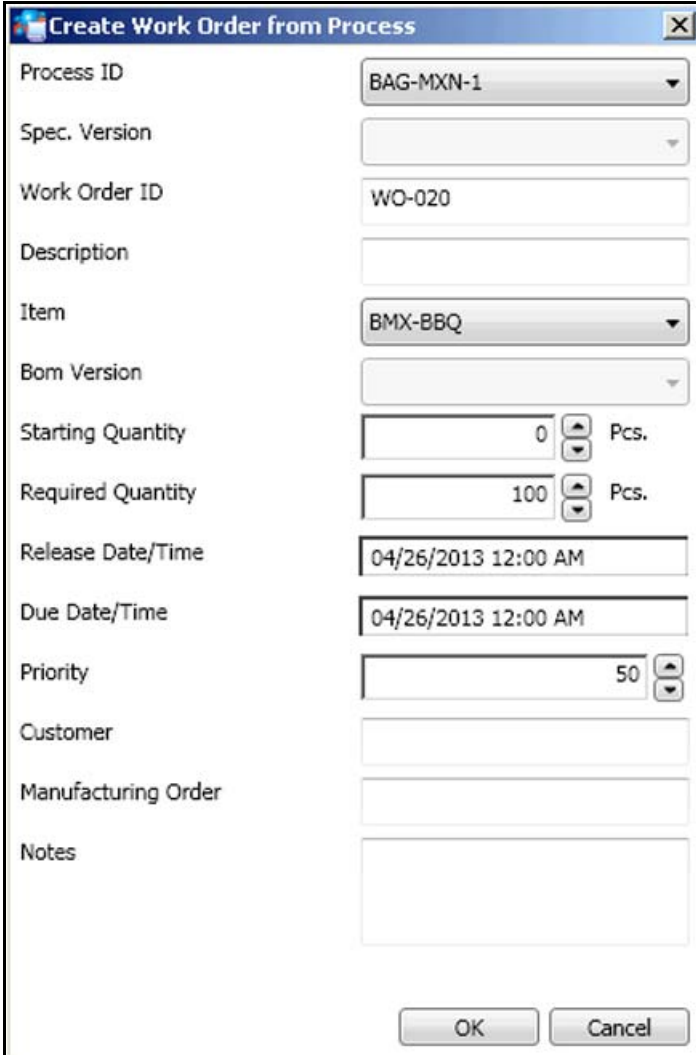
10. In the Wonderware MES Client, on the **Queue** tab, right-click the empty workspace and select **Create Work Order from Process**.



4-12 Module 4 – More on the Operations Model

11. In the **Create Work Order from Process** dialog box, configure the work order as follows:

Process ID: BAG-MXN-1
Work Order ID: WO-020
Description: <enter a description>
Required Quantity: 100



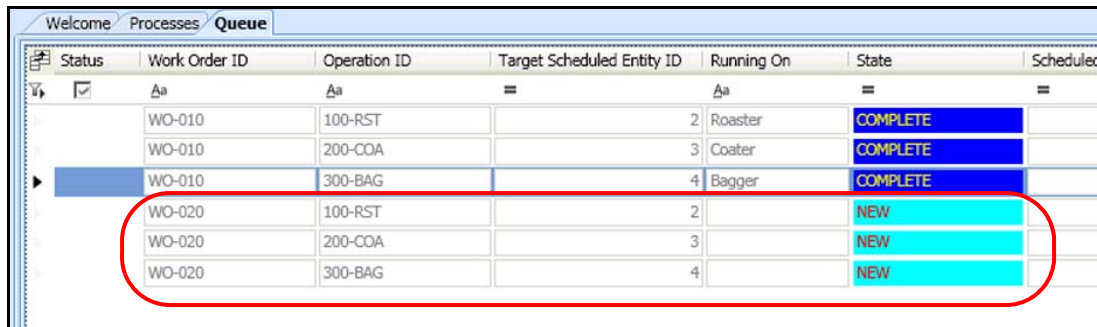
The screenshot shows the 'Create Work Order from Process' dialog box with the following values:

Field	Value
Process ID	BAG-MXN-1
Spec. Version	
Work Order ID	WO-020
Description	
Item	BMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	100 Pcs.
Release Date/Time	04/26/2013 12:00 AM
Due Date/Time	04/26/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

Buttons: OK, Cancel

12. Click **OK**.

After a moment, the three jobs related to the newly created work order appear on the **Queue** tab. These jobs are ready to be run.



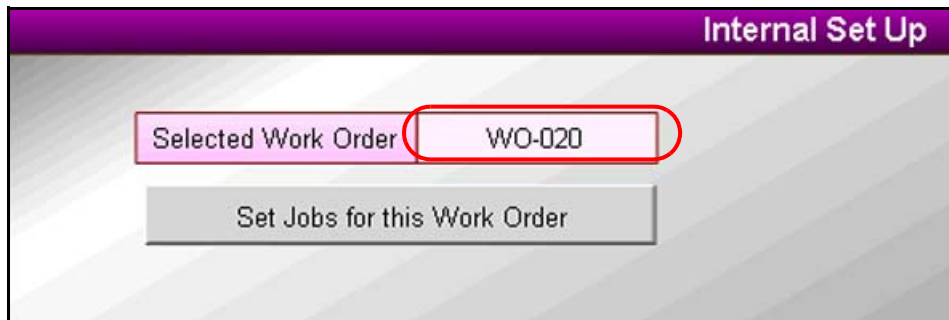
Status	Work Order ID	Operation ID	Target Scheduled Entity ID	Running On	State	Scheduled
	WO-010	100-RST	2	Roaster	COMPLETE	
	WO-010	200-COA	3	Coater	COMPLETE	
	WO-010	300-BAG	4	Bagger	COMPLETE	
	WO-020	100-RST	2		NEW	
	WO-020	200-COA	3		NEW	
	WO-020	300-BAG	4		NEW	

13. Close the **Queue** tab.

Run the Work Order Using the InTouch Application

You will now run the work order to track normal and rejected production in runtime.

14. In WindowViewer, ensure that the **Production** window is displayed.
15. In the **Internal Set Up** panel, **Selected Work Order** field, enter **WO-020**.



Internal Set Up

Selected Work Order: WO-020

Set Jobs for this Work Order

16. Click **Set Jobs for this Work Order**.

Now, you will enable appropriate options to report rejected production and lots associated with a work order in the InTouch application.

17. In the bottom-right of the window, **Enable Options** panel, check the **BAD Counter** check box.



To the right of the **GOOD Prod Counter** panel, the **BAD Prod Counter** panel appears.



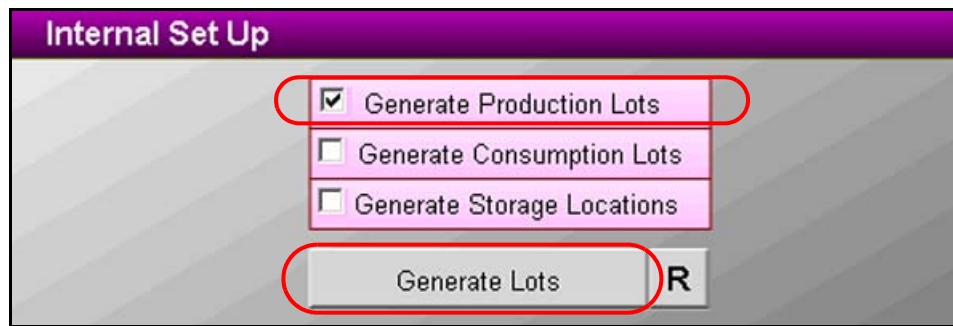
This panel does not have a **Cmd** button because this is a rolling counter. The quantity entered in the **BAD Prod Counter** panel will automatically get updated as bad production in the application.

18. In the **Enable Options** panel, check the **Lots** check box.



The **Lot** fields appear in the production counter panels.

19. In the **Internal Set Up** panel, check the **Generate Production Lots** check box, and then click the **Generate Lots** button.




This allows you to automatically generate production lots for all operations.

4-16 Module 4 – More on the Operations Model

You will now run the roasting job.

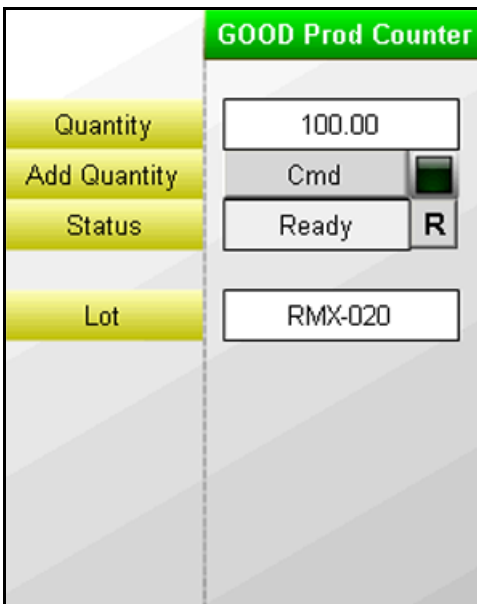
20. Ensure that the **Roaster** entity is selected.

21. In the **Roaster - Job Commands** panel, **Start Job** field, click the **Cmd** button.



The screenshot shows the 'Roaster - Job Commands' panel. It has a blue header. Below the header, there are three input fields: 'Work Order' with value 'WO-020', 'Operation' with value '100-RST', and 'Sequence No' with value '0'. Below these are four rows of buttons. The first row is 'Start Job' with a 'Cmd' button circled in red and a green indicator light. The second row is 'End Job' with a 'Cmd' button and a green indicator light. The third row is 'Pause Job' with a 'Cmd' button and a green indicator light. The fourth row is 'Status' with a 'Ready' button and a red 'R' indicator light.

22. In the **GOOD Prod Counter** panel, **Quantity** field, enter **100.00**, and then click **Cmd**.



The screenshot shows the 'GOOD Prod Counter' panel. It has a green header. Below the header, there are four input fields: 'Quantity' with value '100.00', 'Add Quantity' with a 'Cmd' button and a green indicator light, 'Status' with a 'Ready' button and a red 'R' indicator light, and 'Lot' with value 'RMX-020'.

This reports good production against the roasting job.

In the **Currently Running Job** panel, the **Total Good Prod** field gets updated.

Currently Running Job	
Work Order	WO-020
Operation	100-RST
Sequence No	0
Item ID	BMX-BBQ
Required Qty	100.00
Start Qty	100.00
Total Good Prod	100.00
Total Bad Prod	0.00

23. In the **BAD Prod Counter** panel, **Quantity** field, enter **5.00** to report bad production.

BAD Prod Counter	
5.00	+
Ready	R
BAD-RMX-020	

In the **Currently Running Job** panel, the **Total Bad Prod** field gets updated automatically.

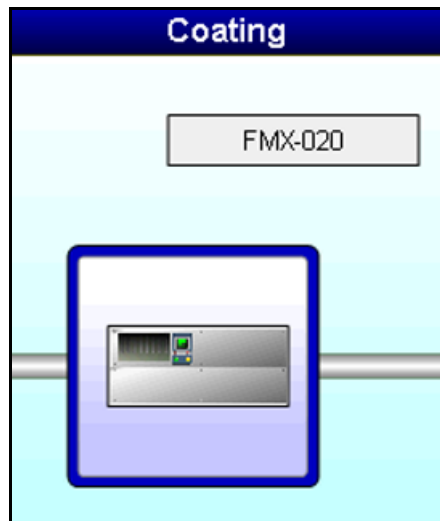
Currently Running Job	
Work Order	WO-020
Operation	100-RST
Sequence No	0
Item ID	BMX-BBQ
Required Qty	100.00
Start Qty	100.00
Total Good Prod	100.00
Total Bad Prod	5.00

24. In the **Roaster - Job Commands** panel, **End Job** field, click **Cmd** to end the roasting job.

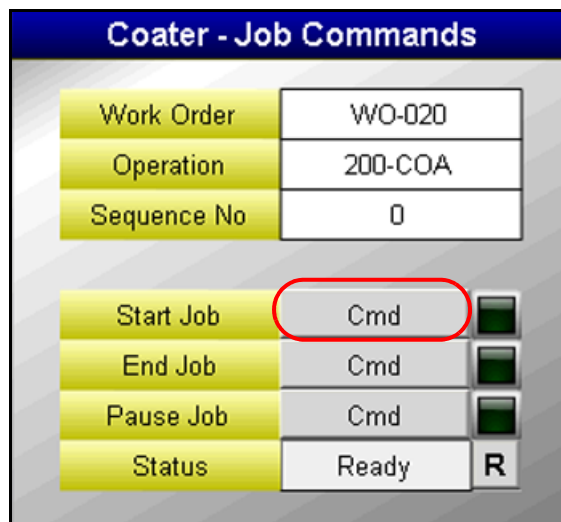
Roaster - Job Commands		
Work Order	WO-020	
Operation	100-RST	
Sequence No	0	
Start Job	Cmd	<input type="checkbox"/>
End Job	Cmd	<input type="checkbox"/>
Pause Job	Cmd	<input type="checkbox"/>
Status	Ready	R

You will now run the coating job.

25. In the **Coating** panel, click the **Coater** entity.



26. In the **Coater - Job Commands** panel, **Start Job** field, click **Cmd** to start the coating job.



27. In the **GOOD Prod Counter** panel, report **88.00** units of good production, and in the **BAD Prod Counter** panel, report **12.00** units of bad production.

GOOD Prod Counter	BAD Prod Counter
<input type="text" value="88.00"/>	<input type="text" value="12.00"/> <input type="button" value="+"/> <input type="button" value="S"/> <input type="button" value="⏻"/>
<input type="button" value="Cmd"/> <input type="button" value="⏻"/>	
<input type="button" value="Ready"/> <input type="button" value="R"/>	<input type="button" value="Ready"/> <input type="button" value="R"/>
<input type="text" value="FMX-020"/>	<input type="text" value="BAD-FMX-020"/>

In the **Currently Running Job** panel, the total good production and total bad production values are updated.

Currently Running Job	
Work Order	WO-020
Operation	200-COA
Sequence No	0
Item ID	BMX-BBQ
Required Qty	100.00
Start Qty	100.00
Total Good Prod	88.00
Total Bad Prod	12.00

28. In the **Coater - Job Commands** panel, **End Job** field, click **Cmd** to end the coating job.

Now, you will run the bagging job.

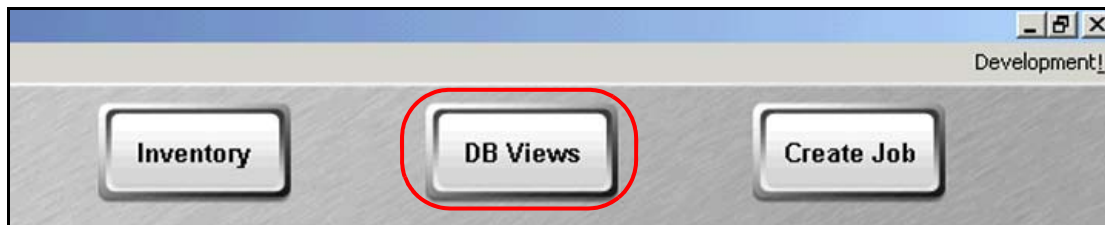
29. Repeat Steps 25 through 28 to run the bagging job and report **81.00** units of good production and **7.00** units of bad production.

Note: Do not forget to end the bagging job.

View Production Reports Using DB Views

Now, you will view production reports using **DB Views** in WindowViewer.

30. On the WindowViewer **Navigation Bar**, click **DB Views**.



31. On the right side of the window, click the **Production Data** button.



4-22 Module 4 – More on the Operations Model

The production data appear in the window.

Drag a column header here to group by that column.										
wo_id	oper_id	seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id
WO-010	100-RST	0	Roaster	100	✓	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods
WO-010	200-COA	0	Coater	100	✓	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods
WO-010	300-BAG	0	Bagger	100	✓	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods
WO-020	100-RST	0	Roaster	100	✓	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods
WO-020	100-RST	0	Roaster	5	□	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods
WO-020	200-COA	0	Coater	12	□	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods
WO-020	200-COA	0	Coater	88	✓	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods
WO-020	300-BAG	0	Bagger	81	✓	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods
WO-020	300-BAG	0	Bagger	7	□	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods

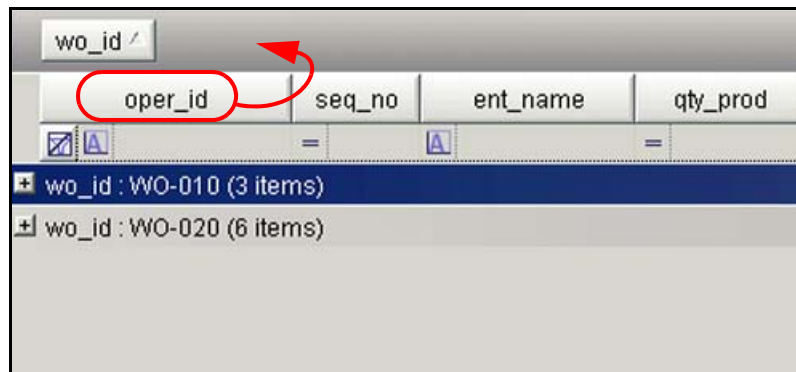
32. Drag **wo_id** onto the grouping area to organize the view.

wo_id here to group by that column.					
wo_id	oper_id	seq_no	ent_name	qty_prod	
WO-010	100-RST	0	Roaster	100	
WO-010	200-COA	0	Coater	100	
WO-010	300-BAG	0	Bagger	100	
WO-020	100-RST	0	Roaster	100	
WO-020	100-RST	0	Roaster	5	
WO-020	200-COA	0	Coater	12	
WO-020	200-COA	0	Coater	88	
WO-020	300-BAG	0	Bagger	81	
WO-020	300-BAG	0	Bagger	7	

This will help you group your view by work order.

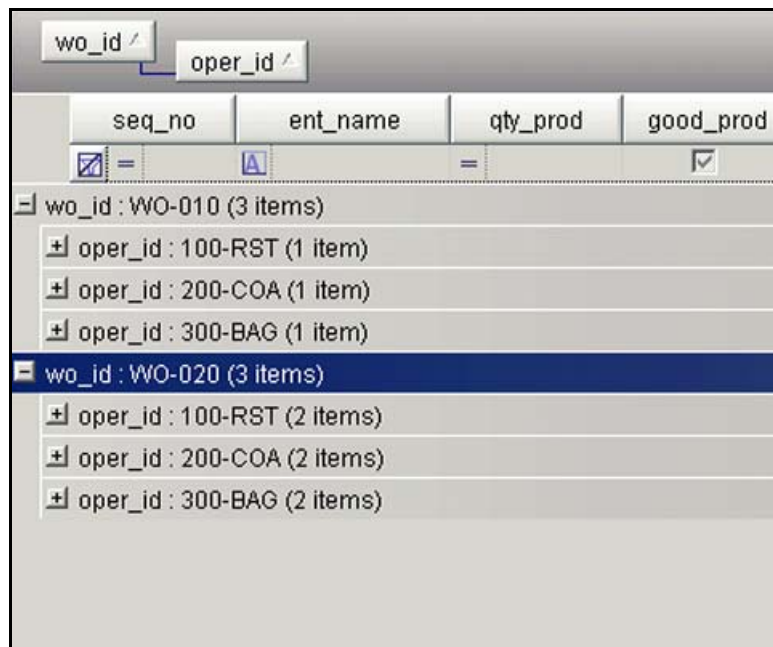
wo_id
oper_id
seq_no
ent_name
wo_id : WO-010 (3 items)
wo_id : WO-020 (6 items)

33. Drag **oper_id** next to **wo_id** on the grouping area.



This will help you group your view by work order and operation.

34. Expand **WO-010** and **WO-020**.



35. Expand the operations to look at the production information for **WO-020**.
36. Verify that you see good and bad production.

wo_id /		oper_id /									
seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent	
<input checked="" type="checkbox"/>	=	<input type="text" value="A"/>	=	<input checked="" type="checkbox"/>	=	<input type="text" value="A"/>	<input type="text" value="A"/>	<input type="text" value="A"/>	<input type="text" value="A"/>	<input type="text" value="A"/>	<input type="text" value="A"/>
wo_id : WO-010 (3 items)											
oper_id : 100-RST (1 item)											
oper_id : 200-COA (1 item)											
oper_id : 300-BAG (1 item)											
wo_id : WO-020 (3 items)											
oper_id : 100-RST (2 items)											
seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent	
0	Roaster	100	<input checked="" type="checkbox"/>	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	RMX-020		
0	Roaster	5	<input type="checkbox"/>	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	BAD-RMX-020		
oper_id : 200-COA (2 items)											
seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent	
0	Coater	12	<input type="checkbox"/>	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	BAD-FMX-020		
0	Coater	98	<input checked="" type="checkbox"/>	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	FMX-020		
oper_id : 300-BAG (2 items)											
seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent	
0	Bagger	81	<input checked="" type="checkbox"/>	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	BMX-020		
0	Bagger	7	<input type="checkbox"/>	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	BAD-BMX-020		

Bad production is noted by the absence of a check mark in the **good_prod** column. You can also view the descriptions displayed in the **reas_desc** column.

Section 2 – Storage Capability

This section discusses storage capability in the Operations Capability Object.

Overview

You can configure an entity to store items through the Operations Capability Object. Whenever you execute a job, items are produced and consumed in the process. You can specify the location to store items that are produced or consumed while executing a job.

To enable storage capability, select the **Entity Can Store Items** check box in the **General** tab. This check box will also display the **Storage Execution** tab.

You can configure the storage execution options for an entity that is used to store multiple items and lots. You can also configure the initial status of an entity, which indicates whether the entity is available to store items.

Specifying Default Storage Entities

A storage entity is used to store items that are produced or consumed while executing a job. You can specify the default storage entities for good production, rejected production, and consumed items when jobs are executed.

Entities must exist with the option for storage before these fields can be set. Generally this means that the **Entity Model Builder** must have been run once to populate the MES database with the entities that have the storage option set. These are default settings stored with the entity and can be overridden at runtime during execution of the job.

When you run the **Entity Model Builder**, entities for which the **Entity Can Store Items** option is enabled in the **General** tab, the **Entity Model Builder** creates a new default storage entity or updates the existing storage entity settings. You can configure the following default storage entities in this tab:

Default Storage Entity for Good Production

When a production request is made with a production quality of “good,” and if the production request does not contain a storage location identifying where the production item to be stored, then the default storage location configured for the entity is used to store the production item. This default storage location is used in the following scenarios:

- A storage location is not specified while adding good production recorded by production counters in the Operations Capability Object or an operator.
- A storage location is not configured to log good production for a job on an entity.

Default Storage Entity for Reject Production

When a production request is made with a production quality of “bad,” and if the production request does not contain a storage location identifying where the production item to be stored, then the default storage location configured for the entity is used to store the production item.

This default storage location is used in the following scenarios:

- A storage location is not specified while adding rejected production recorded by production counters in the Operations Capability Object or an operator.
- A storage location is not configured to log rejected production for a job on an entity.

Default Storage Entity to Consume Items

When a consumption request is made without identifying storage location from where the items can be consumed, then the default storage location configured for the entity is used to consume the items from this location.

This default storage location is used in the following scenarios:

- A storage location to consume items is not specified while adding consumption recorded by consumption counters in the Operations Capability Object or an operator.
- A storage location is not configured to log consumption for a job on an entity.

Lab 7 – Tracking Storage Locations

Introduction

In this lab, you will define the storage location for production entities using the Operations Capability Object. This will specify where the production will be sent when it is reported in runtime. To define locations, you will enable the storage capability for Operations Capability objects in the **Production** and **Receiving** areas. Then, you will create a work order and track it in the InTouch application.

Objectives

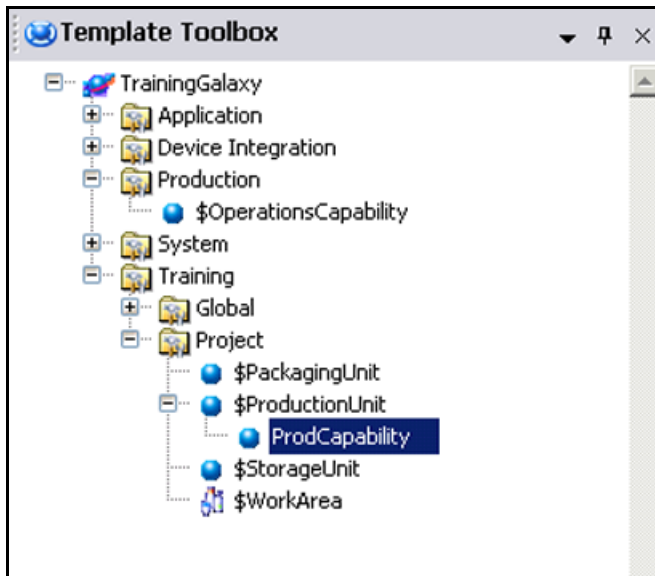
Upon completion of this lab, you will be able to:

- Define storage locations for production entities
- Track storage locations when reporting production in runtime

Enable the Storage Capability for Entities

You will use the MES Entity Model Builder to define the storage location.

1. In the ArchestrA IDE, **Template Toolbox**, double-click **\$ProductionUnit.ProdCapability**.



2. On the **General** tab, in the **Miscellaneous** area, check **Entity Can Store Items** and lock it.

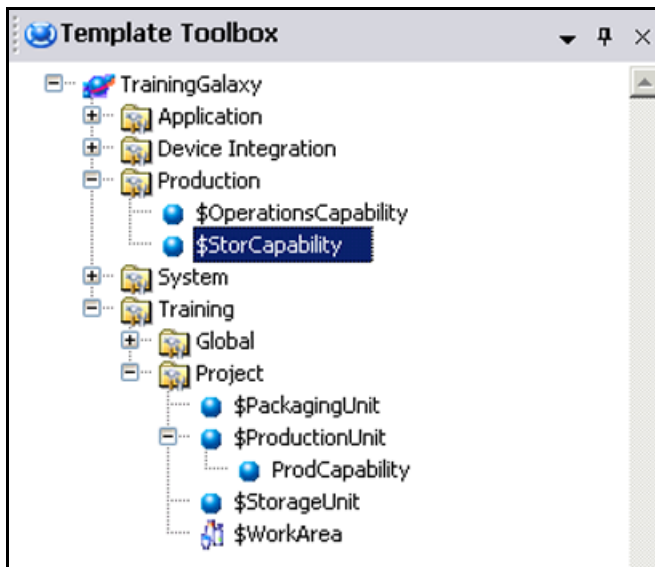
The screenshot shows the configuration window for **\$ProductionUnit.ProdCapability ***. The **General** tab is selected. The **Miscellaneous** section is expanded, and the **Entity Can Store Items** checkbox is checked and highlighted with a red circle. The lock icon next to it is a closed padlock, indicating it is locked. Other options in the Miscellaneous section include **Entity Can Schedule Jobs** (checked, locked), **Enable Specifications** (unchecked, unlocked), and **Enable PEM Attributes** (unchecked, unlocked). The **Job Execution** section is also visible, with **Entity Can Run Jobs** (checked, locked), **Enable Create Job Attributes** (unchecked, unlocked), **Enable Production Counters** (checked, locked), and **Enable Consumption Counters** (unchecked, unlocked). The **Event Settings** section shows **ResponseType** set to **With Response** (locked).

Section	Option	Checked	Locked
Job Execution	Entity Can Run Jobs	Yes	Yes
	Enable Create Job Attributes	No	No
	Enable Production Counters	Yes	Yes
	Enable Consumption Counters	No	No
Miscellaneous	Entity Can Store Items	Yes	Yes
	Entity Can Schedule Jobs	Yes	Yes
	Enable Specifications	No	No
	Enable PEM Attributes	No	No
Event Settings	ResponseType: With Response	-	Yes

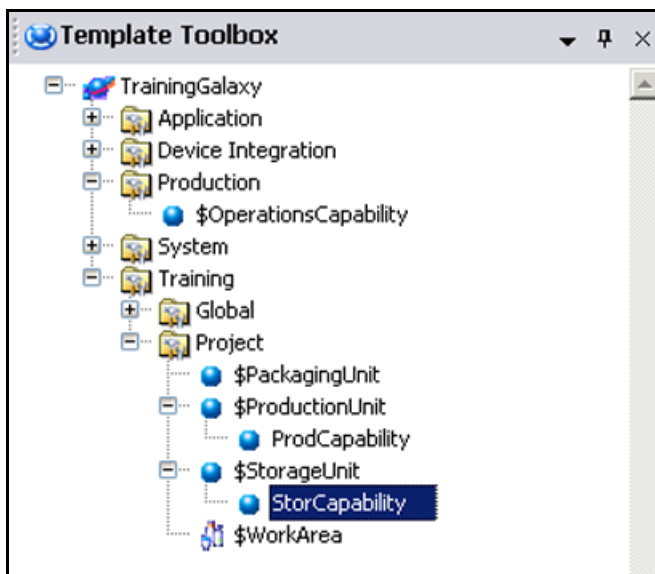
3. Save and close, and then check in the object.

Now, you will create the storage location entities in the **Receiving** and **Production Storage** areas. For this, you will create a new derived template of the Operations Capability Object.

4. In the **Template Toolbox**, right-click **\$OperationsCapability** and click **New | Derived Template**.
5. Rename the object **\$StorCapability**.



6. Drag **\$StorCapability** to **\$StorageUnit**.





7. Double-click **\$StorageUnit.StorCapability** to open the configuration editor.


8. On the **General** tab, in the **Miscellaneous** area, check **Entity Can Store Items** and lock it.


\$StorageUnit.StorCapability *


General | Storage Execution | Inventory Transfer | Object Information | Scripts

Job Execution 


☐ Entity Can Run Jobs 


☐ Enable Create Job Attributes 


☐ Enable Production Counters 


☐ Enable Consumption Counters 


Miscellaneous


☒ Entity Can Store Items 

☐ Entity Can Schedule Jobs 

☐ Enable Specifications 

☐ Enable PEM Attributes 

Event Settings 

ResponseType: 

9. Leave the default value for **ResponseType** and lock the **Event Settings** area.

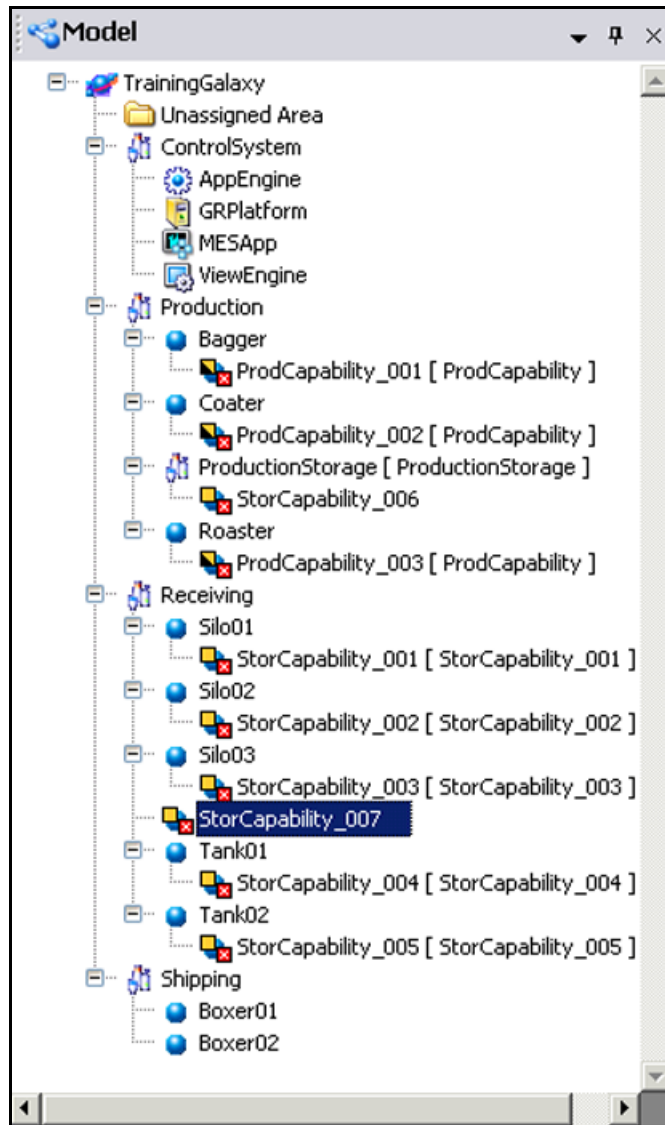
The screenshot shows the configuration window for **\$StorageUnit.StorCapability ***. The window has tabs for **General**, **Storage Execution**, **Inventory Transfer**, **Object Information**, and **Scripts**. The **Storage Execution** tab is active. It contains three sections: **Job Execution**, **Miscellaneous**, and **Event Settings**. The **Event Settings** section is highlighted with a red circle, and the **ResponseType** dropdown menu is also highlighted with a red circle. The **ResponseType** is currently set to **With Response**. The **Event Settings** section is locked, indicated by a padlock icon.

Section	Property	Value	Lock Icon
Job Execution	Entity Can Run Jobs	<input type="checkbox"/>	
	Enable Create Job Attributes	<input type="checkbox"/>	
	Enable Production Counters	<input type="checkbox"/>	
	Enable Consumption Counters	<input type="checkbox"/>	
Miscellaneous	Entity Can Store Items	<input checked="" type="checkbox"/>	
	Entity Can Schedule Jobs	<input type="checkbox"/>	
	Enable Specifications	<input type="checkbox"/>	
	Enable PEM Attributes	<input type="checkbox"/>	
Event Settings	ResponseType	With Response	

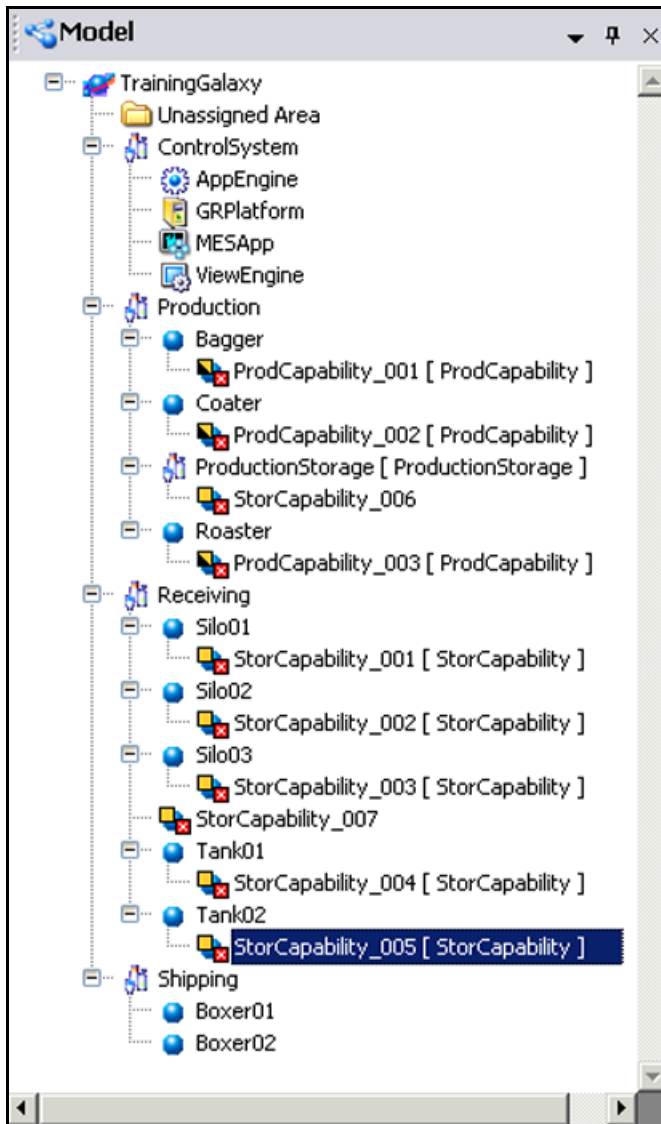
10. Save and close, and then check in the object.

You will now assign instances of **\$StorageUnit.StorCapability** to equipment in the **Receiving** and **ProductionStorage** areas.

11. Create seven instances of **\$StorageUnit.StorCapability** and assign them to **Silo01**, **Silo02**, **Silo03**, **Tank01**, **Tank02**, **ProductionStorage**, and **Receiving**.



12. Change the contained name of the Operations Capability instances contained in **Silo01**, **Silo02**, **Silo03**, **Tank01**, and **Tank02** to **StorCapability**.



This is done to ensure that the hierarchical name of every instance matches with the naming convention already used in the prebuilt InTouch application. You will access only these five instances in the InTouch application.

13. With the **Production** and **Receiving** areas selected, run the **Entity Model Builder**.
14. Deploy the new and modified objects.

Create a Work Order

Now, you will create a work order in Wonderware MES Client.

15. In Wonderware MES Client, on the **Processes** tab, right-click **BAG-MXN-1** and select **Create Work Order**.
16. In the **Create Work Order from Process** dialog box, configure the work order as follows:

Work Order ID: WO-030
Description: <enter a description>
Required Quantity: 100

The screenshot shows the 'Create Work Order from Process' dialog box. The fields are as follows:

Field	Value
Process ID	BAG-MXN-1
Spec. Version	
Work Order ID	WO-030
Description	
Item	BMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	100 Pcs.
Release Date/Time	04/30/2013 12:00 AM
Due Date/Time	04/30/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

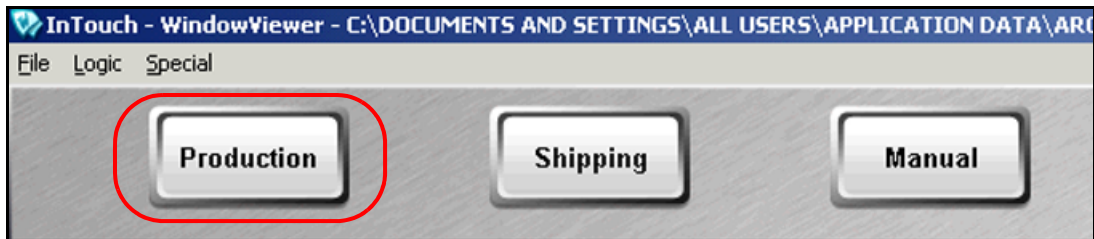
17. Click **OK**.

The three jobs related to the newly created work order are now ready to be run.

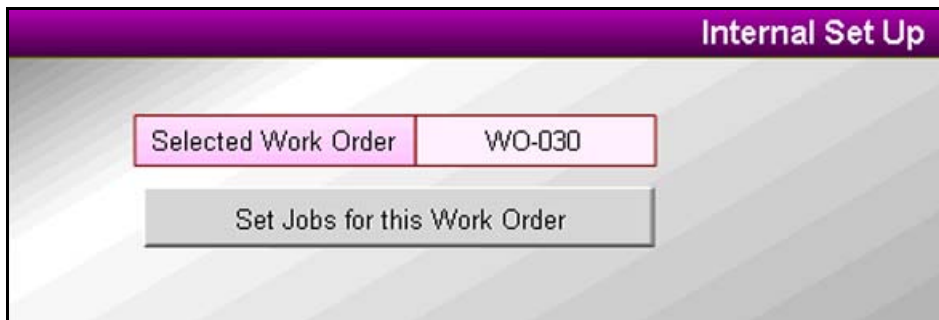
Track the Jobs of the Work Order

You will now track the jobs associated with **WO-030** in runtime. To run these jobs in InTouch, you will ensure that the **Generate Production Lots**, **BAD Counter**, and **Lots** check boxes are checked in the **Production** window.

18. On the WindowViewer **Navigation Bar**, click **Production**.



19. In the **Internal Set Up** panel, **Selected Work Order** field, enter **WO-030** and click **Set Jobs for this Work Order**.



20. Check the **Generate Storage Locations** check box and click **Generate Lots**.



21. In the **Enable Options** panel, check the **Storage Locations** check box.

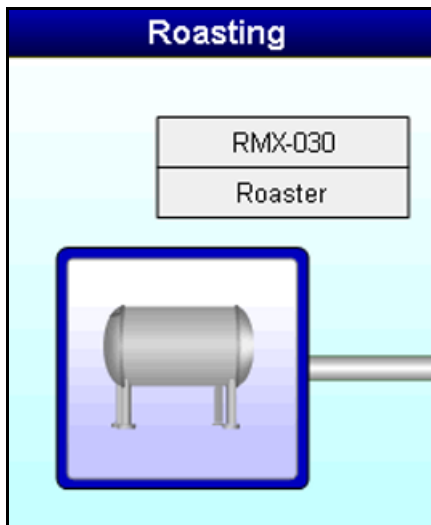


The location that will be used when reporting production for an entity appears.

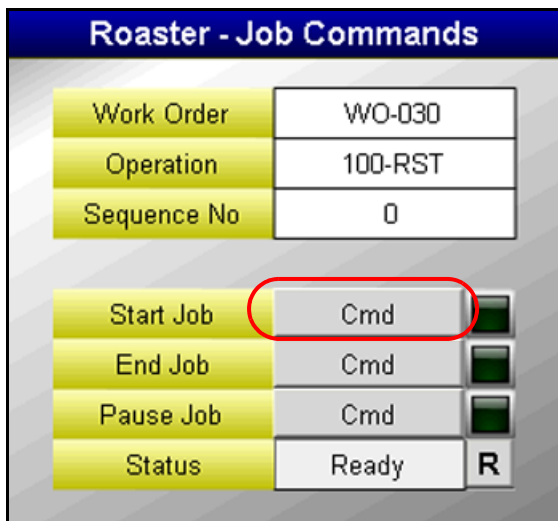
	GOOD Prod Counter	BAD Prod Counter
Quantity	0.00	0.00 + S
Add Quantity	Cmd	
Status	Ready R	Ready R
Lot	RMX-030	BAD-RMX-030
Location	Roaster	Roaster

Now, you will start running the roasting job.

22. In the **Roasting** panel, ensure that the **Roaster** entity is selected.



23. In the **Roaster - Job Commands** panel, **Start Job** field, click the **Cmd** button to start the roasting job.



Now, you will perform steps to view the result if you produce more than the required quantity.

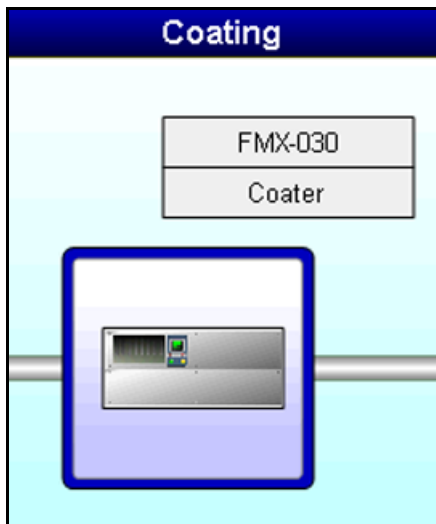
24. In the **GOOD Prod Counter** panel, **Quantity** field, enter **120.00** and click the **Cmd** button.

GOOD Prod Counter	
Quantity	120.00
Add Quantity	Cmd
Status	Ready R
Lot	RMX-030
Location	Roaster

25. In the **Roaster - Job Commands** panel, **End Job** field, click the **Cmd** button to end the roasting job.

Roaster - Job Commands	
Work Order	WO-030
Operation	100-RST
Sequence No	0
Start Job	Cmd
End Job	Cmd
Pause Job	Cmd
Status	Ready R

26. In the **Coating** panel, click the **Coater** entity.



27. In the **Coater - Job Commands** panel, **Start Job** field, click the **Cmd** button to start the coating job.



Notice that in the **Currently Running Job** panel, the **Start Qty** field now displays **120.00**. This is because 100 percent of the output from the roasting operation has been allocated to the coating operation.

Currently Running Job	
Work Order	WO-030
Operation	200-COA
Sequence No	0
Item ID	BMX-BBQ
Required Qty	100.00
Start Qty	120.00
Total Good Prod	0.00
Total Bad Prod	0.00

28. In the **GOOD Prod Counter** panel, **Quantity** field, enter **110.00** and click the **Cmd** button.

GOOD Prod Counter	
Quantity	110.00
Add Quantity	Cmd <input type="button" value="R"/>
Status	Ready <input type="button" value="R"/>
Lot	FMX-030
Location	Coater

29. In the **BAD Prod Counter** panel, **Quantity** field, enter **10.00**.

After a few moments, the **Currently Running Job** panel is updated. The value in the **Total Good Prod** field becomes **110.00**, and the value in the **Total Bad Prod** field becomes **10.00**.

30. In the **Coater - Job Commands** panel, **End Job** field, click the **Cmd** button.
 31. In the **Bagging** panel, click the **Bagger** entity.
 32. In the **Bagger - Job Commands** panel, **Start Job** field, click the **Cmd** button.
 In the **Currently Running Job** panel, the **Start Qty** field displays **110.00**.

Currently Running Job	
Work Order	WO-030
Operation	300-BAG
Sequence No	0
Item ID	BMX-BBQ
Required Qty	100.00
Start Qty	110.00
Total Good Prod	0.00
Total Bad Prod	0.00

33. In the **GOOD Prod Counter** panel, **Quantity** field, enter **110.00** and click the **Cmd** button.
 34. In the **Bagger - Job Commands** panel, **End Job** field, click the **Cmd** button.

View Production Reports Using DB Views

You will now view the production reports using the **DB Views** window.

35. On the **Navigation Bar**, click **DB Views**.



36. Click **Production Data**.



37. Drag **wo_id** and **oper_id** onto the grouping area to organize the view.

seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id
wo_id : WO-010 (3 items)					
wo_id : WO-020 (3 items)					
wo_id : WO-030 (3 items)					

38. Expand **WO-030** and expand the **100-RST** operation.

The report displays the quantity, the lot number, and the entity name to which the production goes for this operation. The production record also displays information about the storage locations used in each operation.

seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent
wo_id : WO-010 (3 items)										
wo_id : WO-020 (3 items)										
wo_id : WO-030 (3 items)										
oper_id : 100-RST (1 item)										
0	Roaster	120	100	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	RMX-030	Roaster
oper_id : 200-COA (2 items)										
oper_id : 300-BAG (1 item)										

39. Expand the **200-COA** operation.

For this operation, you reported good and bad productions. Therefore, the report displays the details of both.

seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent
wo_id : WO-010 (3 items)										
wo_id : WO-020 (3 items)										
wo_id : WO-030 (3 items)										
oper_id : 100-RST (1 item)										
0	Roaster	120	100	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	RMX-030	Roaster
oper_id : 200-COA (2 items)										
0	Coater	110	100	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	FMX-030	Coater
0	Coater	10	100	100	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	BAD-FMX-030	Coater
oper_id : 300-BAG (1 item)										

Section 3 – Bill of Materials

This section discusses bill of materials, consumption counters, and product genealogy.

Overview

A Bill of Material (BOM) contains the basic information and production details for BOM version. A BOM item represents any component or by-product of the production of parent item. These components and by-products must be defined as an item and assigned to an item to be a part of the BOM.

A BOM version specifies the components that are consumed to produce the parent item, any by-products of that production, and default values for several production settings. BOM item adds production-specific details for usage of the item in the current BOM version.

An item can contain multiple BOM versions, but you can define only one version as the preferred version. The preferred BOM version is used automatically whenever a process is defined to produce the parent item.

A BOM is created in the Wonderware MES Client, **Order Management** group, under the **Items** module. After selecting the item, a section in the **Properties** window is enabled, and a button called **Configure BOMs** opens for you to configure one or more BOM versions for the item.

Consumption Counters

Consumption counters are used to track the consumption of material for an entity. To view the **Consumption Counters** tab, select the **Entity Can Run Jobs** and **Enable Consumption Counters** check boxes in the **General** tab of the Operations Capability Object.

You can configure up to 20 consumption counters for an entity in the **Consumption Counters** tab of the Operations Capability Object. When you configure multiple consumption counters for an Operations Capability Object instance, all the job positions contain the same number of consumption counters at runtime.

Product Genealogy

Product genealogy refers to the process of tracking and recording changes made in every component used and created as they progress through a supply chain. This process is also known as traceability. Wonderware MES Software/Operations allows you to track and trace all products and by-products throughout an entire production cycle.

A manufacturing company must record the production process details to track the production status at any instant. Genealogy allows you to trace the complete history of any material lot (produced or consumed) that is managed by Wonderware MES Software/Operations. You can use genealogy to trace the origins of a contaminated or defective end product. You can use genealogy to:

- Track materials that are produced back to all the raw and intermediate materials used for production (genealogy). For example, this can be used to track the origins of contaminated or defective end products.
- Track the raw material or intermediate material to all materials that are produced using them (reverse genealogy). For example, this can be used to track the extent of contaminated or defective end products if the raw material is known to be contaminated.

Lab 8 – Defining a Bill of Materials

Introduction

In this lab, you will use Wonderware MES Client to define a Bill of Materials (BOM) for items in the production process of the mixed nut factory.

These BOMs will define the consumptions and productions required to make bags of flavored mixed nuts, using the process you have defined so far. Then, you will assign these BOMs to the three operations in the production process of the mixed nut factory.

Objectives

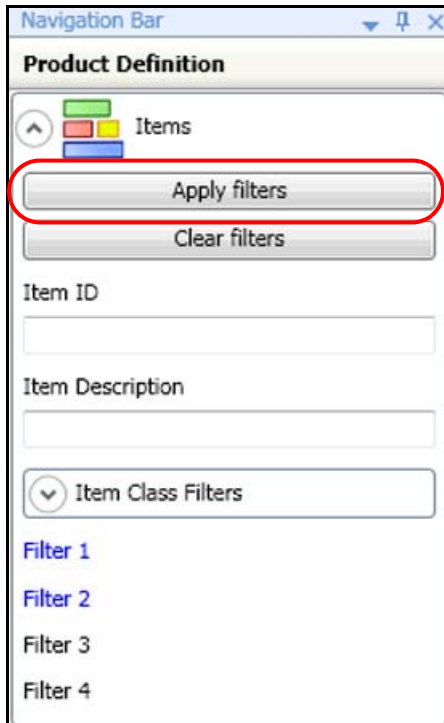
Upon completion of this lab, you will be able to:

- Create and configure BOMs for operations in a process
- Assign BOMs to different operations in a process

Define a BOM for the Flavored Mixed Nuts Finished Product

You will use Wonderware MES Client to configure a BOM for the bags of BBQ flavored mixed nuts, **BMX-BBQ**.

1. In the Wonderware MES Client, **Product Definition** group, **Items** module, click **Apply filters**.

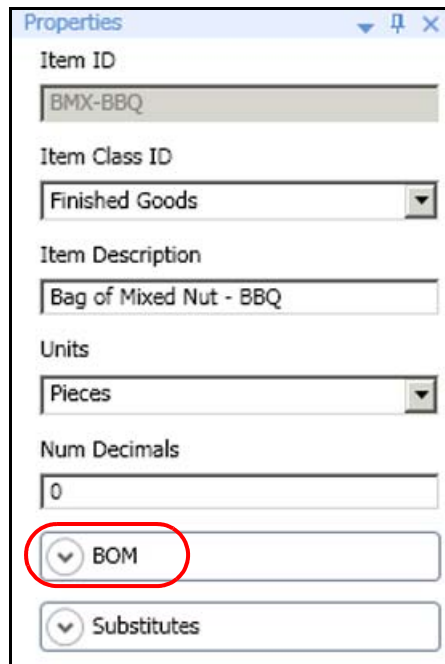


2. On the **Items** tab, click the **BMX-BBQ** item.

The screenshot shows the 'Items' table with the following data:

Status	Item ID	Item Description	Item Class ID	Units	Num Decimals	Lifetime
	AMD-BLK	Almonds Bulk	Raw Materials	Pounds		3
	BAG-BBQ	BBQ Mixed Nut - Empty	Raw Materials	Pieces		0
	BBQ-FLA	BBQ Flavoring	Raw Materials	Pounds		3
	BMX-BBQ	Bag of Mixed Nut - BBC	Finished Goods	Pieces		0
	CSW-BLK	Cashews Bulk	Raw Materials	Pounds		3
	Example Item	Not a Real Item	Example Item Class	Pieces		0
	FMX-BBQ	Flavored Mixed Nut - B	WIP Materials	Pounds		3
	OIL-LQD	Coating Oil	Raw Materials	Gallons		3
	PNT-BLK	Peanuts Bulk	Raw Materials	Pounds		3
	RMX-BLK	Roasted Mixed Nut	WIP Materials	Pounds		3

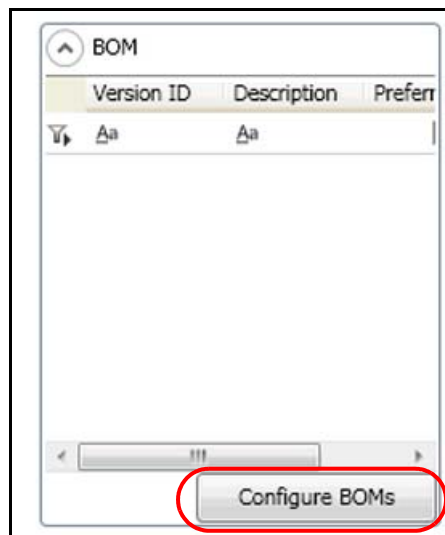
3. In the **Properties** pane, expand the **BOM** section.



The screenshot shows a 'Properties' window with several fields. The 'BOM' section is expanded, indicated by a red circle around the 'BOM' label. The fields are as follows:

Field	Value
Item ID	BMX-BBQ
Item Class ID	Finished Goods
Item Description	Bag of Mixed Nut - BBQ
Units	Pieces
Num Decimals	0
BOM	Expanded
Substitutes	Collapsed

4. In the **BOM** section, click **Configure BOMs**.

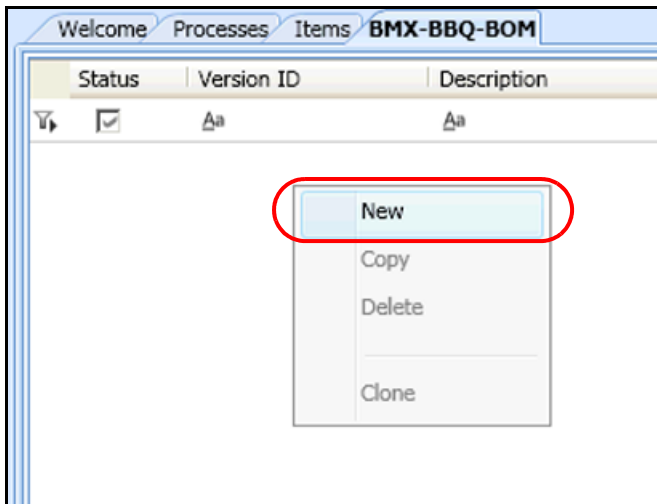


The screenshot shows the 'BOM' section of the Properties window. It contains a table with columns 'Version ID', 'Description', and 'Preferred'. Below the table is a 'Configure BOMs' button, which is highlighted with a red circle.

Version ID	Description	Preferred
------------	-------------	-----------

A new tab appears, which allows you to configure one or more BOMs for items to be produced and consumed.

5. On the **BMX-BBQ-BOM** tab, right-click the empty workspace and select **New** to create the BOM for **BMX-BBQ**.



6. In the **Properties** pane, configure the new BOM as follows:

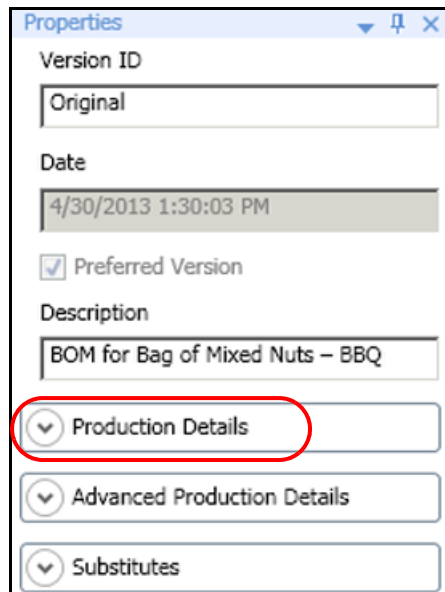
Version ID: Original

Description: BOM for Bag of Mixed Nuts – BBQ

A screenshot of a 'Properties' pane in a software application. The pane contains several fields and sections. The 'Version ID' field is set to 'Original'. The 'Date' field shows '4/30/2013 1:30:03 PM'. The 'Preferred Version' checkbox is checked. The 'Description' field is set to 'BOM for Bag of Mixed Nuts – BBQ'. Below these fields are three expandable sections: 'Production Details', 'Advanced Production Details', and 'Substitutes', each with a downward arrow icon.

This is the first BOM version defined for this item. Therefore, the **Preferred Version** check box is checked by default.

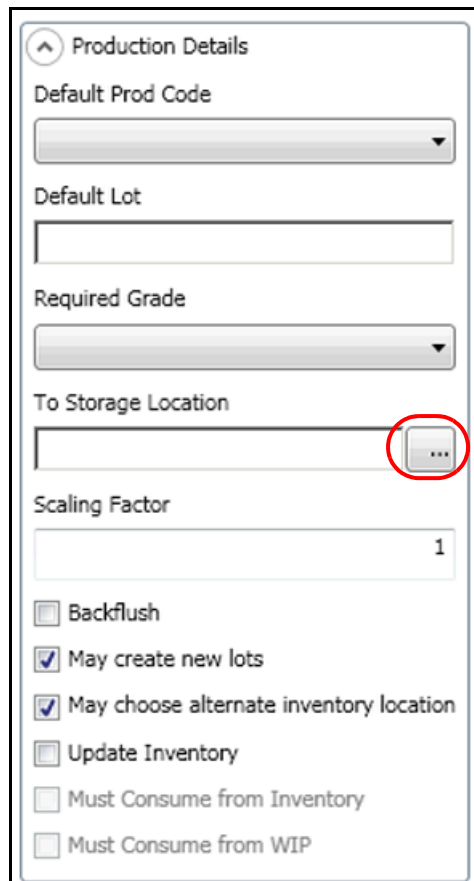
7. In the **Properties** pane, expand the **Production Details** section.



The screenshot shows a 'Properties' dialog box with several fields: 'Version ID' (Original), 'Date' (4/30/2013 1:30:03 PM), 'Preferred Version' (checked), and 'Description' (BOM for Bag of Mixed Nuts – BBQ). Below these are three expandable sections: 'Production Details' (highlighted with a red circle), 'Advanced Production Details', and 'Substitutes'.

This area is used to specify details about how this BOM will produce items.

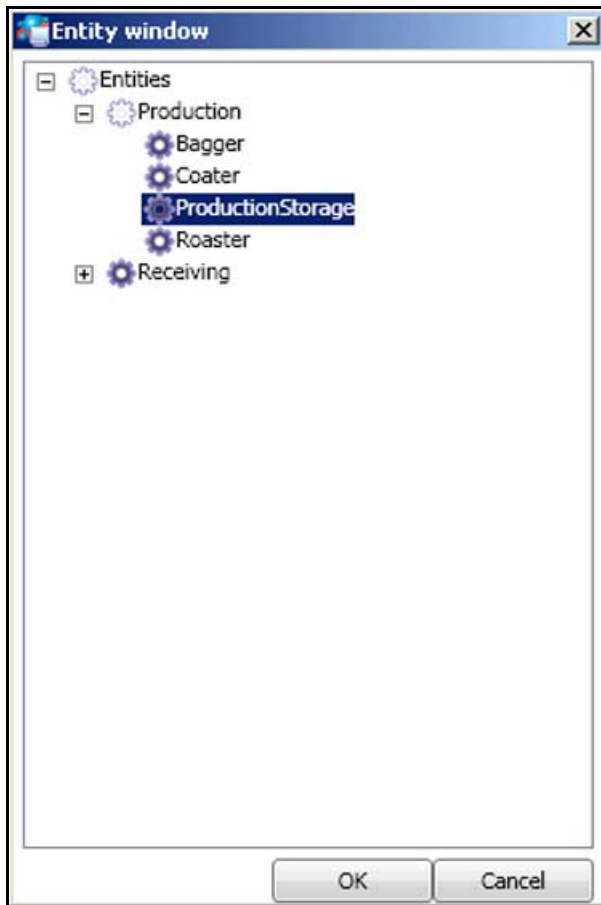
8. In the **Production Details** section, **To Storage Location** field, click the ellipsis button.



The screenshot shows the 'Production Details' section expanded. It contains fields for 'Default Prod Code', 'Default Lot', 'Required Grade', 'To Storage Location' (with an ellipsis button highlighted by a red circle), and 'Scaling Factor' (set to 1). Below these are several checkboxes: 'Backflush' (unchecked), 'May create new lots' (checked), 'May choose alternate inventory location' (checked), 'Update Inventory' (unchecked), 'Must Consume from Inventory' (unchecked), and 'Must Consume from WIP' (unchecked).

The **Entity window** dialog box appears.

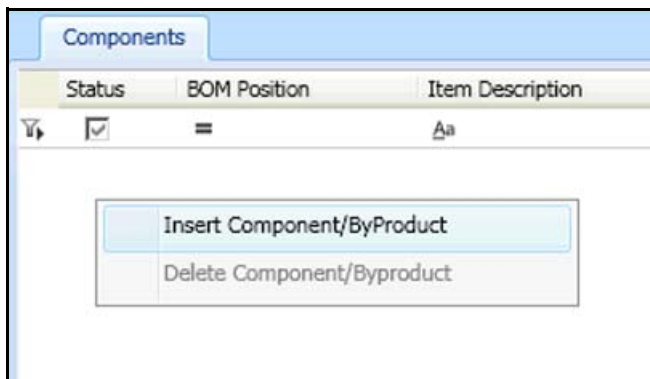
9. In the **Entity window** dialog box, expand **Entities** and **Production**, and then click **ProductionStorage**.



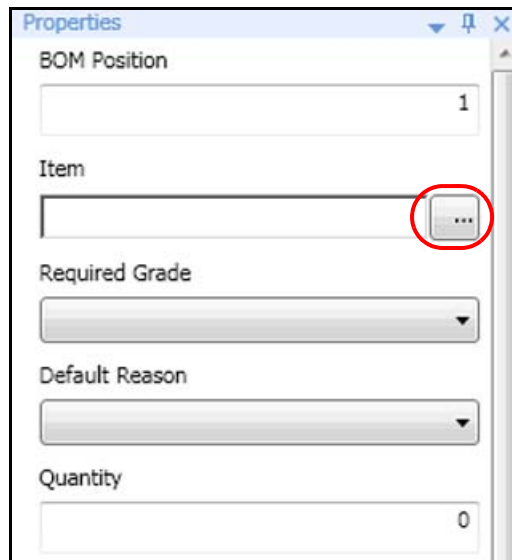
10. Click **OK**.
11. Save all changes.

Now, you will add a component to the BOM created for BMX-BBQ.

12. Towards the bottom of the workspace, on the **Components** tab, right-click the empty workspace and select **Insert Component/ByProduct**.



13. In the **Properties** pane, **Item** field, click the ellipsis button.

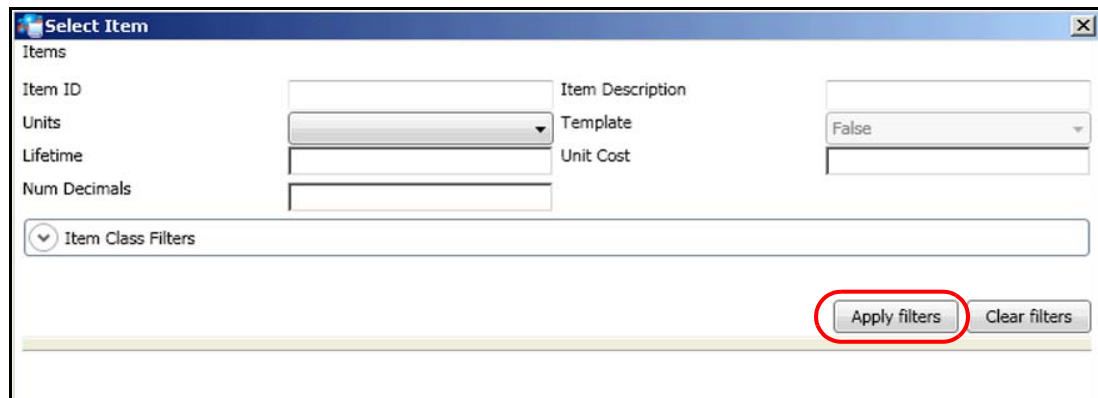


The screenshot shows a 'Properties' dialog box with several fields. The 'Item' field is highlighted with a red circle around its ellipsis button. The other fields are: 'BOM Position' with value '1', 'Required Grade' with a dropdown arrow, 'Default Reason' with a dropdown arrow, and 'Quantity' with value '0'.

The **Select Item** dialog box appears.

Now, you will select the intermediate material, **Flavored Mixed Nut - BBQ**, required for producing the bags of mixed nuts.

14. In the **Select Item** dialog box, click **Apply filters**.



The screenshot shows the 'Select Item' dialog box. It has a header 'Items' and a list of fields: 'Item ID', 'Units', 'Lifetime', 'Num Decimals', 'Item Description', 'Template', and 'Unit Cost'. The 'Template' field is set to 'False'. Below the fields is a section for 'Item Class Filters'. At the bottom right, there are two buttons: 'Apply filters' (circled in red) and 'Clear filters'.

This shows all the items available for consumption in the database.

15. In the **Select Item** column, check the **FMX-BBQ** item.

Select Item

Items

Item ID:

Units:

Lifetime:

Num Decimals:

Item Description:

Template:

Unit Cost:

Item Class Filters:

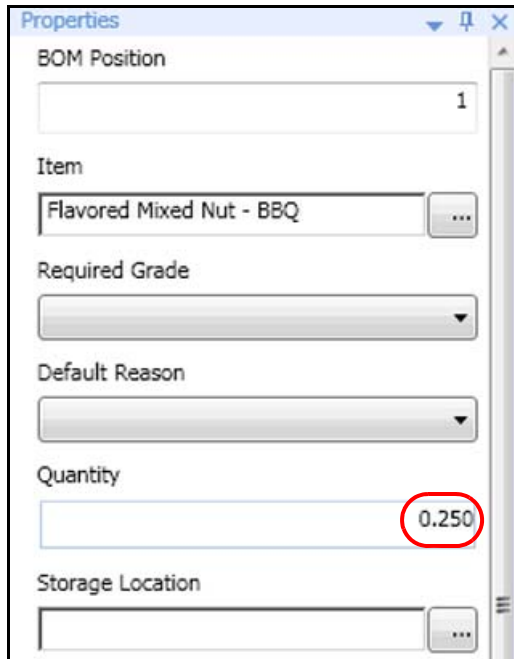
Apply filters Clear filters

Select Item	Item	Item Class
<input type="checkbox"/>	AMD-BLK(Almonds Bulk)	Raw Materials(Raw Materials)
<input type="checkbox"/>	BAG-BBQ(BBQ Mixed Nut - Empty)	Raw Materials(Raw Materials)
<input type="checkbox"/>	BBQ-FLA(BBQ Flavoring)	Raw Materials(Raw Materials)
<input type="checkbox"/>	CSW-BLK(Cashews Bulk)	Raw Materials(Raw Materials)
<input type="checkbox"/>	OIL-LQD(Coating Oil)	Raw Materials(Raw Materials)
<input type="checkbox"/>	PNT-BLK(Peanuts Bulk)	Raw Materials(Raw Materials)
<input checked="" type="checkbox"/>	FMX-BBQ(Flavored Mixed Nut - BBQ)	WIP Materials(Intermediate Materials)
<input type="checkbox"/>	RMX-BLK(Roasted Mixed Nut)	WIP Materials(Intermediate Materials)

OK Cancel

16. Click **OK**.

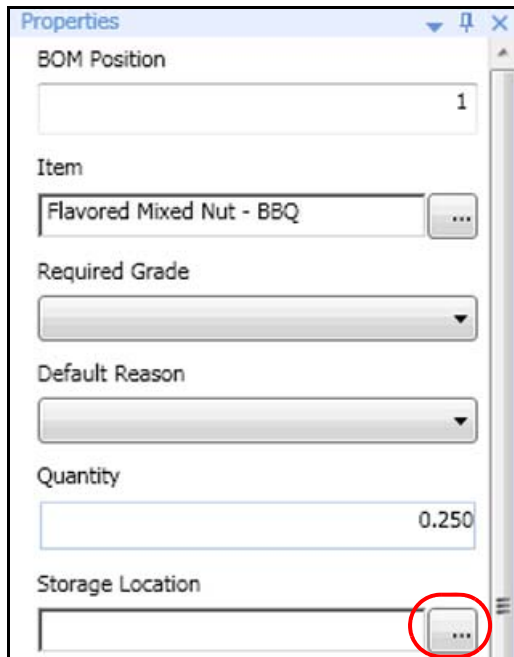
17. In the **Properties** pane, **Quantity** field, enter 0.250.



The screenshot shows a 'Properties' dialog box with the following fields: BOM Position (1), Item (Flavored Mixed Nut - BBQ), Required Grade (dropdown), Default Reason (dropdown), Quantity (0.250), and Storage Location (empty). The 'Quantity' field is circled in red.

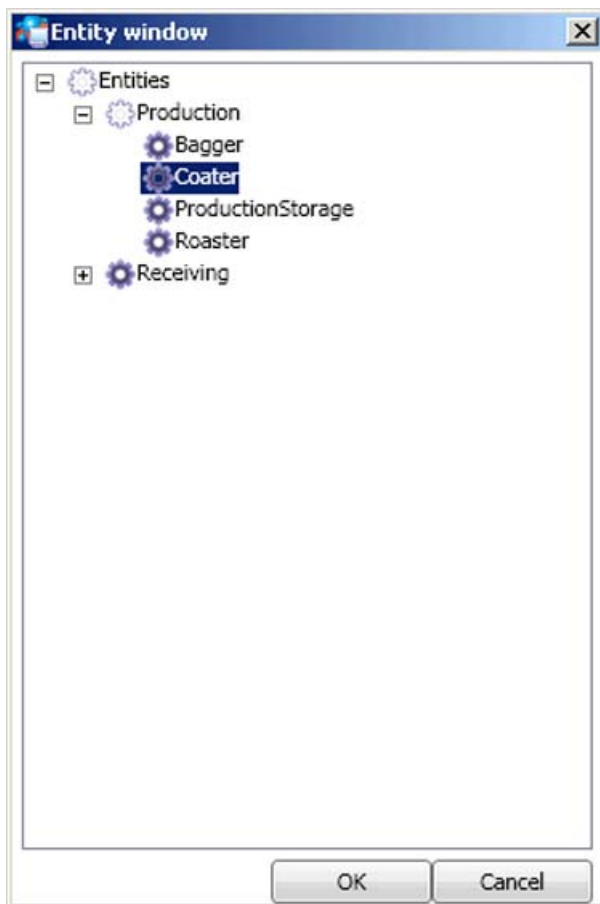
This is done to specify the consumption quantity of an intermediate material required to produce the finished good. In this case, 0.25 pounds of **Flavored Mixed Nut - BBQ** is required to produce 1 bag of flavored mixed nuts.

18. In the **Properties** pane, **Storage Location** field, click the ellipsis button.



The screenshot shows the same 'Properties' dialog box as before, but now the 'Storage Location' field is empty and the ellipsis button (three dots) is circled in red.

19. In the **Entity window** dialog box, expand **Entities** and **Production**, and then click **Coater**.



20. Click **OK**.

21. In the **Properties** pane, configure as follows:

Min Quantity: 0.23

Max Quantity: 0.27

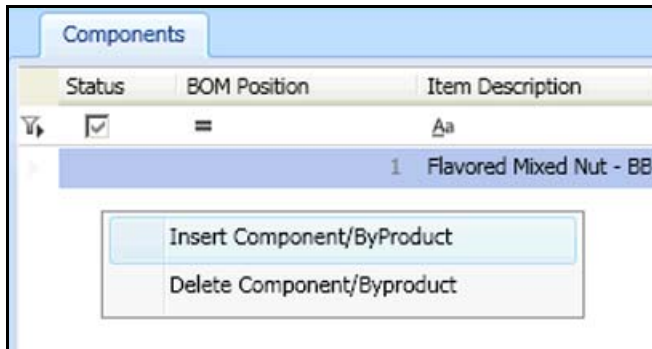
The screenshot shows a 'Properties' window with the following fields and values:

- BOM Position:** 1
- Item:** Flavored Mixed Nut - BBQ
- Required Grade:** (empty dropdown)
- Default Reason:** (empty dropdown)
- Quantity:** 0.25
- Storage Location:** Coater
- Min Quantity:** 0.23 (circled in red)
- Max Quantity:** 0.27 (circled in red)
- Backflush Consumption:** ☐
- Must Consume Before Production Allowed:** ☐
- May create new lots:** ☒
- May choose alternate inventory location:** ☒

22. Save all changes.

Now, you will add an additional component to the BOM created for **BMX-BBQ**.

23. On the **Components** tab, right-click the empty workspace and select **Insert Component/ByProduct**.



24. In the **Properties** pane, **Item** field, click the ellipsis button.
The **Select Item** dialog box appears.

Now, you will select the raw material, **BBQ Mixed Nut – Empty**, required for producing the bags of mixed nuts.

25. In the **Select Item** dialog box, click **Apply filters**.

26. In the **Select Item** column, check the **BAG-BBQ** item.

Select Item

Items

Item ID: Item Description:

Units: Template:

Lifetime: Unit Cost:

Num Decimals:

Item Class Filters:

Select Item	Item	Item Class
<input type="checkbox"/>	AMD-BLK(Almonds Bulk)	Raw Materials(Raw Materials)
<input checked="" type="checkbox"/>	BAG-BBQ(BBQ Mixed Nut - Empty)	Raw Materials(Raw Materials)
<input type="checkbox"/>	BBQ-FLA(BBQ Flavoring)	Raw Materials(Raw Materials)
<input type="checkbox"/>	CSW-BLK(Cashews Bulk)	Raw Materials(Raw Materials)
<input type="checkbox"/>	OIL-LQD(Coating Oil)	Raw Materials(Raw Materials)
<input type="checkbox"/>	PNT-BLK(Peanuts Bulk)	Raw Materials(Raw Materials)
<input type="checkbox"/>	FMX-BBQ(Flavored Mixed Nut - BBQ)	WIP Materials(Intermediate Materials)
<input type="checkbox"/>	RMX-BLK(Roasted Mixed Nut)	WIP Materials(Intermediate Materials)

27. Click **OK**.

28. In the **Properties** pane, configure as follows:

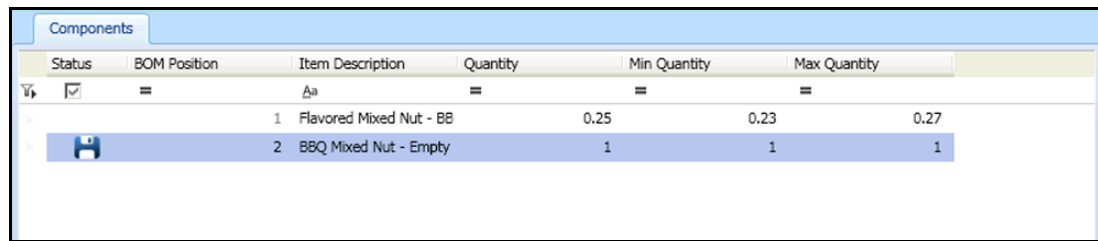
BOM Position:	2 (<i>default</i>)
Quantity:	1
Storage Location:	Receiving
Min Quantity:	1
Max Quantity:	1
Backflush Consumption:	<i>checked</i>

The screenshot shows a 'Properties' window with the following settings:


- BOM Position:** 2
- Item:** BBQ Mixed Nut - Empty
- Required Grade:** (empty dropdown)
- Default Reason:** (empty dropdown)
- Quantity:** 1
- Storage Location:** Receiving
- Min Quantity:** 1
- Max Quantity:** 1
- ☒ **Backflush Consumption**
- ☐ **Must Consume Before Production Allowed**
- ☒ **May create new lots**
- ☒ **May choose alternate inventory location**

Backflush consumption is used to specify the consumption quantity of a raw material required to produce the finished good. In this case, 1 empty bag is required to produce 1 bag of flavored mixed nuts.

On the **Components** tab, both components of the BOM appear.



The screenshot shows a software window titled "Components" with a table containing two rows of BOM data. The first row is for "Flavored Mixed Nut - BB" and the second row is for "BBQ Mixed Nut - Empty". The second row is highlighted in blue. A save icon is visible in the left margin next to the second row.

Status	BOM Position	Item Description	Quantity	Min Quantity	Max Quantity
<input checked="" type="checkbox"/>	=	1 Flavored Mixed Nut - BB	0.25	0.23	0.27
	=	2 BBQ Mixed Nut - Empty	1	1	1

29. Save all changes and close the **BMX-BBQ-BOM** tab.

Define a BOM for the Flavored Mixed Nuts WIP Material

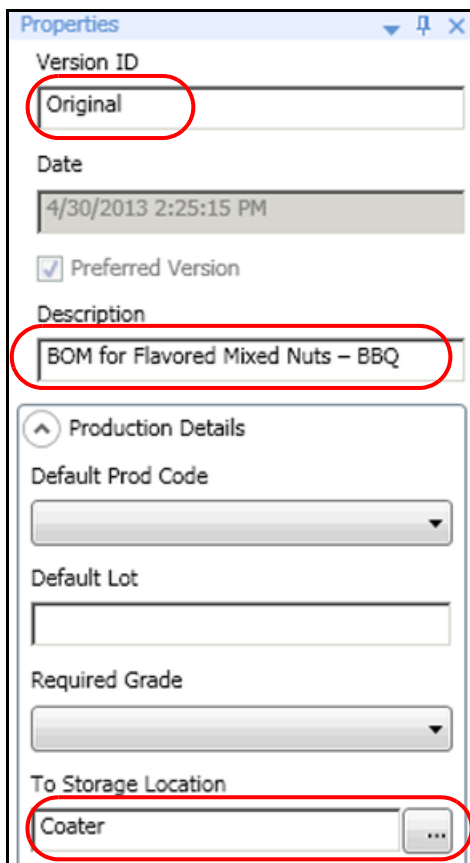
Now, you will create a BOM for **FMX-BBQ**.

30. On the **Items** tab, click **FMX-BBQ**.
31. In the **Properties** pane, **BOM** section, click **Configure BOMs**.
32. On the **FMX-BBQ-BOM** tab, right-click the empty workspace and select **New**.
33. In the **Properties** pane, configure the new BOM as follows:

Version ID: Original

Description: BOM for Flavored Mixed Nuts – BBQ

34. Expand the **Production Details** section, and then click the ellipsis button to set the **To Storage Location** to **Coater**.



The screenshot shows the 'Properties' pane for a BOM configuration. The 'Version ID' field is set to 'Original'. The 'Date' field shows '4/30/2013 2:25:15 PM'. The 'Preferred Version' checkbox is checked. The 'Description' field is set to 'BOM for Flavored Mixed Nuts – BBQ'. The 'Production Details' section is expanded, showing 'Default Prod Code', 'Default Lot', 'Required Grade', and 'To Storage Location'. The 'To Storage Location' field is set to 'Coater' and has an ellipsis button next to it.

35. Save all changes.

Now, you will add three components, **Roasted Mixed Nuts**, **Coating Oil**, and **BBQ Flavoring**, to the BOM.

36. On the **Components** tab, right-click the empty workspace and select **Insert Component/ByProduct**.

37. Configure the **Properties** pane as follows:

BOM Position:	1 (<i>default</i>)
Item:	Roasted Mixed Nut
Quantity:	0.95
Storage Location:	Roaster
Min Quantity:	0.93
Max Quantity:	0.97
Backflush Consumption:	<i>unchecked (default)</i>



The screenshot shows the 'Properties' dialog box with the following settings:

- BOM Position:** 1
- Item:** Roasted Mixed Nut
- Required Grade:** (empty)
- Default Reason:** (empty)
- Quantity:** 0.95
- Storage Location:** Roaster
- Min Quantity:** 0.93
- Max Quantity:** 0.97
- Backflush Consumption:** ☐ (unchecked)
- Must Consume Before Production Allowed:** ☐ (unchecked)
- May create new lots:** ☒ (checked)
- May choose alternate inventory location:** ☒ (checked)

38. Add a second component and configure it as follows:

BOM Position:	2 (<i>default</i>)
Item:	Coating Oil
Quantity:	0.02
Storage Location:	Tank01
Min Quantity:	0.02
Max Quantity:	0.02
Backflush Consumption:	<i>unchecked (default)</i>

The screenshot shows a 'Properties' dialog box with the following fields and options:

- BOM Position:** A text field containing the value '2'.
- Item:** A text field containing 'Coating Oil' with a selection button (three dots) to its right.
- Required Grade:** A dropdown menu.
- Default Reason:** A dropdown menu.
- Quantity:** A text field containing '0.02'.
- Storage Location:** A text field containing 'Tank01' with a selection button (three dots) to its right.
- Min Quantity:** A text field containing '0.02'.
- Max Quantity:** A text field containing '0.02'.
- Backflush Consumption:** An unchecked checkbox.
- Must Consume Before Production Allowed:** An unchecked checkbox.
- May create new lots:** A checked checkbox.
- May choose alternate inventory location:** A checked checkbox.

39. Add a third component and configure it as follows:

BOM Position: 3 (*default*)
Item: BBQ Flavoring
Quantity: 0.03
Storage Location: Receiving
Min Quantity: 0.03
Max Quantity: 0.03
Backflush Consumption: *unchecked (default)*

The screenshot shows a 'Properties' dialog box with the following fields and options:

- BOM Position:** A text box containing the value '3'.
- Item:** A text box containing 'BBQ Flavoring' with a selection button (three dots) to its right.
- Required Grade:** A dropdown menu.
- Default Reason:** A dropdown menu.
- Quantity:** A text box containing '0.03'.
- Storage Location:** A text box containing 'Receiving' with a selection button (three dots) to its right.
- Min Quantity:** A text box containing '0.03'.
- Max Quantity:** A text box containing '0.03'.
- Backflush Consumption:** An unchecked checkbox.
- Must Consume Before Production Allowed:** An unchecked checkbox.
- May create new lots:** A checked checkbox.
- May choose alternate inventory location:** A checked checkbox.

40. Save all changes and close the **FMX-BBQ-BOM** .

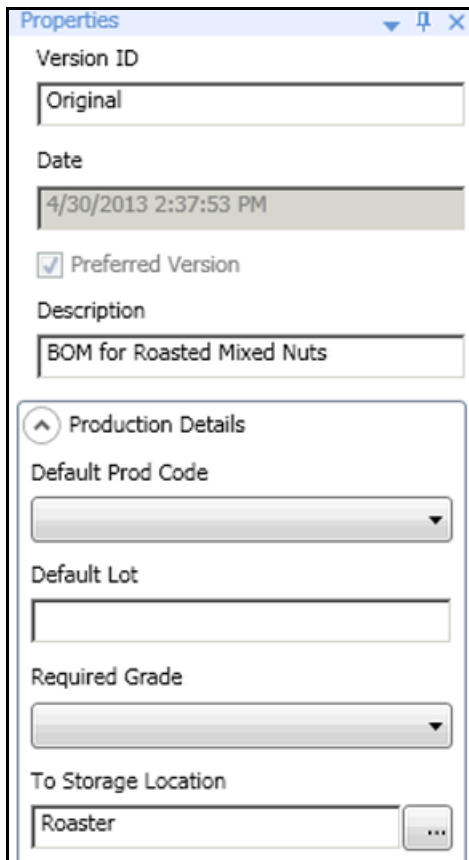
41. On the **Items** tab, save all changes.

Define a BOM for RMX-BLK

You will now create a BOM for **RMX-BLK**.

42. Create a new BOM for the **RMX-BLK** item and configure it as follows:

Version ID:	Original
Description:	BOM for Roasted Mixed Nuts
<i>Production Details</i>	
To Storage Location:	Roaster



Properties

Version ID
Original

Date
4/30/2013 2:37:53 PM

☒ Preferred Version

Description
BOM for Roasted Mixed Nuts

Production Details

Default Prod Code
[Dropdown]

Default Lot
[Text Field]

Required Grade
[Dropdown]

To Storage Location
Roaster [Dropdown Arrow]

43. Save all changes.

You will now add three components, **Peanuts**, **Cashews**, and **Almonds** to the BOM.

44. Add a BOM component and configure it as follows:

BOM Position:	1 (<i>default</i>)
Item:	Peanuts Bulk
Quantity:	0.474
Storage Location:	Silo01
Min Quantity:	0.4
Max Quantity:	0.6
Backflush Consumption:	<i>unchecked (default)</i>

The screenshot shows a 'Properties' dialog box with the following fields and values:

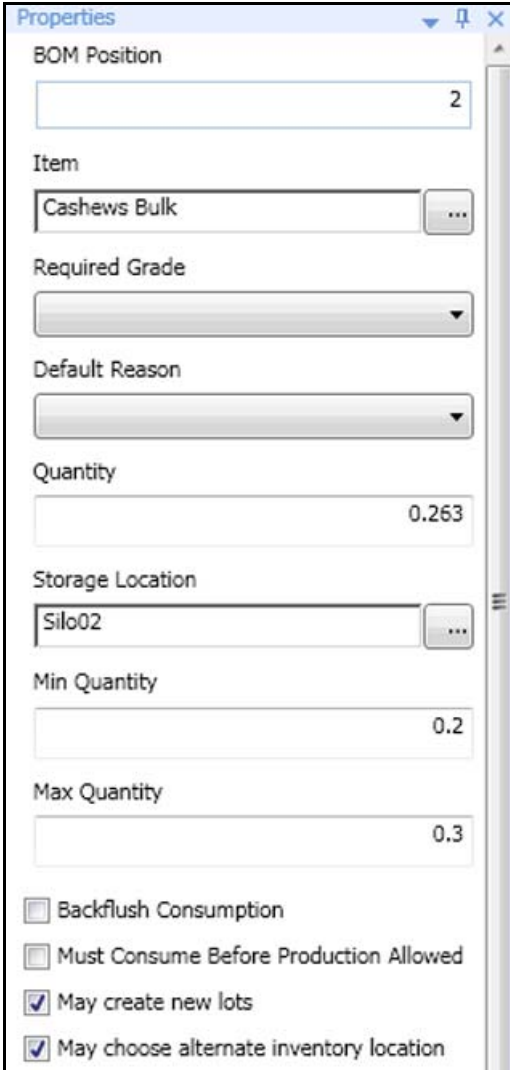
- BOM Position: 1
- Item: Peanuts Bulk
- Required Grade: (empty)
- Default Reason: (empty)
- Quantity: 0.474
- Storage Location: Silo01
- Min Quantity: 0.4
- Max Quantity: 0.6

At the bottom, there are four checkboxes:

- ☐ Backflush Consumption
- ☐ Must Consume Before Production Allowed
- ☒ May create new lots
- ☒ May choose alternate inventory location

45. Add a BOM component and configure it as follows:

BOM Position:	2 (<i>default</i>)
Item:	Cashews Bulk
Quantity:	0.263
Storage Location:	Silo02
Min Quantity:	0.2
Max Quantity:	0.3
Backflush Consumption:	<i>unchecked (default)</i>



Properties

BOM Position: 2

Item: Cashews Bulk

Required Grade:

Default Reason:

Quantity: 0.263

Storage Location: Silo02

Min Quantity: 0.2

Max Quantity: 0.3

☐ Backflush Consumption

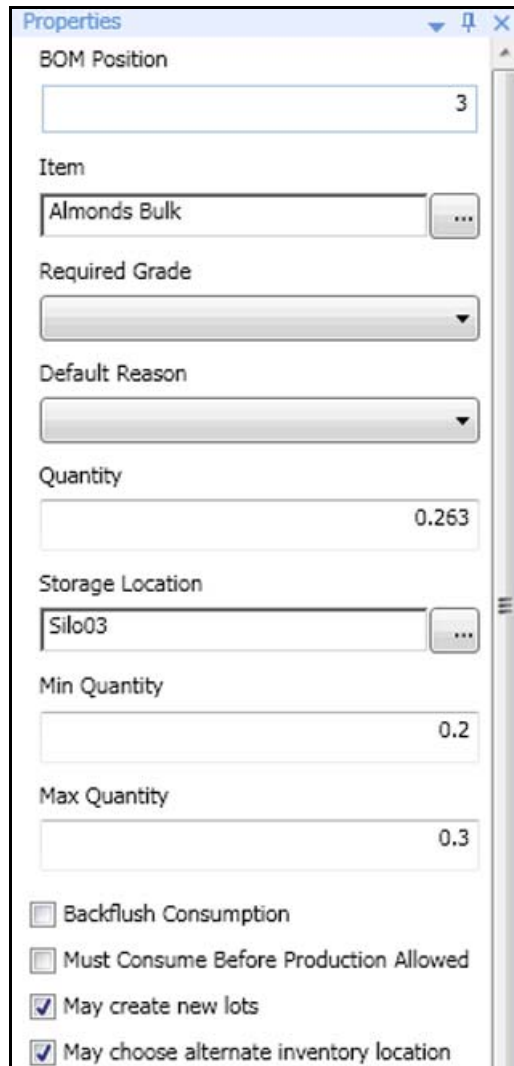
☐ Must Consume Before Production Allowed

☒ May create new lots

☒ May choose alternate inventory location

46. Add a BOM component and configure it as follows:

BOM Position: 3 (*default*)
Item: Almonds Bulk
Quantity: 0.263
Storage Location: Silo03
Min Quantity: 0.2
Max Quantity: 0.3
Backflush Consumption: *unchecked (default)*



The screenshot shows a 'Properties' window for a BOM component. The fields are configured as follows:

- BOM Position:** 3
- Item:** Almonds Bulk
- Required Grade:** (empty dropdown)
- Default Reason:** (empty dropdown)
- Quantity:** 0.263
- Storage Location:** Silo03
- Min Quantity:** 0.2
- Max Quantity:** 0.3
- Backflush Consumption:** ☐ (unchecked)
- Must Consume Before Production Allowed:** ☐ (unchecked)
- May create new lots:** ☒ (checked)
- May choose alternate inventory location:** ☒ (checked)

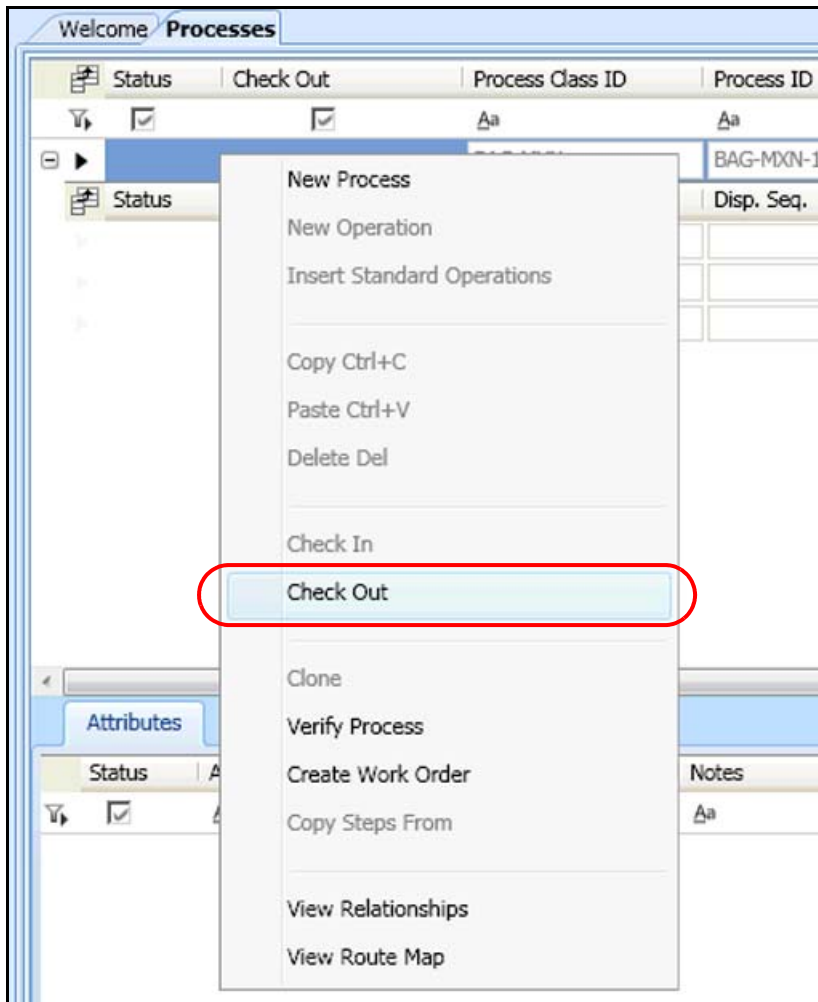
47. Save all changes and close the **RMX-BLK-BOM** window.

48. Save all changes and close the **Items** tab.

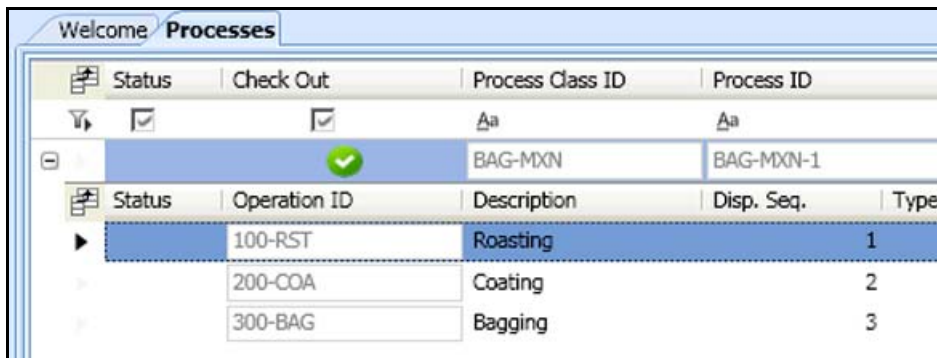
Assign BOMs to Operations in the Production Process

Now you will assign BOM for the first operation, **100-RST**.

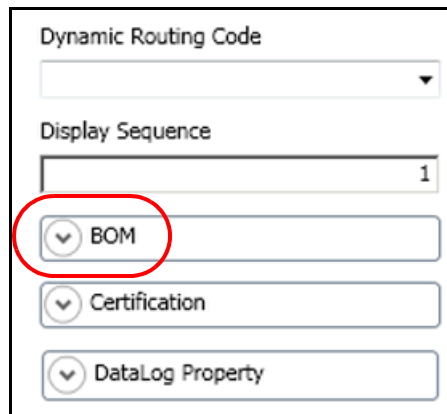
49. On the **Processes** tab, right-click the **BAG-MXN-1** process and select **Check Out**.



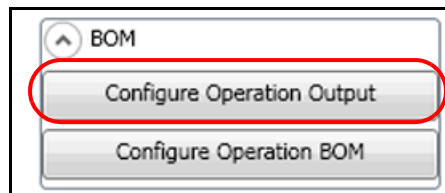
50. Select the first operation, **100-RST**.



51. Towards the bottom of the **Properties** pane, expand the **BOM** section.

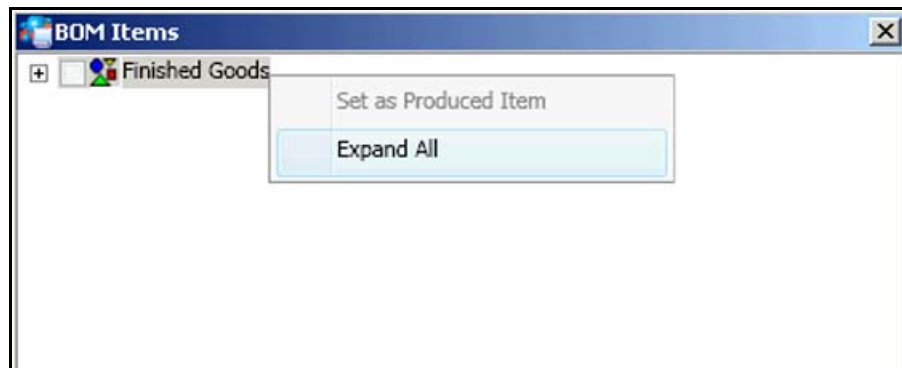


52. In the **BOM** section, click **Configure Operation Output** to configure the output of this operation.

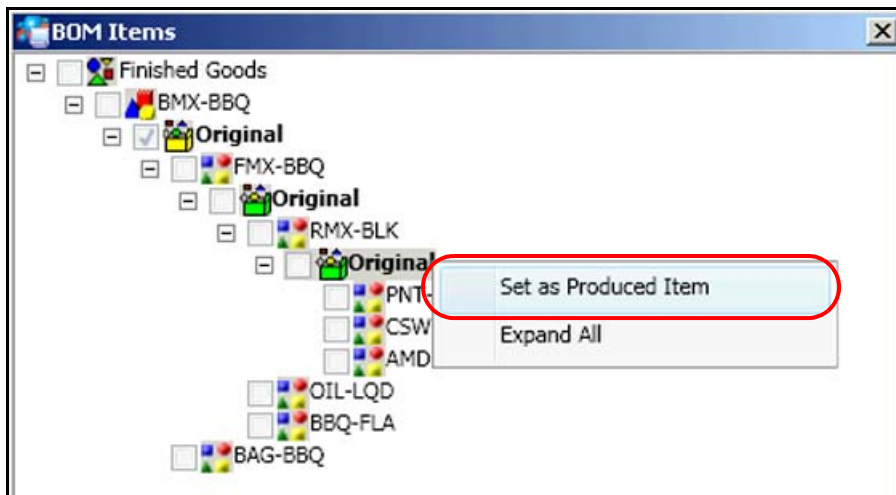


The **BOM Items** dialog box appears.

53. In the **BOM Items** dialog box, right-click **Finished Goods** and select **Expand All**.

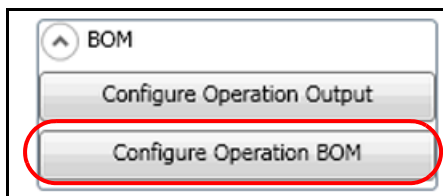


54. Under **RMX-BLK**, right-click **Original** and select **Set as Produced Item**.

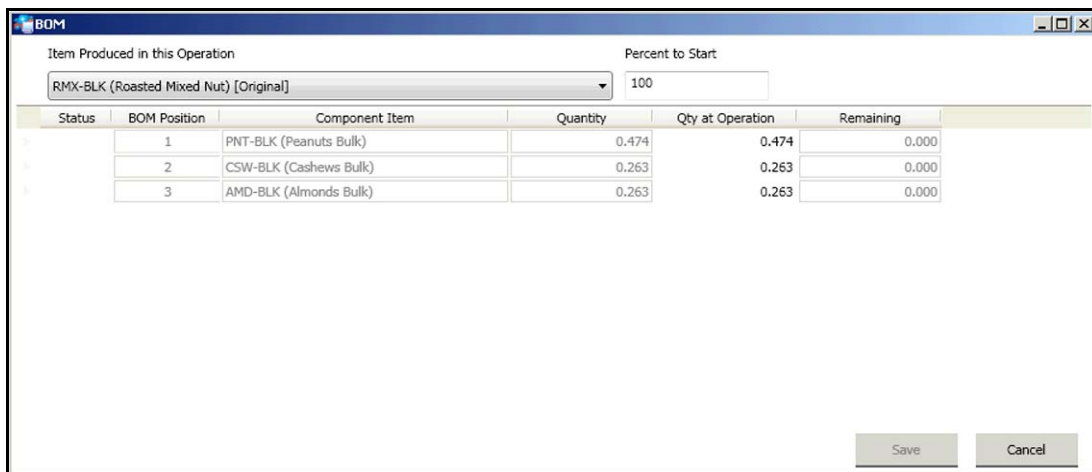


This specifies that **RMX-BLK** is the output being produced in this operation.

55. Close the **BOM Items** dialog box.
 56. In the **Properties** pane, **BOM** section, click **Configure Operation BOM**.



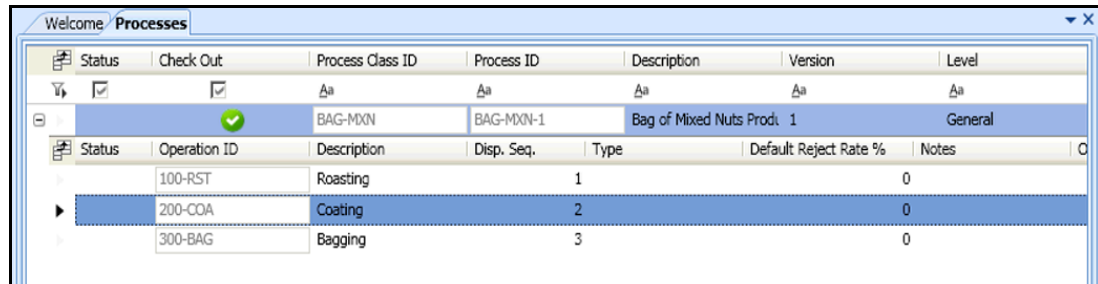
The **BOM** dialog box appears. You will use this dialog box to configure the way in which items will be consumed in this operation. The entire quantity specified in the BOM is being consumed by the process. Therefore, you do not need to modify any parameters here.



57. Close the **BOM** dialog box.

Now, you will configure a BOM for **200-COA**.

58. On the **Processes** tab, select the **Coating** operation.

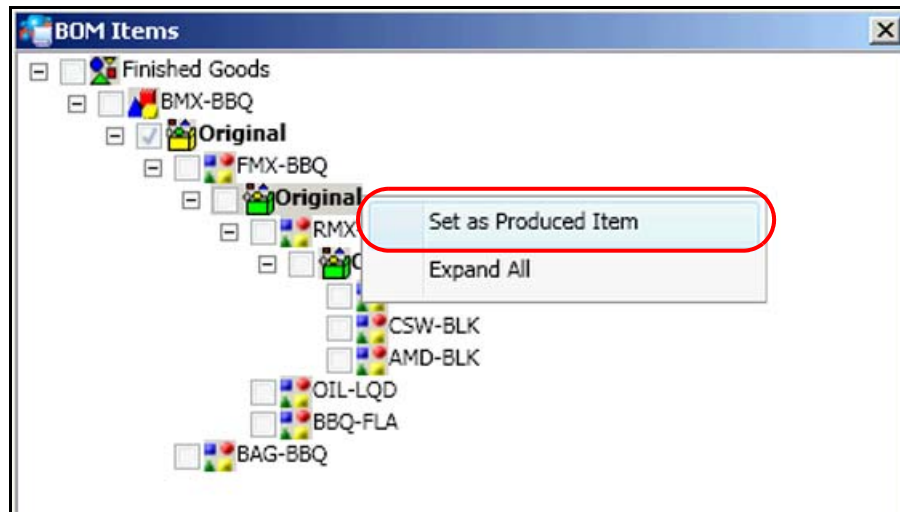


59. In the **Properties** pane, expand the **BOM** section.

60. In the **BOM** section, click **Configure Operation Output**.

61. In the **BOM Items** dialog box, right-click **Finished Goods** and click **Expand All**.

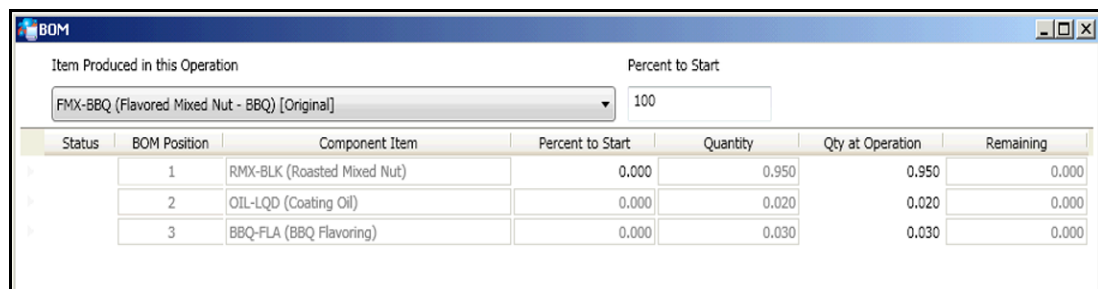
62. Under **FMX-BBQ**, right-click **Original** and select **Set as Produced Item**.



This specifies that **FMX-BBQ** will be the output product in this operation.

63. Close the **BOM Items** dialog box.

64. In the **Properties** pane, **BOM** section, click **Configure Operation BOM** and ensure that the entire quantity specified in the BOM is being consumed.

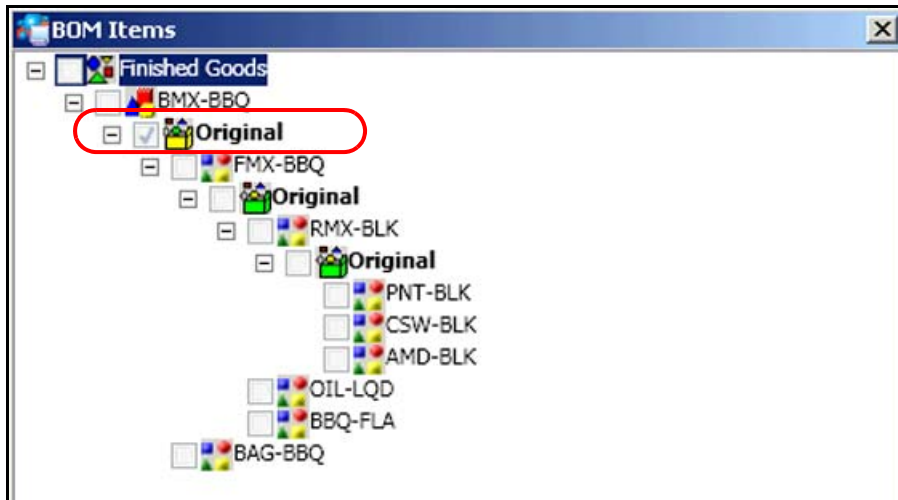


65. Close the **BOM** dialog box.

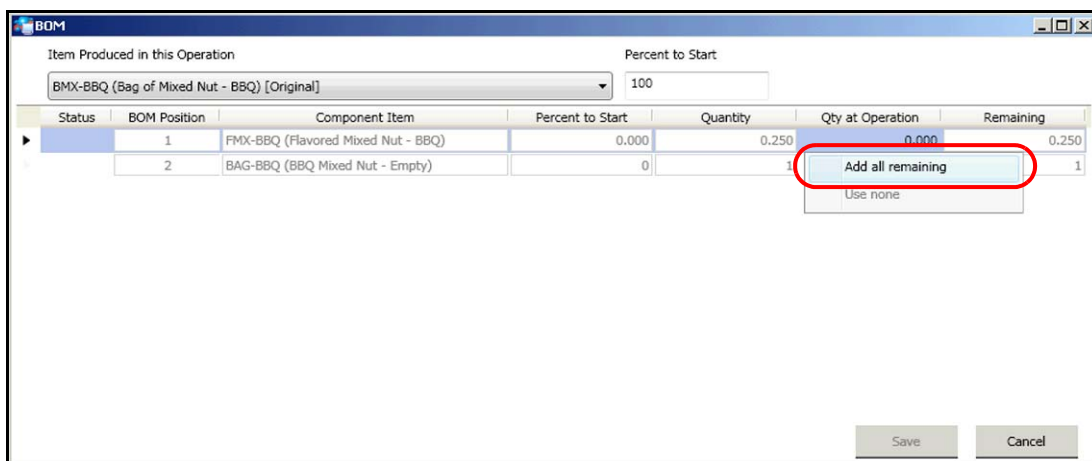
You will now configure a BOM for **300-BAG**.

66. On the **Processes** tab, select the **Bagging** operation.
67. In the **Properties** pane, expand the **BOM** section, and then click **Configure Operation Output**.
68. In the **BOM Items** dialog box, right-click **Finished Goods** and click **Expand All**.

In this case, the **Original** BOM check box for **BMX-BBQ** is already checked. This happens by default because when a process is created, the process attaches each operation to the associated finished product.



69. Close the **BOM Items** dialog box.
 70. In the **Properties** pane, **BOM** section, click **Configure Operation BOM**.
- You did not make any changes to the output. Therefore, the system has not automatically configured **Qty at Operation**. You will now configure **Qty at Operation**.
71. In the **BOM** dialog box, right-click **FMX-BBQ** and select **Add all remaining**.



The **Qty at Operation** field for **FMX-BBQ** is updated.

The screenshot shows the BOM dialog box for 'Item Produced in this Operation' set to 'BMX-BBQ (Bag of Mixed Nut - BBQ) [Original]'. The 'Percent to Start' is 100. The table below shows the components:

Status	BOM Position	Component Item	Percent to Start	Quantity	Qty at Operation	Remaining
▶	1	FMX-BBQ (Flavored Mixed Nut - BBQ)	0.000	0.25	0.250	0.000
	2	BAG-BBQ (BBQ Mixed Nut - Empty)	0	1	0	1

Buttons: Save, Cancel

72. Right-click **BAG-BBQ** and select **Add all remaining**.

The **Qty at Operation** field is updated.

The screenshot shows the BOM dialog box for 'Item Produced in this Operation' set to 'BMX-BBQ (Bag of Mixed Nut - BBQ) [Original]'. The 'Percent to Start' is 100. The table below shows the components:

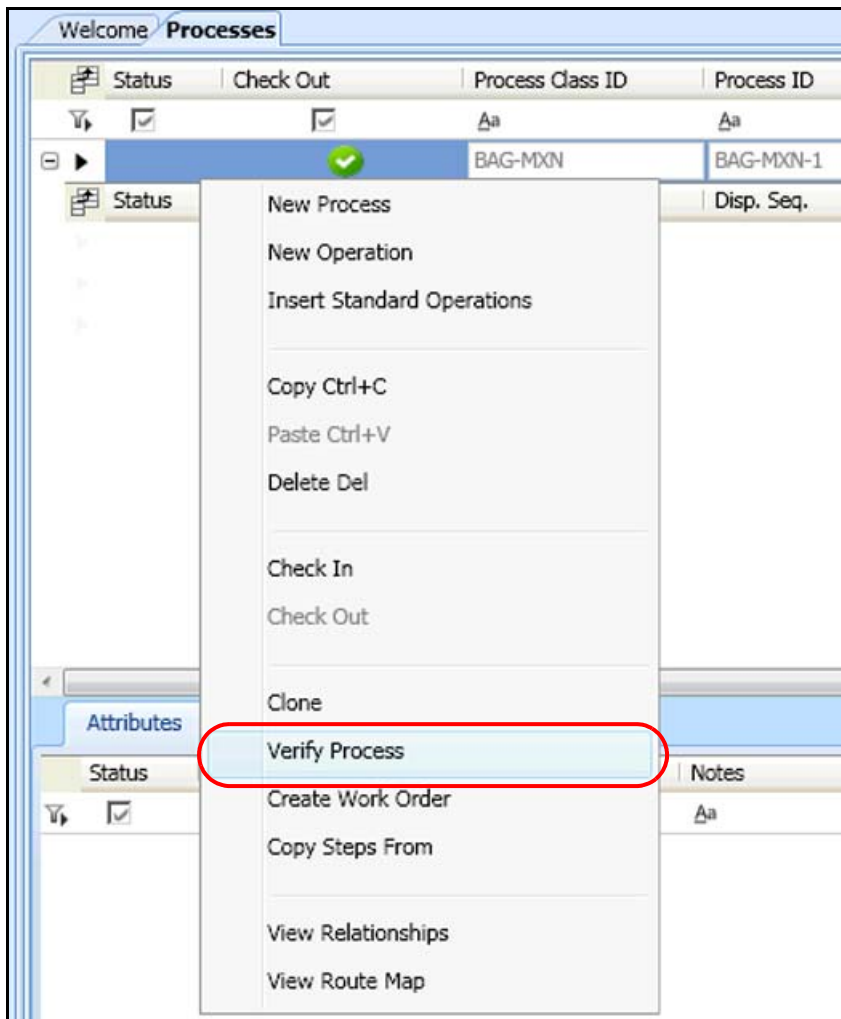
Status	BOM Position	Component Item	Percent to Start	Quantity	Qty at Operation	Remaining
▶	1	FMX-BBQ (Flavored Mixed Nut - BBQ)	0.000	0.250	0.250	0.000
▶	2	BAG-BBQ (BBQ Mixed Nut - Empty)	0	1	1	0

Buttons: Save, Cancel

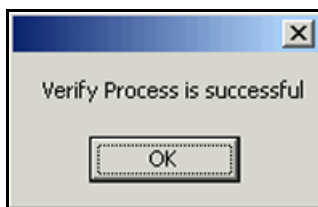
73. Click **Save** and close the **BOM** dialog box.

Now, you will verify whether the operations have been correctly configured in the process.

74. On the **Processes** tab, right-click the **BAG-MXN-1** process and select **Verify Process**.



The confirmation dialog box appears.



75. Click **OK**.

76. On the **Processes** tab, check in the **BAG-MXN-1** process.

Create a Work Order in Wonderware MES Client

You will now create a work order from the modified process.

77. On the **Processes** tab, right-click **BAG-MXN-1** and select **Create Work Order**.

78. In the **Create Work Order from Process** dialog box, configure new work order as follows:

Work Order ID: WO-040
Description: <enter a description>
Item: BMX-BBQ
Required Quantity: 400

Note: The **Item** drop-down list now has multiple items being produced in different operations. Therefore, you need to specify the **Item** that you need to produce.

The screenshot shows the 'Create Work Order from Process' dialog box. The fields are filled as follows:

Field	Value
Process ID	BAG-MXN-1
Spec. Version	
Work Order ID	WO-040
Description	
Item	BMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	400 Pcs.
Release Date/Time	05/01/2013 12:00 AM
Due Date/Time	05/01/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

79. Click **OK** to generate the work order.

The work order will be completed in the next lab.

Lab 9 – Tracking Genealogy

Introduction

In the previous lab, you defined a Bill of Materials (BOM) for items in the production process of the mixed nut factory. These BOMs defined the consumption and production information required to make bags of flavored mixed nuts.

In this lab, you will configure the Operations Capability Object to track consumptions. For this, you will modify the Operations Capability Object to enable consumption counters and deploy the changes to the instances defined in the plant model. Then, you will use the InTouch application to track the work order you created in the previous lab. After ensuring that the work order runs correctly, you will use Wonderware Information Server to view genealogy reports related to the work order.

Objectives

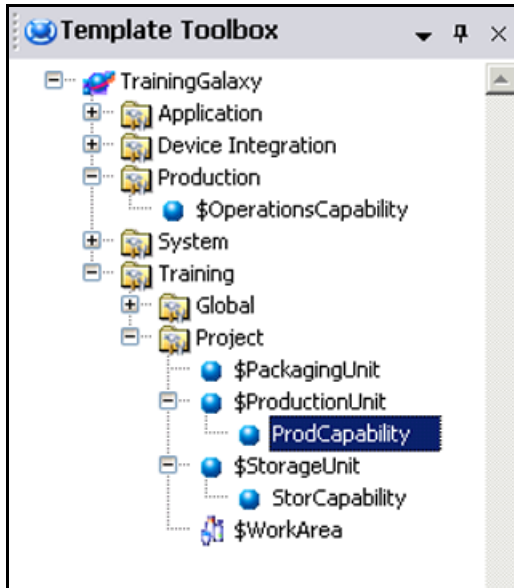
Upon completion of this lab, you will be able to:

- Create and configure consumption counters
- Track genealogy in runtime
- Track consumption

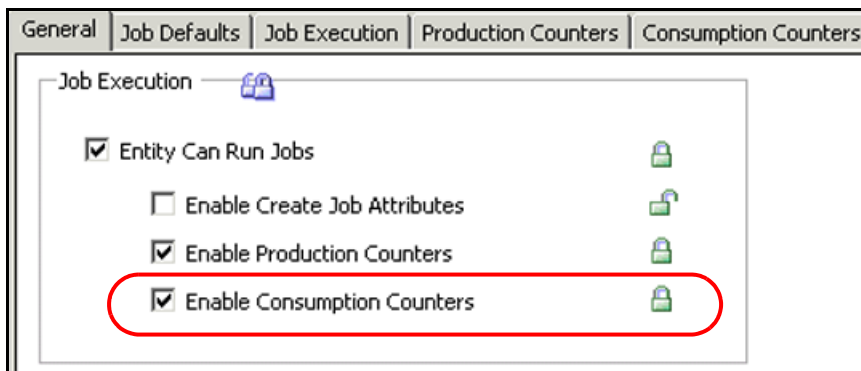
Define Consumption Counters for Entities in the Production Area

Before tracking consumptions in runtime, you will enable consumption counters for all Operations Capability objects in the **Production** area of the plant. You will enable these counters at the template level in the ArchestrA IDE.

1. In the ArchestrA IDE, **Template Toolbox**, double-click **\$ProductionUnit.ProdCapability**.



2. On the **General** tab, **Job Execution** area, check the **Enable Consumption Counters** check box and lock it.



In the configuration editor, the **Consumption Counters** tab appears.

3. Click the **Consumption Counters** tab.
4. On the **Consumption Counters** tab, click the **Add** button to add three consumption counters and configure them as follows:

Name	Job Position	BOM Position	Consumption Reason
BOMPos1	0 (<i>default</i>)	1 and <i>locked</i>	Example Consumption
BOMPos2	0 (<i>default</i>)	2 and <i>locked</i>	Example Consumption
BOMPos3	0 (<i>default</i>)	3 and <i>locked</i>	Example Consumption

General | Job Defaults | Job Execution | Production Counters | Consumption Counters | Storage Execution | Inventory Transfer | Object Information | Scripts | UDAs | Extensions | Graphics

Consumption Counter Name : BOMPos3

Job Position: 0

Consumption Counters:

Name
BOMPos1
BOMPos2
BOMPos3

Inherited Consumption Counters:

Name

General Counter Attributes

Attribute Name	Use Input Source	Value or Input Source
BOM Position	<input type="checkbox"/>	3
Item	<input type="checkbox"/>	
Consumption Reason	<input type="checkbox"/>	Example Consumption
From Storage Location	<input type="checkbox"/>	
From Lot	<input type="checkbox"/>	
From Sublot	<input type="checkbox"/>	
Finished Goods Lot	<input type="checkbox"/>	
Finished Goods Sublot	<input type="checkbox"/>	

5. Save and close, and then check in the object.
6. Redeploy the three modified objects.

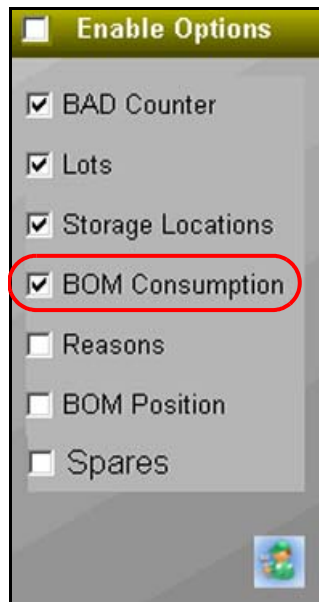
Track the Work Order Using the InTouch Application

Now, you will track **WO-040** in the InTouch application.

7. On the WindowViewer **Navigation Bar**, click the **Production** button.
8. In the **Production** window, **Internal Set Up** panel, set jobs for **WO-040**.
9. Check the **Generate Consumption Lots** check box, and then click **Generate Lots**.

The **Receiving** panel displays the consumption lots and the storage location of raw materials, which will be used for producing flavored mixed nuts.

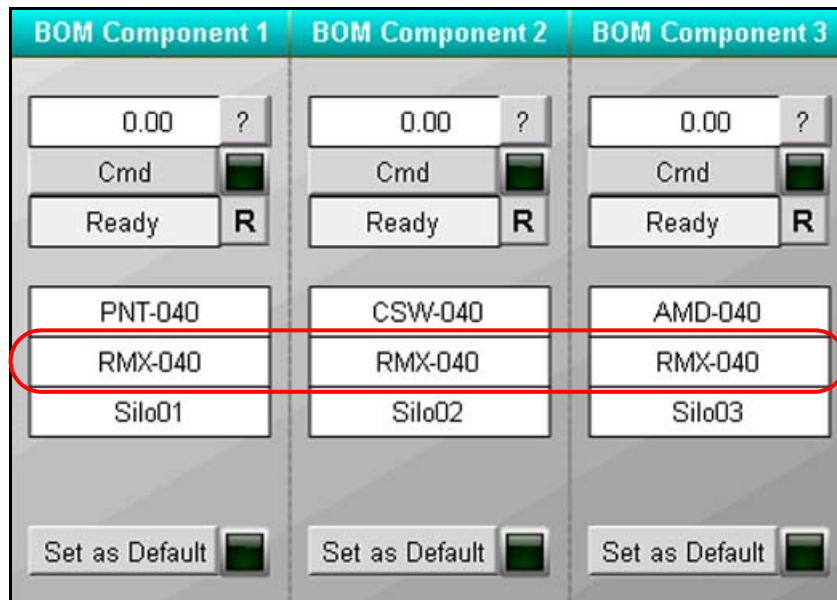
10. In the **Enable Options** panel, check the **BOM Consumption** check box.



Enable Options

- ☒ BAD Counter
- ☒ Lots
- ☒ Storage Locations
- ☒ **BOM Consumption**
- ☐ Reasons
- ☐ BOM Position
- ☐ Spares

This displays three consumption counters, **BOM Component 1**, **BOM Component 2**, and **BOM Component 3**. These consumption counters also have an **FG Lot** (finished goods lot) field, which is not in the production counters. This information is necessary to link genealogy.



BOM Component 1	BOM Component 2	BOM Component 3
0.00 ?	0.00 ?	0.00 ?
Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Ready R	Ready R	Ready R
PNT-040	CSW-040	AMD-040
RMX-040	RMX-040	RMX-040
Silo01	Silo02	Silo03
Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

Now, you will run the roasting job.

11. In the **Production** window, **Roasting** panel, ensure the **Roaster** entity is selected.
12. Start the roasting job.
13. In the **BOM Component 1** panel, **Quantity** field, enter **45.00**.
14. Leave the default **Lot** and **Location** values, and then click the **Cmd** button.
15. Configure the **BOM Component 2** and **BOM Component 3** panels as follows:

	BOM Component 2	BOM Component 3
Quantity:	25.00	25.00
Lot:	CSW-040	AMD-040
Location:	Silo02	Silo03

BOM Component 1	BOM Component 2	BOM Component 3
45.00 ?	25.00 ?	25.00 ?
Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Ready R	Ready R	Ready R
PNT-040	CSW-040	AMD-040
RMX-040	RMX-040	RMX-040
Silo01	Silo02	Silo03
Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

16. In both the **BOM Component 2** and **BOM Component 3** panels, click **Cmd**.

You have now consumed **45.00** pounds of peanuts, **25.00** pounds of cashews, and **25.00** pounds of almonds. These components are required to produce **95.00** pounds of roasted mixed nuts.

Note: The consumption details are not available in the **Production** window. You can switch to **DB Views** and click **Consumption Data** for tracking consumption details.

17. In the **GOOD Prod Counter** panel, report **95.00** pounds of good production.

GOOD Prod Counter	
Quantity	95.00
Add Quantity	Cmd <input type="checkbox"/>
Status	Ready R
Lot	RMX-040
FG Lot	
Location	Roaster

18. End the roasting job.

You will now run the coating job.

19. In the **Production** window, **Coating** panel, click the **Coater** entity.

20. Start the coating job.

The **95.00** pounds of the roasted mixed nut WIP material, in addition to **2.00** pounds of coating oil and **3.00** pounds of BBQ flavoring, are required to produce **100.00** pounds of flavored mixed nut WIP material.

21. Consume roasted mixed nuts, coating oil, and BBQ flavoring as follows:

	BOM Component 1	BOM Component 2	BOM Component 3
Quantity:	95.00	2.00	3.00
Lot:	RMX-040	OIL-040	BBQ-040
FG Lot:	FMX-040	FMX-040	FMX-040
Location:	Roaster	Tank01	Receiving

BOM Component 1	BOM Component 2	BOM Component 3
95.00 ?	2.00 ?	3.00 ?
Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Ready R	Ready R	Ready R
RMX-040	OIL-040	BBQ-040
FMX-040	FMX-040	FMX-040
Roaster	Tank01	Receiving
Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

22. In the **GOOD Prod Counter** panel, report **100.00** pounds of good production.

GOOD Prod Counter	
Quantity	100.00
Add Quantity	Cmd <input type="checkbox"/>
Status	Ready R
Lot	FMX-040
FG Lot	
Location	Coater

23. End the coating job.

Now, you will run the bagging job.

24. In the **Production** window, **Bagging** panel, click the **Bagger** entity.

25. Start the bagging job.

BOM Component 1 and **BOM Component 2** are required to fill bags of flavored mixed nuts. This is because **Flavored Mixed Nuts** and **Empty Bags** are used here.

26. In the **BOM Component 1** panel, consume **100.00** pounds of flavored mixed nuts.

BOM Component 1	
100.00	?
Cmd	<input type="checkbox"/>
Ready	R
FMX-040	
BMX-040	
Coater	
Set as Default	<input type="checkbox"/>

You will now explicitly specify the **Lot** and **FG Lot** codes for the 400 empty bags because this operation has backflush consumption configured. This is because each bag contains one-quarter pound of flavored mixed nuts.

27. In the **BOM Component 2** panel, click **Set as Default**.

BOM Component 2

0.00 ?

Cmd

Ready R

BAG-040

BMX-040

Receiving

Set as Default

28. In the **GOOD Prod Counter** panel, report **400.00** pieces of good production.

GOOD Prod Counter

Quantity	400.00
Add Quantity	Cmd
Status	Ready R
Lot	BMX-040
FG Lot	
Location	ProductionStorage

29. End the bagging job.

View Reports in Wonderware Information Server

Now, you will view the genealogy reports.

30. In the Wonderware Information Server, **System** panel, under **Reports** and **MES**, click **Genealogy by Work Order**.

The parameter window appears.

31. In the **Date Time** area, select a start date and time that corresponds to the first day of the course and an end date and time that corresponds to the day after the course.

Genealogy by Work Order

Date Time

4/29/2013 12:00:00 AM [5] 00:00:00.000 5/ 4/2013 12:00:00 AM

Time zone: (GMT-08:00) Pacific Time (US & Canada): Tijuana

Filter

Do not auto-populate list boxes: ☒ True ☐ False

Item Name Pattern:

Select Specific Item Name ☒ True ☐ False

Items List: ALL

Select Specific Entity Name: ☒ True ☐ False

Show Data Filtering Criteria: On

Work Order Id Pattern:

Work Order Select Specific: ☒ True ☐ False

Work OrderID List: ALL

Entity Pattern:

Entities List: ALL

Show Expanded: Collapsed

Execute

32. Click **Execute** to generate the genealogy report.

33. Expand the detailed report for each of the three operations in work order **WO-040** and browse through the information this report generates.

<div> <div>Work Order ID: WO-040</div> <div> <div>Operation ID: 100-RST</div> <div>Entity Name: Roaster</div> </div> <div> <div>Produced Item: Roasted Mixed Nut (RMX-BLK)</div> <div>Job Start Time: 5/2/2013 12:28:06 PM</div> <div>Job End Time: 5/2/2013 12:30:27 PM</div> </div> </div>				
Produced Lot	Target Entity Name	Grade	State	Produced Quantity
RMX-040	Roaster	GOODGRADE	GOODSTATE	95 Pounds
	Consumed Item ID (Description)	Lot	Entity Name	
	Almonds Bulk	AMD-040	Silo03	
	Cashews Bulk	CSW-040	Silo02	
	Peanuts Bulk	PNT-040	Silo01	
<div> <div>Operation ID: 200-COA</div> <div>Entity Name: Coater</div> </div> <div> <div>Produced Item: Flavored Mixed Nut - BBQ (FMX-BBQ)</div> <div>Job Start Time: 5/2/2013 12:30:57 PM</div> <div>Job End Time: 5/2/2013 12:35:01 PM</div> </div>				
Produced Lot	Target Entity Name	Grade	State	Produced Quantity
FMX-040	Coater	GOODGRADE	GOODSTATE	100 Pounds
	Consumed Item ID (Description)	Lot	Entity Name	
	BBQ Flavoring	BBQ-040	Receiving	
	Coating Oil	OIL-040	Tank01	
	Roasted Mixed Nut	RMX-040	Roaster	
<div> <div>Operation ID: 300-BAG</div> <div>Entity Name: Bagger</div> </div> <div> <div>Produced Item: Bag of Mixed Nut - BBQ (BMX-BBQ)</div> <div>Job Start Time: 5/2/2013 12:35:10 PM</div> <div>Job End Time: 5/2/2013 12:39:04 PM</div> </div>				
Produced Lot	Target Entity Name	Grade	State	Produced Quantity
BMX-040	ProductionStorage	GOODGRADE	GOODSTATE	400 Pieces
	Consumed Item ID (Description)	Lot	Entity Name	
	BBQ Mixed Nut - Empty	BAG-040	Receiving	
	Flavored Mixed Nut - BBQ	FMX-040	Coater	

Section 4 – Item Grades, States, and Reasons

This section discusses the use of Item Grades, States, and Reasons and explains how to use Item Reasons in runtime Production and Consumption Counters.

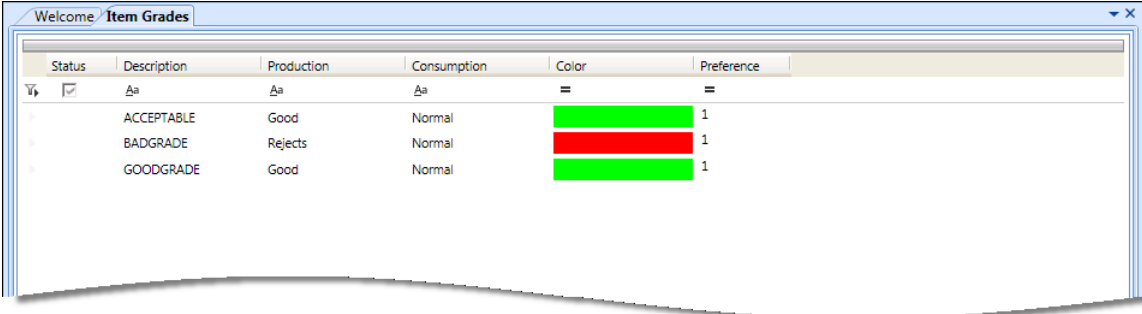
Item Grades

An **Item Grade** defines the physical condition of an item. You can define an unlimited number of **Item Grades**. This allows you to increase the flexibility of tracking the quality of an instances of an item produced and/or consumed, such as a lot. For example, a process that produces an item must be tested to determine its grade. You can define grades as A, B, and C for the produced item.

Item Grades are used in the Wonderware MES Client to restrict the consumption and shipment of materials. Item grades are closely related to item states and item reasons.

When you open the **Item Grades** module in the Wonderware MES Client **Product Definition** group, a list of all the existing item grades is shown in the .

Item grades are closely related to item states and item reasons. However, item grades are used by the internal logic of the system to restrict consumption and shipment of materials.



Status	Description	Production	Consumption	Color	Preference
<input checked="" type="checkbox"/>	Aa	Aa	Aa	=	=
<input type="checkbox"/>	ACCEPTABLE	Good	Normal		1
<input type="checkbox"/>	BADGRADE	Rejects	Normal		1
<input type="checkbox"/>	GOODGRADE	Good	Normal		1

Item States

An **Item State** defines the possible state for an instance of an item that determines its minimal shippable and/or consumable standards. You can use the **Item States** module in the Wonderware MES Client **Product Definition** group to create and maintain item states. When you open the Item States module, a list of all existing item states is shown in the .

Item Reasons

An **Item Reason** defines a reason for an item to be in any state and grade. You can use the **Item Reasons** module in the **Product Definition** group of the Wonderware MES Client to create and maintain item reason groups and reasons. The **Item Reason** group and the reasons associated to that reason group are assigned to item classes and entities to specify which reasons are applicable to different item classes or entities.

Item Reason Groups

Item reason groups are used to organize similar reasons. An item reason is selected when production or consumption of an item is reported and then this reason determines the state and grade of the lot of an item. A reason can be selected by PLC, I/O, or an operator.

You can assign multiple item reason groups to an item class. The following groups are available on the **Current View** tab:

View

In the **View** group, the following commands are available:

- **Default View** – Shows a list of all the existing item reason groups and reasons.
- **Group By Item Classes** – Shows a list of all the reasons by group. When you click **Group By Item Classes**, the group name and description of all the available reason groups class is shown in the . Click the plus (+) symbol to expand an item reason group and view the list of reasons in that group.
- **Group By Entities** – Shows a list of all the reasons grouped by entities. When you click **Group By Entities**, the name and description of all the available entities is shown in the . Click the plus (+) symbol to expand an entity group and view the list of reasons in that group.

Sequence

In the **Sequence** group, the following commands are available:

- **First** – Changes the selected item reason to the first item reason
- **Up** – Moves up the selected item reason
- **Down** – Moves down the selected item reason
- **Last** – Changes the selected item reason to the last item reason

View Relationships

In the **View Relationships** group, the following command is available:

- **View Relationships** – Shows a graphical representation of the relationship between an item group, an item class, and entities.

Using Item Reasons

To use **Item Reasons** in runtime **Production and Consumption** counters, you must provide a reference to a reason in the appropriate location in the Operations Capability Object.

To use configure an Item reason for a production counter, provide a reference to a production reason attribute, or select an item reason from the list of item reasons defined in the MES system whose reason group is classified as **Produced**, in the **Production Reason** box while configuring the production counter.

Likewise, if you wish to configure an **Item Reason** for a consumption counter, provide a reference to a consumption reason attribute, or select an item reason from the list of item reasons defined in the MES system whose reason group is classified as **Consumed**, in the **Consumption Reason** box while configuring the production counter.

Lab 10 – Defining Item Grades, States, and Reasons

Introduction

In this lab, you will define item grades, states, and reasons for the consumption and production activities in the mixed nut factory. All this information will then be used to accurately define the quality of production and consumption in runtime. You will define item reasons by assigning the item reason to the appropriate grades and states.

Next, you will use the ArchestrA IDE to set the default item reasons in the Operations Capability Object. You will then use Wonderware MES Client to set the global defaults for the entities being produced in the mixed nut factory. Finally, you will use the InTouch application to describe the quality of consumption and production when running jobs associated with a work order in runtime.

Objectives

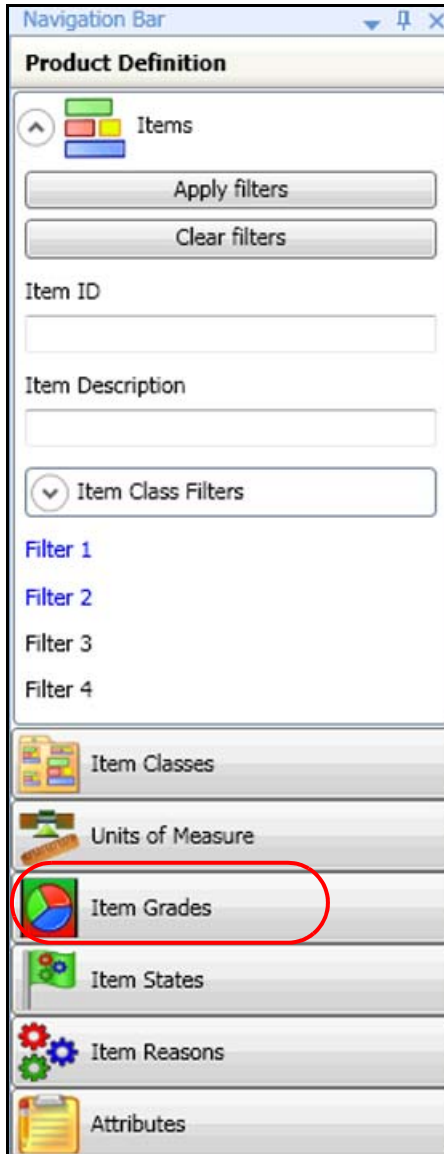
Upon completion of this lab, you will be able to:

- Configure item grades, item states, and item reasons
- Assign item reasons to production and consumption counters
- Use item reasons to describe the quality of production and consumption in runtime

Configure Item Grades and Item States

For the purpose of this lab, the materials in the mixed nut factory can be categorized as normal, poor, and scrap. Normal and poor materials can be considered to be good production, and scrap is considered to be bad production. You will now reconfigure the default item grades in Wonderware MES Client to meet these requirements.

1. In the Wonderware MES Client, **Product Definition** group, click **Item Grades**.



The **Item Grades** tab appears with three default grades.

Status	Description	Production	Consumption	Color	Preference
<input checked="" type="checkbox"/>	ACCEPTABLE	Good	Normal	Green	1
<input type="checkbox"/>	BADGRADE	Rejects	Normal	Red	1
<input type="checkbox"/>	GOODGRADE	Good	Normal	Green	1

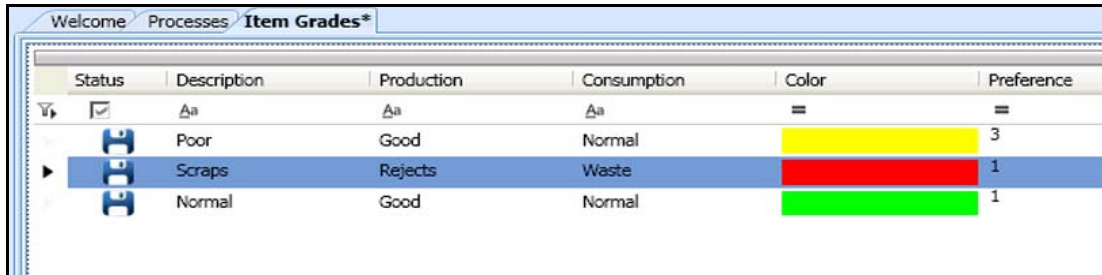
- On the **Item Grades** tab, click **GOODGRADE**, and then in the **Properties** pane, configure the item grade information as follows:




Description: Normal
Production: Good (*default*)
Consumption: Normal (*default*)
Color: Green (*default*)
Preference: 1 (*default*)

Properties
 Description: Normal
 Production: Good
 Consumption: Normal
 Color: Green
 Preference: 1

3. On the **Item Grades** tab, configure the remaining two item grades as follows:

Old Description	Description	Production	Consumption	Color	Preference
ACCEPTABLE	Poor	Good (<i>default</i>)	Normal (<i>default</i>)	Yellow	3
BADGRADE	Scraps	Rejects (<i>default</i>)	Waste	Red (<i>default</i>)	1 (<i>default</i>)



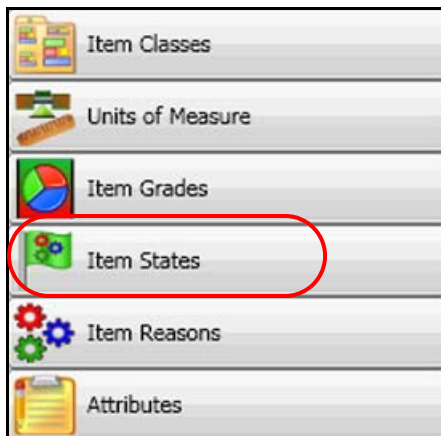
Status	Description	Production	Consumption	Color	Preference
	Poor	Good	Normal	Yellow	3
	Scraps	Rejects	Waste	Red	1
	Normal	Good	Normal	Green	1

4. Save all changes and close the **Item Grades** tab.

This completes the process of configuring item grades for the mixed nut factory.

For the purpose of this lab, the materials in the mixed nut factory are of four types: finished goods, WIP materials, production scrap, and raw materials. Now, you will reconfigure the default item states in Wonderware MES Client to match those of the mixed nut factory.

5. In the **Product Definition** group, click **Item States**.



- On the **Item States** tab, click **GOODSTATE**, and then in the **Properties** pane, configure it as follows:

Item State: Finished Goods
Color: Green (*default*)

- Configure the remaining two item states as follows:

Old Description	Description	Color
BADSTATE	Production Scraps	Red (<i>default</i>)
NORMAL	WIP Materials	Blue

Status	Description	Color	Preference
	Production Scraps	Red	1
	Finished Goods	Green	1
	WIP Materials	Blue	1

- On the **Item States** tab, right-click the empty workspace and select **New**.
- In the **Properties** pane, configure the new item state as follows:

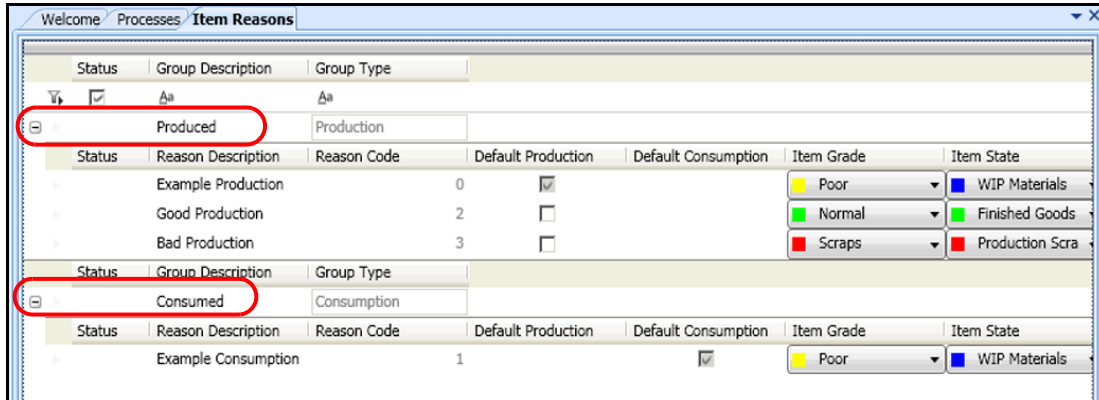
Item State: Raw Materials
Color: Brown

- Save all changes and close the **Item States** tab.

Configure Item Reasons

You will now assign item grades and item states to the production and consumption item reasons.

11. In the **Product Definition** group, click **Item Reasons**, and then on the **Item Reasons** tab, expand the **Produced** and **Consumed** item reason groups.



Each of these item reason groups contains one or more item reasons.

12. On the **Item Reasons** tab, **Produced** item reasons group, configure the item reasons as follows:

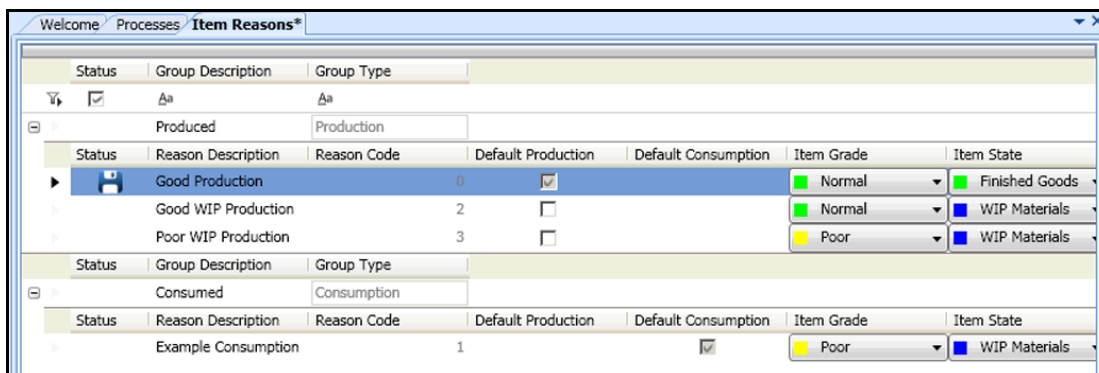
Old Description	Reason Description	Item Grade	Item State
Good Production	Good WIP Production	Normal (<i>default</i>)	WIP Materials
Bad Production	Poor WIP Production	Poor	WIP Materials

13. Save all changes.
14. Click **Example Production** and configure it as follows:

Reason Description: Good Production

Item Grade: Normal

Item State: Finished Goods



15. Right-click the empty workspace and select **New Item Reason**.

Reason Description: Overproduction
Item Grade: Scraps
Item State: Production Scraps

The Properties dialog box shows the following configuration:

- Reason Description:** Overproduction
- Item Grade:** Scraps (indicated by a red square icon)
- Item State:** Production Scraps (indicated by a red square icon)
- Reason Code:** 4

16. Save all changes.
17. In the **Consumed** item reasons group, click **Example Consumption** and configure it as follows:

Reason Description: Good Consumption
Item Grade: Normal
Item State: Raw Materials

The Item Reasons window displays two groups: 'Produced' and 'Consumed'. The 'Consumed' group is expanded, showing the 'Good Consumption' reason selected.

Status	Group Description	Group Type
Produced	Production	
Consumed	Consumption	

Status	Reason Description	Reason Code	Default Production	Default Consumption	Item Grade	Item State
Good Production		0	<input checked="" type="checkbox"/>		Normal	Finished Goods
Good WIP Production		2	<input type="checkbox"/>		Normal	WIP Materials
Poor WIP Production		3	<input type="checkbox"/>		Poor	WIP Materials
Overproduction		4	<input type="checkbox"/>		Scraps	Production Scraps
Good Consumption		1		<input checked="" type="checkbox"/>	Normal	Raw Materials

18. Right-click the empty workspace and select **New Item Reason**.
19. Configure the new item reason as follows:

Reason Description: Poor Consumption

Item Grade: Poor

Item State: Raw Materials

The screenshot shows the 'Item Reasons' window with the 'Produced' group selected. The table below represents the data visible in the window:

Status	Reason Description	Reason Code	Default Production	Default Consumption	Item Grade	Item State
	Good Production	0	<input checked="" type="checkbox"/>		Normal	Finished Goods
	Good WIP Production	2	<input type="checkbox"/>		Normal	WIP Materials
	Poor WIP Production	3	<input type="checkbox"/>		Poor	WIP Materials
	Overproduction	4	<input type="checkbox"/>		Scraps	Production Scraps

20. In the **Consumed** item reasons group, create two more item reasons and configure them as follows:

Reason Description	Item Grade	Item State
WIP Consumption	Normal (default)	WIP Materials
Overconsumption	Scraps	Production Scraps

The screenshot shows the 'Item Reasons' window with the 'Consumed' group selected. The table below represents the data visible in the window:

Status	Reason Description	Reason Code	Default Production	Default Consumption	Item Grade	Item State
	Good Consumption	1		<input checked="" type="checkbox"/>	Normal	Raw Materials
	Poor Consumption	5		<input type="checkbox"/>	Poor	Raw Materials
	WIP Consumption	6		<input type="checkbox"/>	Normal	WIP Materials
	Overconsumption	7		<input type="checkbox"/>	Scraps	Production Scraps

21. Save all changes.

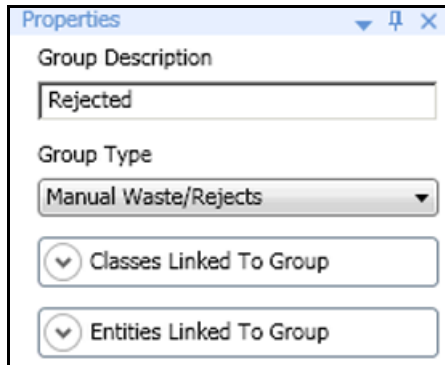
Now, you will create an item reason group and item reasons for rejected production.

22. Right-click the empty workspace and select **New Item Reason Group**.

23. In the **Properties** pane, configure the item reason group as follows:

Group Description: Rejected

Group Type: Manual Waste/Rejects



Properties

Group Description
Rejected

Group Type
Manual Waste/Rejects

Classes Linked To Group

Entities Linked To Group

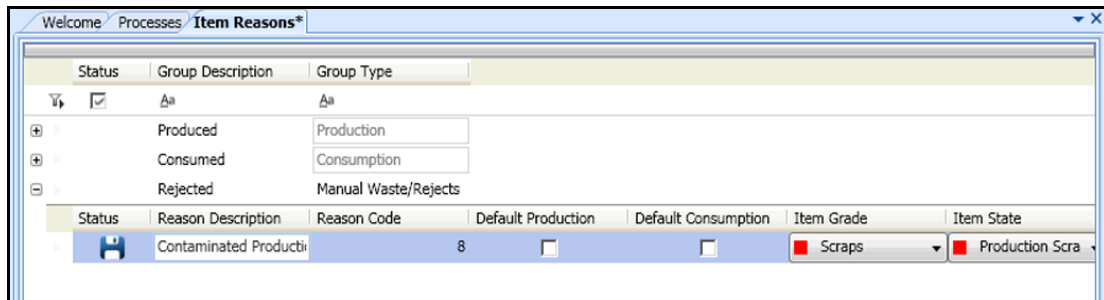
24. Save all changes.

25. Right-click the **Rejected** item reason group to create an item reason, and then configure it as follows:

Reason Description: Contaminated Production

Item Grade: Scraps

Item State: Production Scraps



Status	Group Description	Group Type
+	Produced	Production
+	Consumed	Consumption
-	Rejected	Manual Waste/Rejects

Status	Reason Description	Reason Code	Default Production	Default Consumption	Item Grade	Item State
+	Contaminated Production	8	<input type="checkbox"/>	<input type="checkbox"/>	Scraps	Production Scraps

26. Save all changes and close the **Item Reasons** tab.

Configure Production and Consumption Reasons in the Operations Capability Object

Before using item grades, states, and reasons to describe the quality of consumption and production in runtime, you may set global default reasons for production and consumption in the Operations Capability Object for every entity in the production area. You will set these defaults at the template level in the ArchestrA IDE. This ensures that all instances of the template automatically inherit the changes.

27. In the ArchestrA IDE, **Template Toolbox**, double-click **\$ProductionUnit.ProdCapability**.
28. On the **Job Defaults** tab, to the right of the **Default Reason For Good Production** field, click the ellipsis button.

The screenshot displays the ArchestrA IDE interface for configuring the **\$ProductionUnit.ProdCapability** object. The **Job Defaults** tab is selected, showing various configuration fields and checkboxes. The **Default Reason For Good Production** field is highlighted with a red circle, indicating the target for the next step in the configuration process.

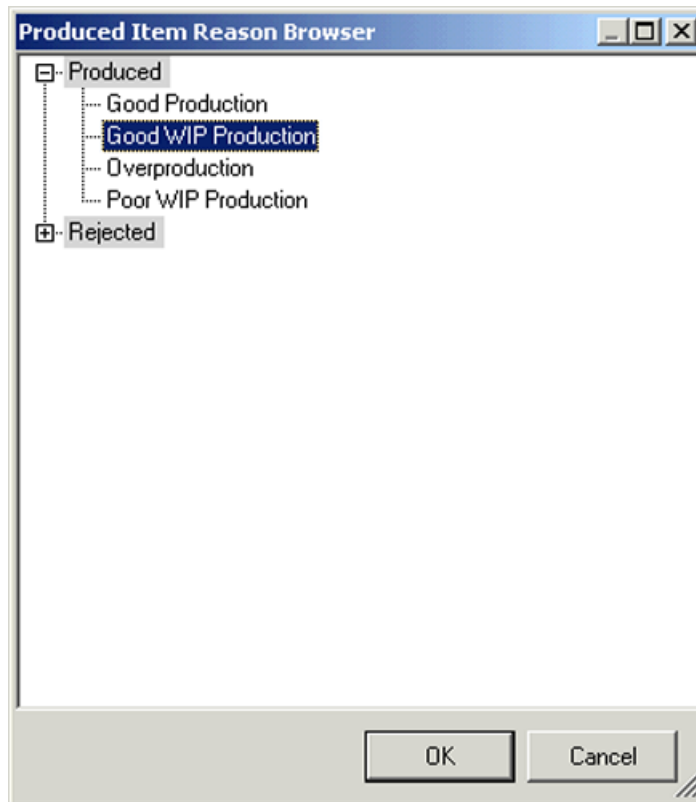
Field	Value	Action
Number of Simultaneous Jobs That Can Run On This Entity:	1	Up/Down arrows
Default Storage Entity For Good Production:		Ellipsis button
Default Storage Entity For Reject Production:		Ellipsis button
Default Storage Entity To Consume Items:		Ellipsis button
Default Reason For Good Production:		Ellipsis button (highlighted)
Default Reason For Normal Consumption:		Ellipsis button
Default Lot Number For Production:		
Default Sublot Number For Production:		

Checkboxes:

- ☐ Automatically End Jobs When Req'd Qtys Are Met
- ☐ Must Produce Required Quantity
- ☐ Auto Apply Production Counts When No Job Running
- ☐ Allow Zero Quantity Split
- ☐ Auto Allocate Quantities To Running Job

The **Produced Item Reason Browser** dialog box appears.

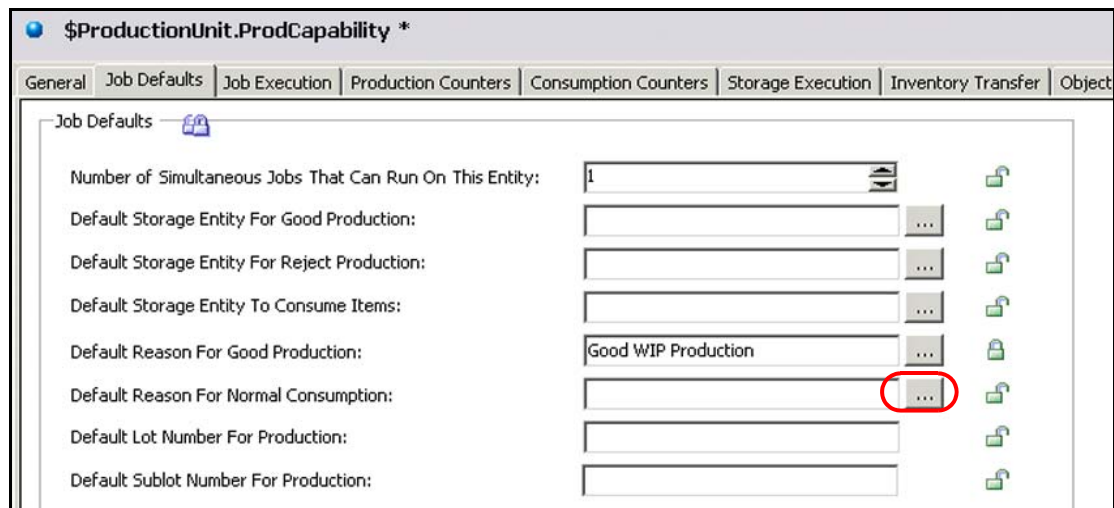
29. Click **Good WIP Production**.



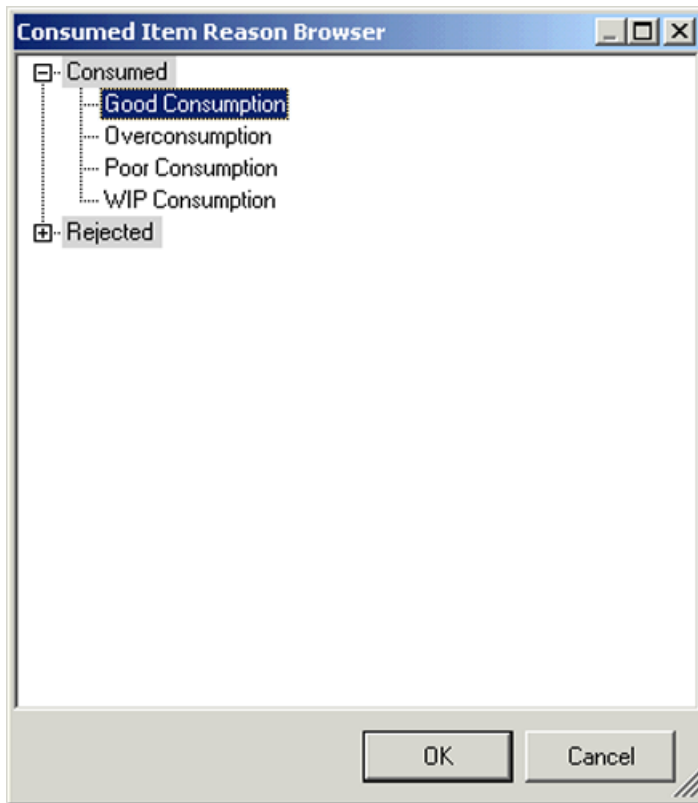
30. Click **OK**.

31. Lock the **Default Reason For Good Production** attribute.

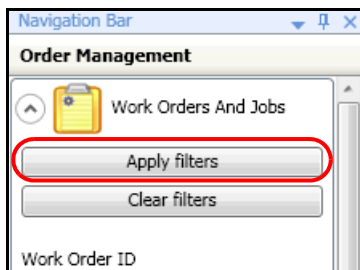
32. To the right of the **Default Reason For Normal Consumption** field, click the ellipsis button.



33. In the **Consumed Item Reason Browser**, ensure **Good Consumption** is selected.

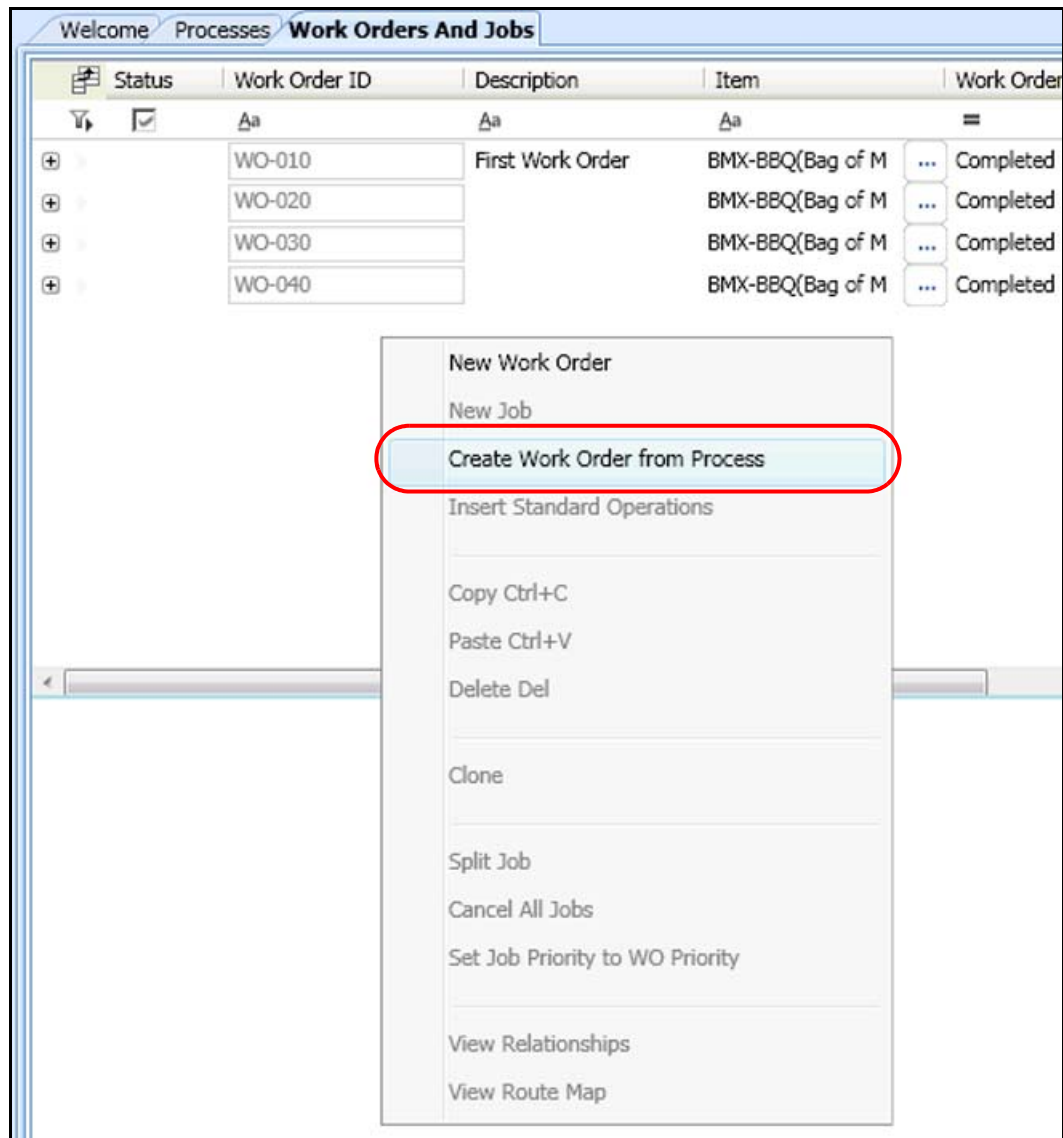


34. Click **OK**.
35. Lock the **Default Reason For Normal Consumption** attribute.
36. Save and close, and then check in the object.
37. Run the **Entity Model Builder** for the **Production** area to resynchronize the plant model.
38. Redeploy the modified objects.
- You will now create a new work order in Wonderware MES Client.
39. In the **Navigation Bar**, **Order Management** group, expand **Work Orders And Jobs**, and then click **Apply filters**.



The **Work Orders And Jobs** tab appears.

40. Right-click the empty workspace and select **Create Work Order from Process**.



41. Configure the work order as follows:

Process ID: BAG-MXN-1
Work Order ID: WO-050
Description: <enter a description>
Item: BMX-BBQ
Required Quantity: 400

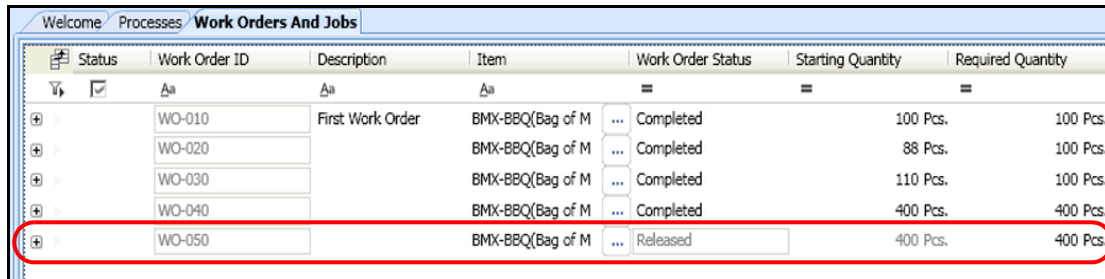
The screenshot shows a software dialog box titled "Create Work Order from Process". It contains the following fields and values:

- Process ID: BAG-MXN-1 (dropdown menu)
- Spec. Version: (empty dropdown menu)
- Work Order ID: WO-050 (text field)
- Description: (empty text field)
- Item: BMX-BBQ (dropdown menu)
- Bom Version: (empty dropdown menu)
- Starting Quantity: 0 (spin box) Pcs.
- Required Quantity: 400 (spin box) Pcs.
- Release Date/Time: 05/08/2013 12:00 AM (text field)
- Due Date/Time: 05/08/2013 12:00 AM (text field)
- Priority: 50 (spin box)
- Customer: (empty text field)
- Manufacturing Order: (empty text field)
- Notes: (empty text area)

At the bottom of the dialog box are "OK" and "Cancel" buttons.

42. Click **OK**.

After a few moments, the new work order appears.



Status	Work Order ID	Description	Item	Work Order Status	Starting Quantity	Required Quantity
+	WO-010	First Work Order	BMX-BBQ(Bag of M	Completed	100 Pcs.	100 Pcs.
+	WO-020		BMX-BBQ(Bag of M	Completed	88 Pcs.	100 Pcs.
+	WO-030		BMX-BBQ(Bag of M	Completed	110 Pcs.	100 Pcs.
+	WO-040		BMX-BBQ(Bag of M	Completed	400 Pcs.	400 Pcs.
+	WO-050		BMX-BBQ(Bag of M	Released	400 Pcs.	400 Pcs.

43. Close the **Work Orders And Jobs** tab.

Run Jobs in Runtime

Now, you will run the jobs for **WO-050** and view the consumption and production reports for the jobs.

44. In the WindowViewer **Production** window, **Internal Set Up** panel, set jobs for **WO-050**.

45. Click **Generate Lots**.

This will automatically populate the consumption and production lots.

46. In the **Enable Options** panel, check the **Reasons** check box.

This enables the **Prod. Reason** field for the **GOOD Prod Counter**, **BAD Prod Counter**, **BOM Component 1**, **BOM Component 2**, and **BOM Component 3** panels. You will use this field to select the item reasons.

	GOOD Prod Counter	BAD Prod Counter	BOM Component 1	BOM Component 2	BOM Component 3
Quantity	0.00	0.00 + S	0.00 ?	0.00 ?	0.00 ?
Add Quantity	Cmd		Cmd	Cmd	Cmd
Status	Ready R	Ready R	Ready R	Ready R	Ready R
Lot	RMX-050	BAD-RMX-050	PNT-050	CSW-050	AMD-050
FG Lot			RMX-050	RMX-050	RMX-050
Location	Roaster	Roaster	Silo01	Silo02	Silo03
Prod. Reason	2 ?	3 ?	1 ?	1 ?	1 ?
			Set as Default	Set as Default	Set as Default

47. In the **Roasting** panel, click the **Roaster** entity and start the roasting job.

To know which of the values are for production and consumption, the InTouch application has an option for displaying the description for **Item Reasons** in a tabular form.

48. In the **GOOD Prod Counter** panel, **Prod. Reason** field, click the question mark button.

GOOD Prod Counter

0.00

Cmd ☐

Ready R

RMX-050

Roaster

2 ?

This displays the **Item Reasons** dialog box that lists the reason codes organized by reason names and reason groups.



Reason Group	Reason Name	Reason Code
Consumed	Good Consumption	1
Consumed	Poor Consumption	5
Consumed	WIP Consumption	6
Consumed	Overconsumption	7
Produced	Good Production	0
Produced	Good WIP Production	2
Produced	Poor WIP Production	3
Produced	Overproduction	4
Rejected	Contaminated Production	8

You will use the **Item Reasons** dialog box to look up the **Reason Code** corresponding to the appropriate **Reason Name**.

Note: It is important that you look up the **Reason Code** for each **Reason Name**, as they may be different for each machine. Also, the **Item Reasons** pop-up window is an overlay window, which means that it will remain displayed while you enter data into WindowViewer.

49. In the **Item Reasons** dialog box, look up the **Reason Code** corresponding to the following **Reason Name** and in the **Prod. Reason** field for each panel, verify the **Reason Code** listed:

Panel **Reason Name**
GOOD Prod Counter: Good WIP Production
BOM Component 1: Good Consumption
BOM Component 2: Good Consumption
BOM Component 3: Good Consumption

	GOOD Prod Counter	BAD Prod Counter	BOM Component 1	BOM Component 2	BOM Component 3
Quantity	0.00	0.00 + S	0.00 ?	0.00 ?	0.00 ?
Add Quantity	Cmd		Cmd	Cmd	Cmd
Status	Ready R	Ready R	Ready R	Ready R	Ready R
Lot	RMX-050	BAD-RMX-050	PNT-050	CSW-050	AMD-050
FG Lot			RMX-050	RMX-050	RMX-050
Location	Roaster	Roaster	Silo01	Silo02	Silo03
Prod. Reason	2 ?	3 ?	1 ?	1 ?	1 ?
			Set as Default	Set as Default	Set as Default

50. Consume peanuts, cashews, and almonds as follows:

	BOM Component 1	BOM Component 2	BOM Component 3
Quantity:	45.00	25.00	25.00
Lot:	PNT-050	CSW-050	AMD-050
Location:	Silo01	Silo02	Silo03

BOM Component 1	BOM Component 2	BOM Component 3
45.00 ?	25.00 ?	25.00 ?
Cmd	Cmd	Cmd
Ready R	Ready R	Ready R
PNT-050	CSW-050	AMD-050
RMX-050	RMX-050	RMX-050
Silo01	Silo02	Silo03
1 ?	1 ?	1 ?
Set as Default	Set as Default	Set as Default

51. Report good production as follows:

Quantity: 95.00
Lot: RMX-050
Location: Roaster

GOOD Prod Counter	
Quantity	95.00
Add Quantity	Cmd <input type="checkbox"/>
Status	Ready R
Lot	RMX-050
FG Lot	
Location	Roaster
Prod. Reason	2 ?

52. End the roasting job.

Note: In the **DB Views** window, you can access the **Production Data** and **Consumption Data** reports to view the consumption and production activities and their corresponding item reasons.

Now, you will run the coating job.

53. In the **Coating** panel, click the **Coater** entity and start the coating job.

54. In the **Prod. Reason** field, enter the **Reason Code** corresponding to the values as follows:

Panel	Reason Name
GOOD Prod Counter:	Poor WIP Production
BOM Component 1:	WIP Consumption
BOM Component 2:	Good Consumption
BOM Component 3:	Good Consumption

	GOOD Prod Counter	BOM Component 1	BOM Component 2	BOM Component 3
Quantity	0.00	0.00 ?	0.00 ?	0.00 ?
Add Quantity	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Status	Ready R	Ready R	Ready R	Ready R
Lot	FMX-050	RMX-050	OIL-050	BBQ-050
FG Lot		FMX-050	FMX-050	FMX-050
Location	Coater	Roaster	Tank01	Receiving
Prod. Reason	3 ?	6 ?	1 ?	1 ?
		Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

4-114 Module 4 – More on the Operations Model

55. Consume roasted mixed nuts, coating oil, and BBQ flavoring as follows:

	BOM Component 1	BOM Component 2	BOM Component 3
Quantity:	95.00	2.00	3.00
Lot:	RMX-050	OIL-050	BBQ-050
Location:	Roaster	Tank01	Receiving

BOM Component 1	BOM Component 2	BOM Component 3
<input type="text" value="95.00"/> ?	<input type="text" value="2.00"/> ?	<input type="text" value="3.00"/> ?
Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Ready R	Ready R	Ready R
<input type="text" value="RMX-050"/>	<input type="text" value="OIL-050"/>	<input type="text" value="BBQ-050"/>
<input type="text" value="FMX-050"/>	<input type="text" value="FMX-050"/>	<input type="text" value="FMX-050"/>
<input type="text" value="Roaster"/>	<input type="text" value="Tank01"/>	<input type="text" value="Receiving"/>
<input type="text" value="6"/> ?	<input type="text" value="1"/> ?	<input type="text" value="1"/> ?
Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

56. Report good production as follows:

Quantity: 100.00
Lot: FMX-050
Location: Coater

GOOD Prod Counter
<input type="text" value="100.00"/>
Cmd <input type="checkbox"/>
Ready R
<input type="text" value="FMX-050"/>
<input type="text" value="Coater"/>
<input type="text" value="3"/> ?

57. End the coating job.

You will now start the bagging job.

58. In the **Bagging** panel, click the **Bagger** entity and start the bagging job.

59. In the **Prod. Reason** field, enter the **Reason Code** corresponding to the values as follows:

Panel	Reason Name
GOOD Prod Counter:	Good Production
BOM Component 1:	WIP Consumption
BOM Component 2:	Good Consumption

GOOD Prod Counter	BOM Component 1	BOM Component 2
0.00	0.00 ?	0.00 ?
Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Ready R	Ready R	Ready R
BMX-050	FMX-050	BAG-050
	BMX-050	BMX-050
ProductionStorage	Coater	Receiving
0 ?	6 ?	1 ?
	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

60. In the **BOM Component 1** panel, consume **100.00** pounds of flavored mixed nuts.

61. In the **BOM Component 2** panel, click **Set as Default** to set the lot code for the backflush consumption of the empty bags.

62. Report good production as follows:

Quantity: 400.00
Lot: BMX-050
Location: ProductionStorage

63. End the bagging job.

The production and consumption data now include quality information in the form of grades, states, and reasons.

64. In the **DB Views** window, click **Consumption Data**.

65. Organize the data by **wo_id** and **oper_id**.

66. Expand **WO-050** and each operation.

seq_no	ent_name	qty_cons	item_id	item_desc	units	item_class_desc	lot_no	from_ent_name	fg_lot_no
wo_id : WO-040 (3 items)									
wo_id : WO-050 (3 items)									
oper_id : 100-RST (3 items)									
0	Roaster	45	PNT-BLK	Peanuts Bulk	lbs	Raw Materials	PNT-050	Silo01	RMX-050
0	Roaster	25	CSW-BLK	Cashews Bulk	lbs	Raw Materials	CSW-050	Silo02	RMX-050
0	Roaster	25	AMD-BLK	Almonds Bulk	lbs	Raw Materials	AMD-050	Silo03	RMX-050
oper_id : 200-COA (3 items)									
0	Coater	95	RMX-BLK	Roasted Mixed...	lbs	Intermediate Mat...	RMX-050	Roaster	FMX-050
0	Coater	2	OIL-LQD	Coating Oil	gal	Raw Materials	OIL-050	Tank01	FMX-050
0	Coater	3	BBQ-FLA	BBQ Flavoring	lbs	Raw Materials	BBQ-050	Receiving	FMX-050
oper_id : 300-BAQ (2 items)									
0	Bagger	100	FMX-BBQ	Flavored Mixed...	lbs	Intermediate Mat...	FMX-050	Coater	BMX-050
0	Bagger	400	BAQ-BBQ	BBQ Mixed Nut...	Pcs.	Raw Materials	BAQ-050	Receiving	BMX-050

67. Scroll right and verify the consumption data.

68. View the **Production Data** report and verify the production data.

wo_id /		oper_id /								
seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent
wo_id : WO-010 (3 items)										
wo_id : WO-020 (3 items)										
wo_id : WO-030 (3 items)										
wo_id : WO-040 (3 items)										
wo_id : WO-050 (3 items)										
oper_id : 100-RST (1 item)										
0	Roaster	95	✓	95	RMX-BLK	Roasted Mixed...	Pounds	WIP Materials	RMX-050	Roaster
oper_id : 200-COA (1 item)										
0	Coater	100	✓	100	FMX-BBQ	Flavored Mixed...	Pounds	WIP Materials	FMX-050	Coater
oper_id : 300-BAG (1 item)										
0	Bagger	400	✓	400	BMX-BBQ	Bag of Mixed N...	Pieces	Finished Goods	BMX-050	Production

Section 5 – By-Products

This section discusses how to define By-Products and how to track their production in runtime.

Overview

A by-product is a secondary product that is produced during the manufacturing of something else. For example, in a manufacturing process, waste water comes out as a by-product. You may want to measure the amount of the waste water coming out of the manufacturing process for the compliance reasons. To do this, you sometimes run into a separation phase.

In this case, you will identify one of the produced materials as the finished good and all other produced materials as by-products. If you have a derived product, separation phase, or more than one output in a process, one of the products will be the finished good and all others will be by-products.

By-products can be a model in BOM. Similar to specifying the finished good and the **Production Rules** for the finished good in BOM, you can also specify the by-products to be produced as a part of the execution of that BOM and the rules used to track the execution of the by-products.

You can define an item as a by-product by modifying the configuration in the database to be able to define the material and modifying the BOM to specify that it will be a by-product. Then you will modify the process to add it resulting from the process.

The materials are defined by selecting the **Items** module in the Wonderware MES Client, **Product Definition** group. Configure the BOM of the item that will be producing the by-product of the item configured, and configure a BOM position less than zero to designate it as a by-product of the process. By-products are always denoted with a negative BOM position value, and they are always produced, not consumed.

After the by-product is defined, the process needs to be modified to link the by-product to the item to add all remaining quantity to the process.

Lab 11 – Tracking By-Products

Introduction

In this lab, you will use Wonderware MES Client to define a by-product and use the InTouch application to report its production in runtime. In the mixed nut process, the flavoring comes in plastic jugs. The flavoring supplier offers a refund for empty jugs returned. Therefore, you want to track how many empty jugs are generated. These jugs are produced as a result of running the process. Therefore, you will consider it to be a by-product.

Objectives

Upon completion of this lab, you will be able to:

- Define by-products
- Add by-products
- Track the production of by-products in runtime

Define the Empty Jug By-Product

First, you will define the empty jug by-product in Wonderware MES Client.

1. In the Wonderware MES Client, click the **Product Definition** group.
2. In the **Items** module, click **Apply filters**.
3. Create a new item and configure it as follows:

Item ID: FLA-JUG
Item Class ID: WIP Materials
Item Description: Empty Flavoring Jug
Units: Pieces
Num Decimals: 0 (*default*)



The screenshot shows a 'Properties' dialog box with the following fields and values:

Field	Value
Item ID	FLA-JUG
Item Class ID	WIP Materials
Item Description	Empty Flavoring Jug
Units	Pieces
Num Decimals	0

4. Save all changes.

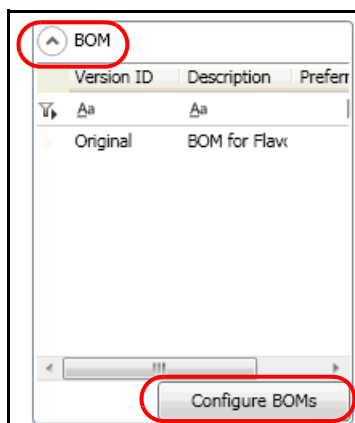
Add the Empty Jug By-Product to the BOM

Now, you will add the empty jug by-product to the BOM for **FMX-BBQ**. This is because flavoring takes place in the coating operation.

- On the **Items** tab, click **FMX-BBQ**.

Status	Item ID	Item Description	Item Class ID	Units	Num Decimals	Lifetime
	AMD-BLK	Almonds Bulk	Raw Materials	Pounds	3	
	BAG-BBQ	BBQ Mixed Nut - Empty	Raw Materials	Pieces	0	
	BBQ-FLA	BBQ Flavoring	Raw Materials	Pounds	3	
	BMX-BBQ	Bag of Mixed Nut - BBC	Finished Goods	Pieces	0	
	CSW-BLK	Cashews Bulk	Raw Materials	Pounds	3	
	Example Item	Not a Real Item	Example Item Class	Pieces	0	
	FMX-BBQ	Flavored Mixed Nut - B	WIP Materials	Pounds	3	
	OIL-LQD	Coating Oil	Raw Materials	Gallons	3	
	PNT-BLK	Peanuts Bulk	Raw Materials	Pounds	3	
	RMX-BLK	Roasted Mixed Nut	WIP Materials	Pounds	3	
	FLA-JUG	Empty Flavoring Jug	WIP Materials	Pieces	0	

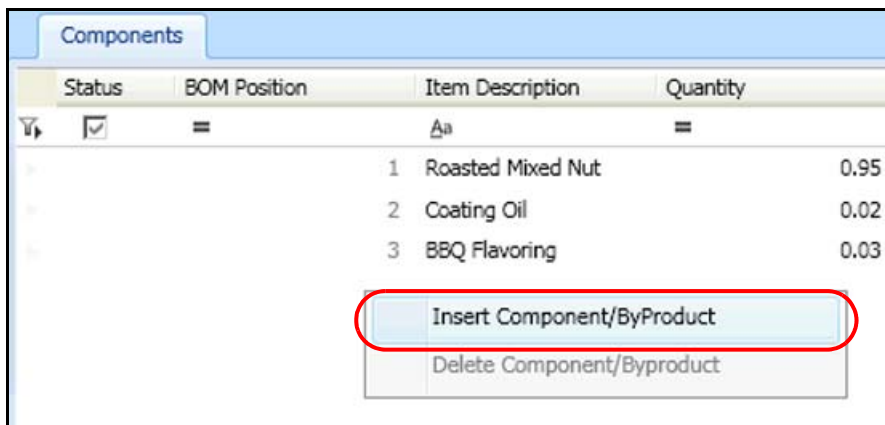
- In the **Properties** pane, expand **BOM**, and then click **Configure BOMs**.



- On the **FMX-BBQ-BOM** tab, click the **Original** BOM.

Status	Version ID	Description	Preferred Version
<input checked="" type="checkbox"/>	Original	BOM for Flavored Mixe	<input checked="" type="checkbox"/>

8. On the **Components** tab, right-click the empty workspace and select **Insert Component/ByProduct**.



This allows you to add empty jugs as by-products to **FMX-BBQ**.

9. In the **Properties** pane, configure the BOM as follows:

BOM Position: -1
Item: Empty Flavoring Jug
Quantity: 1

Properties

BOM Position: -1

Item: Empty Flavoring Jug

Required Grade: [Dropdown]

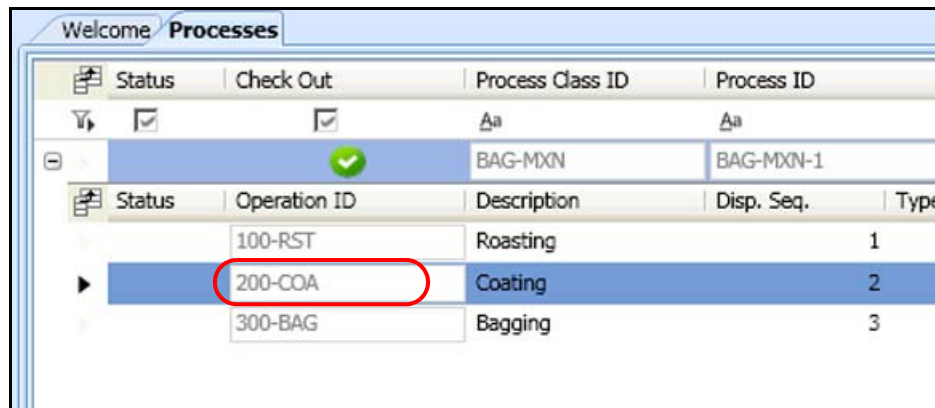
Default Reason: [Dropdown]

Quantity: 1

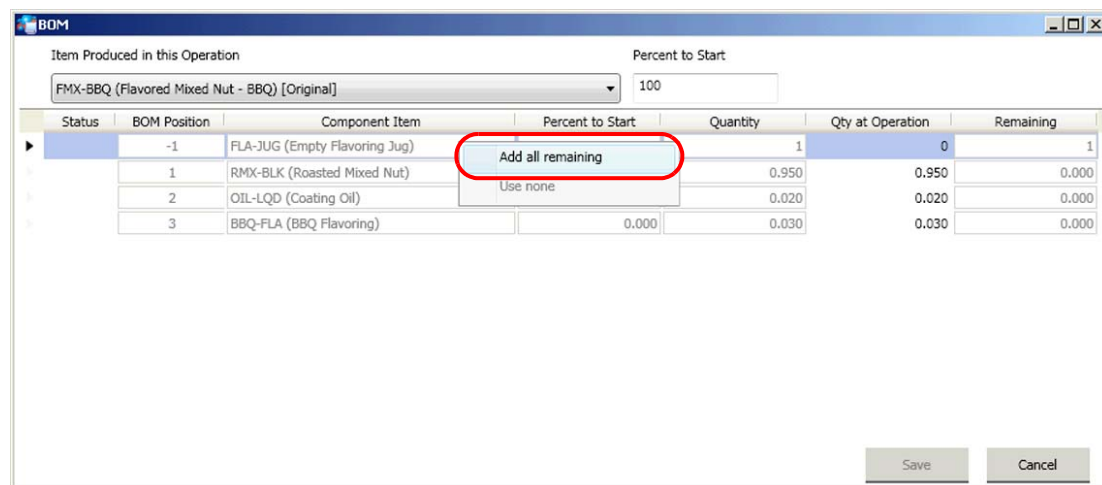
Note: BOM Positions less than 0 are used for by-products, BOM Positions greater than 0 are used for components that are consumed during the running of a job, and BOM Position 0 is used for the produced item.

10. Save all changes and close the **FMX-BBQ-BOM** tab.
 11. Save all changes and close the **Items** tab.
- You will now modify the process to specify the operation in which this by-product is produced.
12. On the **Processes** tab, check out the **BAG-MXN-1** process.

13. On the **Processes** tab, click the **200-COA** operation.

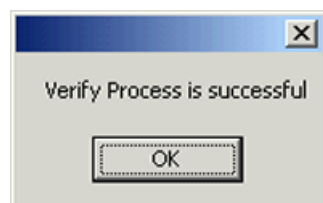


14. In the **Properties** pane, expand **BOM**, and then click **Configure Operation BOM**.
15. In the **BOM** dialog box, right-click **FLA-JUG (Empty Flavoring Jug)** and select **Add all remaining**.



16. Click **Save** and close the **BOM** dialog box.
17. On the **Processes** tab, right-click **BAG-MXN-1** and select **Verify Process**.

The confirmation dialog box appears.



18. Click **OK**.
19. Check in the process.

Track the Production of By-Products in Runtime

Now, you will create a new work order in Wonderware MES Client, run the jobs for that work order, and track all production for these jobs, including by-products.

20. On the **Processes** tab, right-click **BAG-BMX-1** and select **Create Work Order**.

21. In the **Create Work Order from Process** dialog box, configure the work order as follows:

Work Order ID:	WO-060
Description:	<enter a description>
Item:	BMX-BBQ
Required Quantity:	400

22. Click **OK**.

Instead of creating a new counter in the Operations Capability Object, you will reuse the **Good Prod Counter** that you already have by changing the **BOM Position** attribute in the counter. This will enable you to use the same counter to report production for both the finished goods and the by-products.

23. In the WindowViewer **Production** window, **Enable Options** panel, check the **BOM Position** check box.



This enables the **BOM Position** field in the **GOOD Prod Counter** and the **BAD Prod Counter**. You will use this field to modify the **BOM Position** and report production for the by-product.

24. In the **Internal Set Up** panel, **Selected Work Order** field, set the jobs for **WO-060**.

25. Click **Generate Lots** to automatically populate the consumption and production lots.

You will now run the roasting job.

26. Select the **Roaster** entity and start the roasting job.

27. Consume peanuts, cashews, and almonds as follows:

	BOM Component 1	BOM Component 2	BOM Component 3
Quantity:	45.00	25.00	25.00
Lot:	PNT-060	CSW-060	AMD-060
Location:	Silo01	Silo02	Silo03

BOM Component 1	BOM Component 2	BOM Component 3
45.00 ?	25.00 ?	25.00 ?
Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Ready R	Ready R	Ready R
PNT-060	CSW-060	AMD-060
RMX-060	RMX-060	RMX-060
Silo01	Silo02	Silo03
1 ?	1 ?	1 ?
Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

28. In the **GOOD Prod Counter** panel, **Quantity** field, report good production of **95.00** pounds.

GOOD Prod Counter

95.00

Cmd ☐

Ready **R**

RMX-060

Roaster

2 ?

29. End the roasting job.

4-128 Module 4 – More on the Operations Model

You will now run the coating job.

30. Select the **Coater** entity and start the coating job.

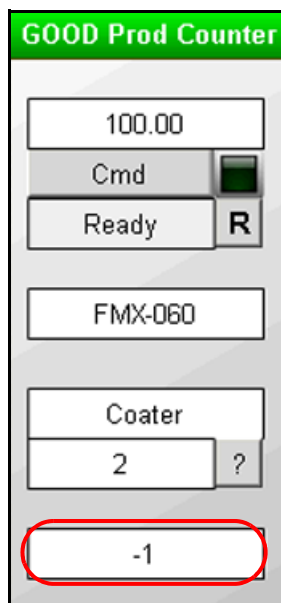
31. Consume roasted mixed nuts, coating oil, and flavoring as follows:

	BOM Component 1	BOM Component 2	BOM Component 3
Quantity:	95.00	2.00	3.00
Lot:	RMX-060	OIL-060	BBQ-060
Location:	Roaster	Tank01	Receiving

32. Report **100.00** pounds of **FMX-BBQ** as good WIP production.

You will now report production of the empty jug by-product.

33. In the **GOOD Prod Counter** panel, **BOM Position** field, enter **-1**.



This sets the production counter to report the by-product production.

34. In the **GOOD Prod Counter** panel, report production of the by-product as follows:

Quantity: 1.00
Lot: FLA-060

35. In the **GOOD Prod Counter** panel, **BOM Position** field, enter **0**.

Note: This is to make sure that you do not record by-products the next time good production is reported.

36. End the coating job.

37. In WindowViewer, run the bagging job for the **WO-060** work order and report consumption and production as follows:

Operation	Consumption Quantity	Production Quantity
Bagging	BOM 1: 100 pounds of FMX-BBQ	400 pieces of BMX-BBQ
	BOM 2: Set default lots for backflush consumption	

Note: Do not forget to end the bagging job.

Now, you will view reports using **DB Views**.

38. Click **DB Views**, and then click **Production Data**.

39. Organize the report by **wo_id** and **oper_id**.

40. Expand **WO-060** and the **200-COA** operation.

wo_id	oper_id	seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent
wo_id : WO-010 (3 items)												
wo_id : WO-020 (3 items)												
wo_id : WO-030 (3 items)												
wo_id : WO-040 (3 items)												
wo_id : WO-050 (3 items)												
wo_id : WO-060 (3 items)												
oper_id : 100-RST (1 item)												
oper_id : 200-COA (2 items)												
		0	Coater	100	✓	100	FMX-BBQ	Flavored Mixed...	Pounds	WIP Materials	FMX-060	Coater
		0	Coater	1	✓	100	FLA-JUG	Empty Flavorin...	Pieces	WIP Materials	FLA-060	Coater
oper_id : 300-BAQ (1 item)												

The report displays the production of flavored mixed nuts and an empty jug by-product. This means that production for the main product as well as the by-product is reported for this job.

41. Click **Genealogy** and organize the report by **wo_id** and **oper_id**.
 42. Expand **WO-060** and the **200-COA** operation.

The report displays the consumption of roasted mixed nuts, coating oil, and flavoring. However, it does not display the production of a by-product. This is because by-products are produced and not consumed.

wo_id	oper_id	seq_no	fg_item_id	qty_prod	produced_units	good_prod	fg_lot_no	to_ent_name	fg_reas_desc	fg_item_grade_desc	fg_item_status_desc
wo_id : WO-040 (3 items)											
wo_id : WO-050 (3 items)											
wo_id : WO-060 (3 items)											
oper_id : 100-RST (3 items)											
oper_id : 200-COA (3 items)											
		0	FMX-BBQ	100	Pounds	✓	FMX-060	Coater	Good WIP Prod...	Normal	WIP Materials
		0	FMX-BBQ	100	Pounds	✓	FMX-060	Coater	Good WIP Prod...	Normal	WIP Materials
		0	FMX-BBQ	100	Pounds	✓	FMX-060	Coater	Good WIP Prod...	Normal	WIP Materials
oper_id : 300-BAQ (2 items)											

Section 6 – Schedule Jobs at a Parent Entity

This section discusses how to schedule jobs at a parent entity and run the jobs at children entities.

Overview

Leveraging the MES hierarchical entity model created in your application, you can schedule jobs at the parent entity and run them at the child entity.

You can pick up one of the children entities to run the job. By running the job at one of the children entities, you can decide in runtime on which machine or location you want to run jobs. For example, if you have two identical production lines and a production area, you can select anyone of the two production lines to run the job because the lines are identical.

In the ArchastrA IDE, define an application object for the parent entity and then define an application object for running the job. For the parent entity, check the **Entity Can Schedule Jobs** check box on the General tab for the object and assign the entity to the area where you would like to schedule the job. For the child entity, check the **Entity Can Run Jobs** check box on the General tab and assign the entity to the area where you would like to run the job.

Lab 12 – Scheduling Jobs at a Parent Entity

Introduction

In previous labs, you looked at the processes, consumption, and production in the Production area. In this lab, you will focus on the Shipping area. You will use Wonderware MES Client to schedule jobs at a parent entity level. You will use an InTouch application to run jobs at the child entities level. In this way, you will leverage the MES hierarchical entity model you defined in your application.

You will model all the necessary information, entities, bill of materials (BOMs), and processes in the Shipping area. You will assume that there are two identical boxers that use empty boxes and fill them with 100 bags of flavored mixed nuts each. You will schedule the processes at the parent entity level, Shipping. You will enable the child entities to run jobs either separately or simultaneously.

Objectives

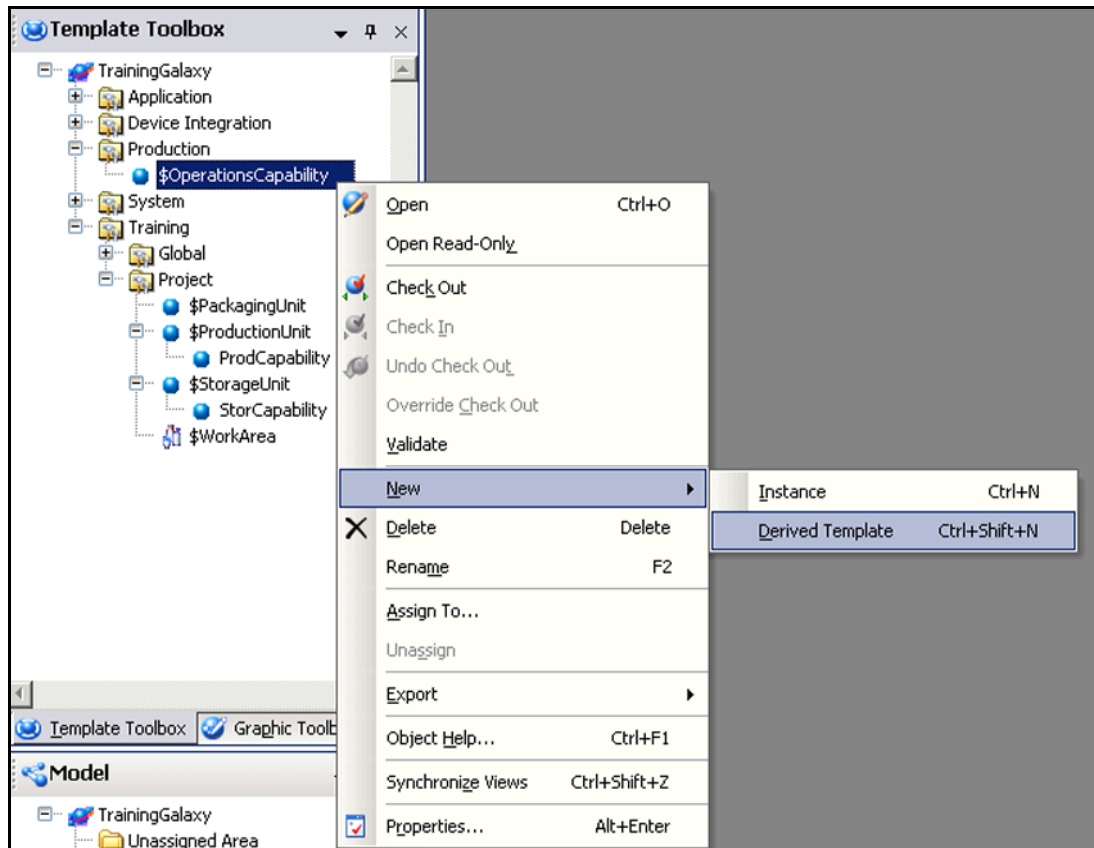
Upon completion of this lab, you will be able to:

- Configure the MES model to schedule jobs at a parent entity and run them at children entities
- Split jobs
- Use input/output sources in Operations Capability objects

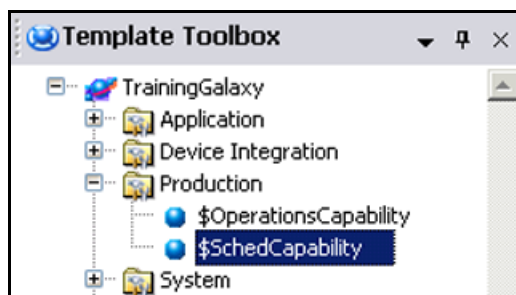
Define Entity Model for Shipping

You will define the entity model for Shipping. You need an Operations Capability Object at the Shipping area, so that you can schedule jobs in this area and run them in **Boxer01** and **Boxer02**. Therefore, now you will create a derived Operations Capability Object template.

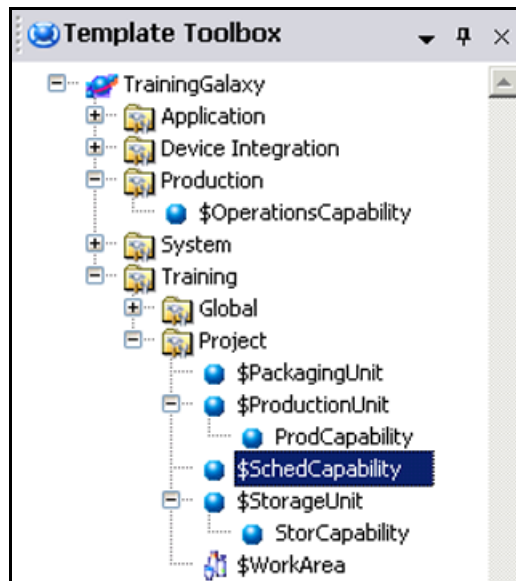
1. In the ArchestrA IDE, **Template Toolbox**, right-click **\$OperationsCapability** and select **New | Derived Template**.



2. Rename the object **\$SchedCapability**.

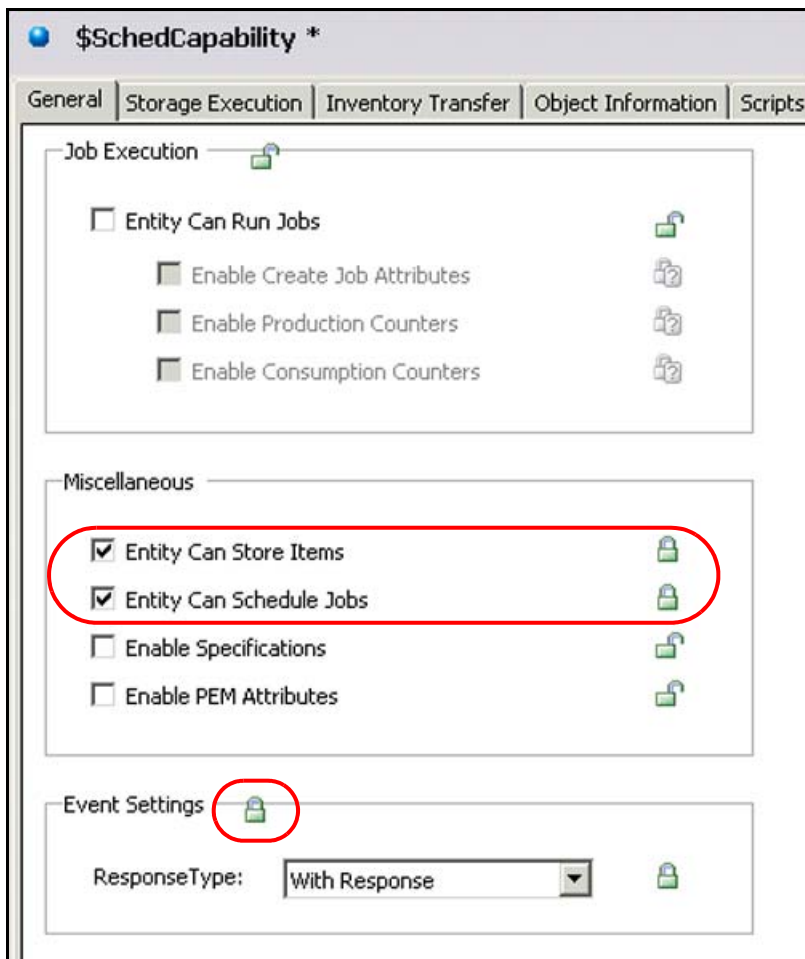


3. Drag **\$SchedCapability** to the **Project** toolset.



Now, you will configure the scheduling capabilities for the **\$SchedCapability** template.

4. Double-click **\$SchedCapability** to open the configuration editor.
5. On the **General** tab, **Miscellaneous** area, check **Entity Can Store Items** and **Entity Can Schedule Jobs**, and then lock them.
6. Leave the default value for **ResponseType** and lock the **Event Settings** area.



Note: The **Entity Can Schedule Jobs** feature is needed for the completion of this lab, but the **Entity Can Store Items** feature will be used in a subsequent lab.

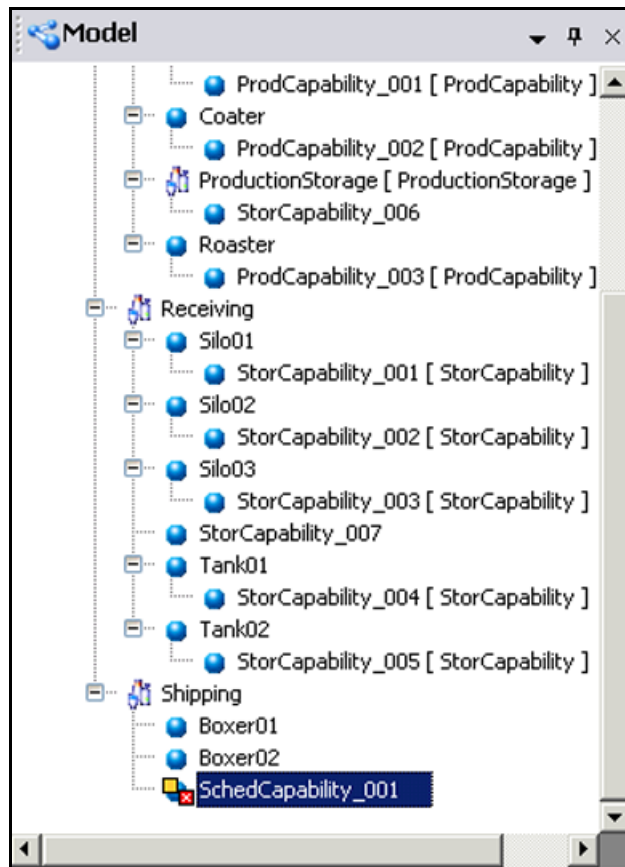
7. Save and close, and then check in the object.

You will now create a new instance of the **\$SchedCapability** object.

8. Right-click **\$SchedCapability** and select **New | Instance**.

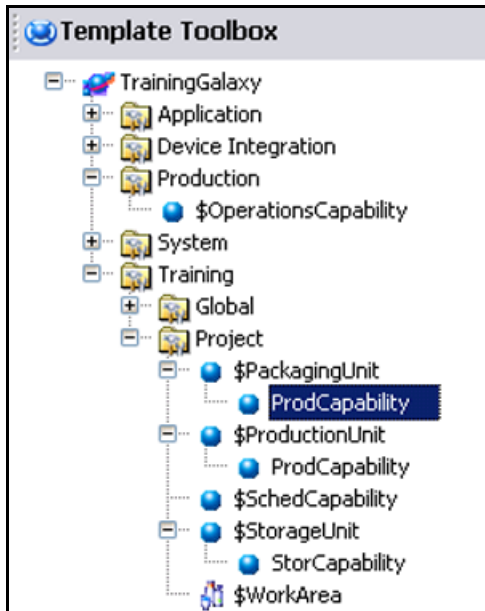
In the **Model** view, **UnassignedArea** folder, **SchedCapability_001** appears.

9. Drag **SchedCapability_001** to the **Shipping** area.



Now, you will create a new Operations Capability Object for the two boxers and configure it to be capable of running jobs.

10. In the **Template Toolbox**, create a new derived template of **\$OperationsCapability** and name it **\$ProdCapability**.
11. Drag **\$ProdCapability** to **\$PackagingUnit**.



12. Double-click **\$PackagingUnit.ProdCapability**.
13. On the **General** tab, configure the **Job Execution** area as follows:


Item	Check	Lock
Entity Can Run Jobs:	<i>checked</i>	<i>locked</i>
Enable Production Counters:	<i>checked</i>	<i>locked</i>


14. Leave the default value for **ResponseType** and lock the **Event Settings** area.


\$PackagingUnit.ProdCapability *


General | Job Defaults | Job Execution | Production Counters | Object Info

Job Execution


☒ Entity Can Run Jobs 


☐ Enable Create Job Attributes 


☒ Enable Production Counters 


☐ Enable Consumption Counters 


Miscellaneous


☐ Entity Can Store Items 

☐ Entity Can Schedule Jobs 

☐ Enable Specifications 


☐ Enable PEM Attributes 

Event Settings 

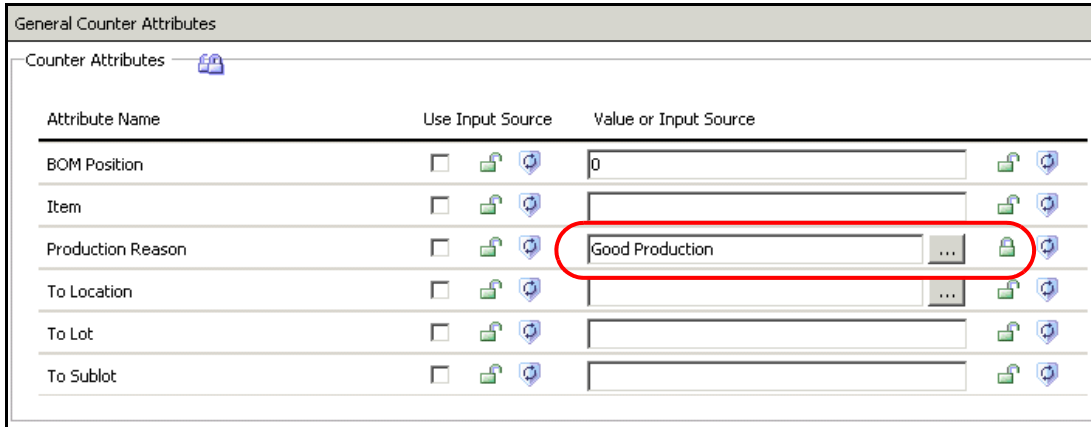
ResponseType: With Response 

You will now create a production counter.

15. Click the **Production Counters** tab.

16. Click the **Add** button , and then name the new counter **PackCnt**.

17. In the **General Counter Attributes** area, **Production Reason** attribute, **Value or Input Source** field, select **Good Production** and lock it.



Attribute Name	Use Input Source	Value or Input Source
BOM Position	<input type="checkbox"/>	0
Item	<input type="checkbox"/>	
Production Reason	<input type="checkbox"/>	Good Production
To Location	<input type="checkbox"/>	
To Lot	<input type="checkbox"/>	
To Sublot	<input type="checkbox"/>	

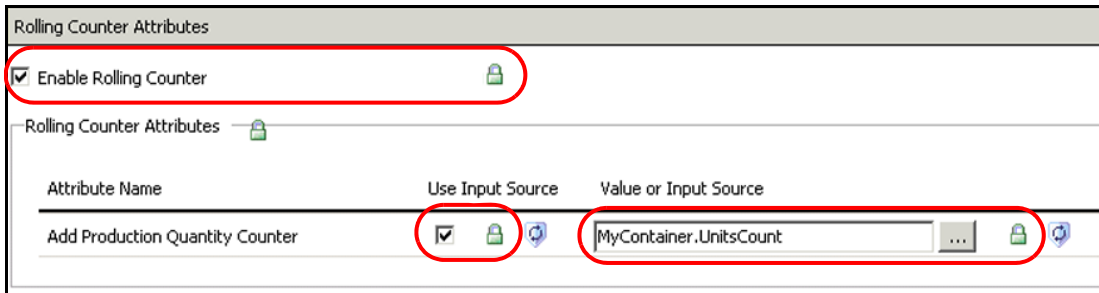
18. Configure the **Rolling Counter Attributes** group as follows:

Enable Rolling Counter: *checked and locked*

Rolling Counter Attributes

Use Input Source: *checked and locked*

Value or Input Source: *MyContainer.UnitsCount and locked*






Attribute Name	Use Input Source	Value or Input Source
Add Production Quantity Counter	<input checked="" type="checkbox"/>	MyContainer.UnitsCount

19. Configure the **Rolling Counter Data** area as follows:

Item	Value	Lock
Deadband:	1.0 (<i>default</i>)	<i>locked</i>
Update Interval:	00:00:05.0000000 (<i>5 seconds</i>)	<i>locked</i>
Max Value:	1000.0	<i>locked</i>

Rolling Counter Data

Deadband:	<input style="width: 90%;" type="text" value="1.0"/>	
Update Interval:	<input style="width: 90%;" type="text" value="00:00:05.0000000"/>	
Max Value:	<input style="width: 90%;" type="text" value="1000.0"/>	

Note: The update interval is set for quick updates for training purposes. However, in a real-time process, this value has to be set carefully because changing this value might affect the application performance.

You will now create scripts to start jobs from the boxers.

20. Click the **Scripts** tab.

21. On the **Scripts** tab, click the **Add** button  to add a new script, name it **StartBatch**, and then configure it as follows:

Note: You can search the **C:\Training** folder for the **Lab 12 - StartBatch Script.txt** file to copy and paste the contents of this script.

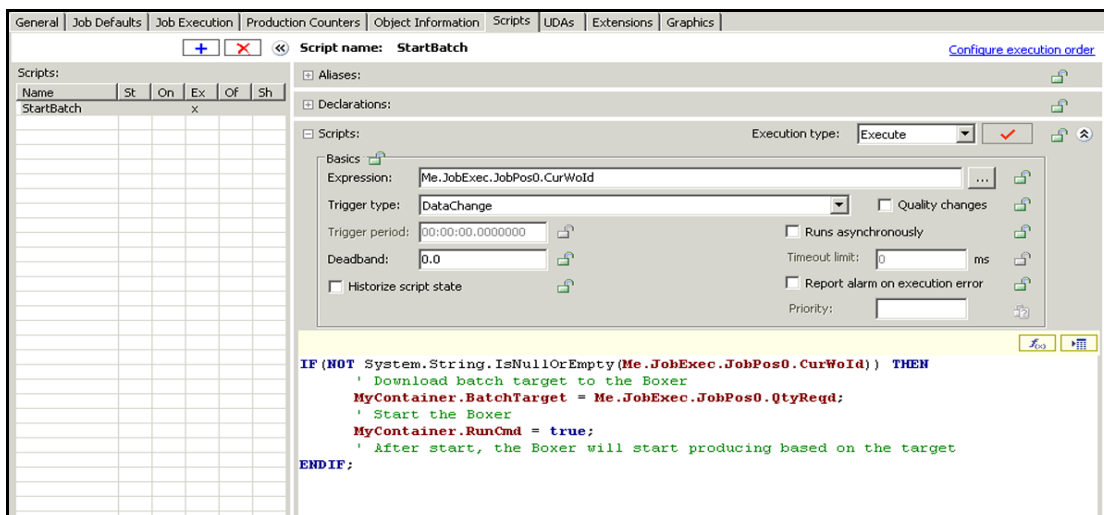
Execution type: Execute (default)

Expression: Me.JobExec.JobPos0.CurWold

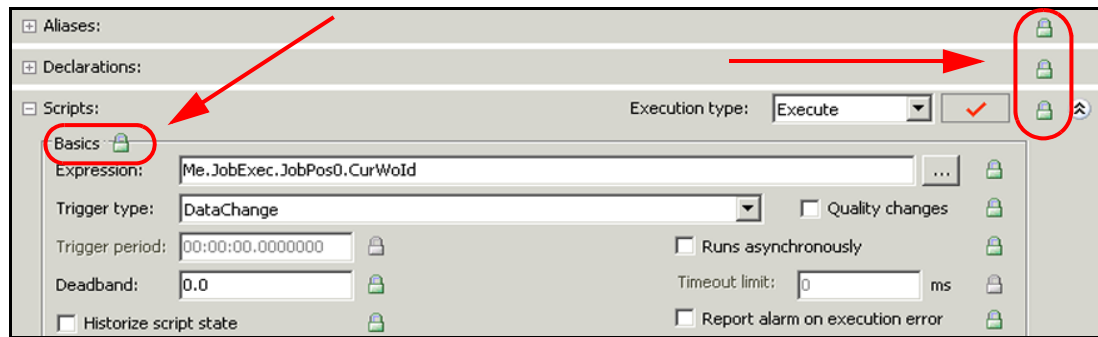
Trigger type: DataChange

22. In the script body enter the following:

```
IF (NOT System.String.IsNullOrEmpty(Me.JobExec.JobPos0.CurWoId)) THEN
    ' Download batch target to the Boxer
    MyContainer.BatchTarget = Me.JobExec.JobPos0.QtyReqd;
    ' Start the Boxer
    MyContainer.RunCmd = true;
    ' After start, the Boxer will start producing based on the target
ENDIF;
```



23. Lock all of the attributes.



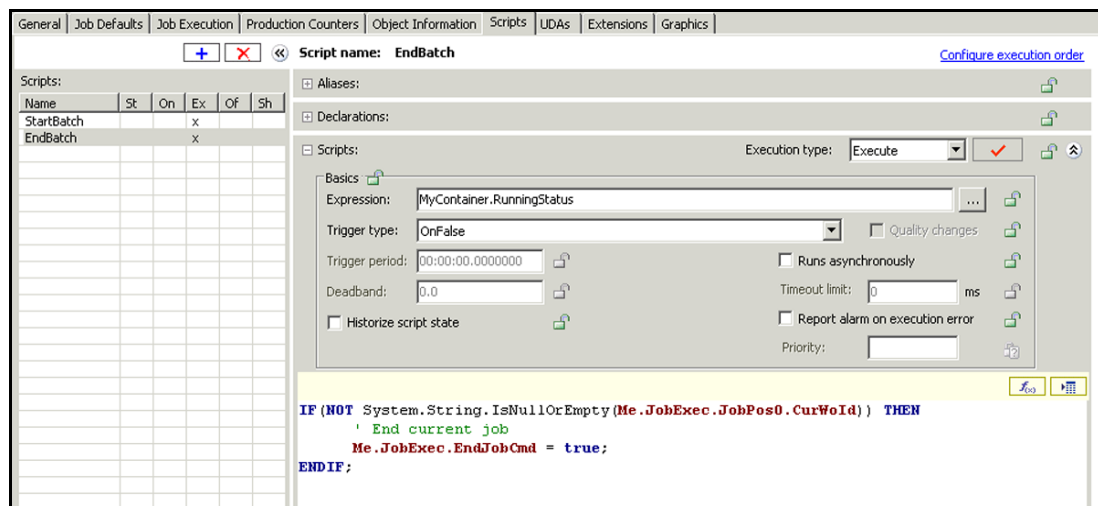
24. On the **Scripts** tab, click the **Add** button to add a new script named **EndBatch** and configure it as follows:

Note: You can search the **C:\Training** folder for the **Lab 12 - EndBatch Script.txt** file to copy and paste the contents of this script.

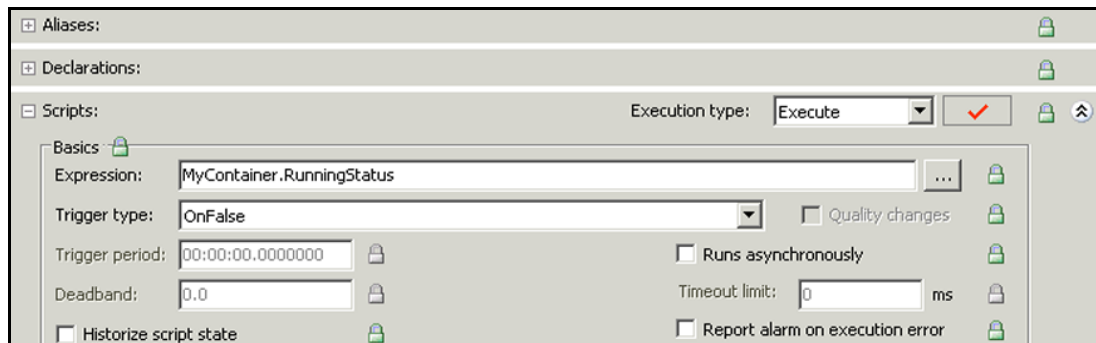
Execution type: Execute (default)
Expression: MyContainer.RunningStatus
Trigger type: OnFalse

25. In the script body enter the following:

```
IF (NOT System.String.IsNullOrEmpty(Me.JobExec.JobPos0.CurWoId)) THEN
    ' End current job
    Me.JobExec.EndJobCmd = true;
ENDIF;
```



26. Lock all of the attributes.

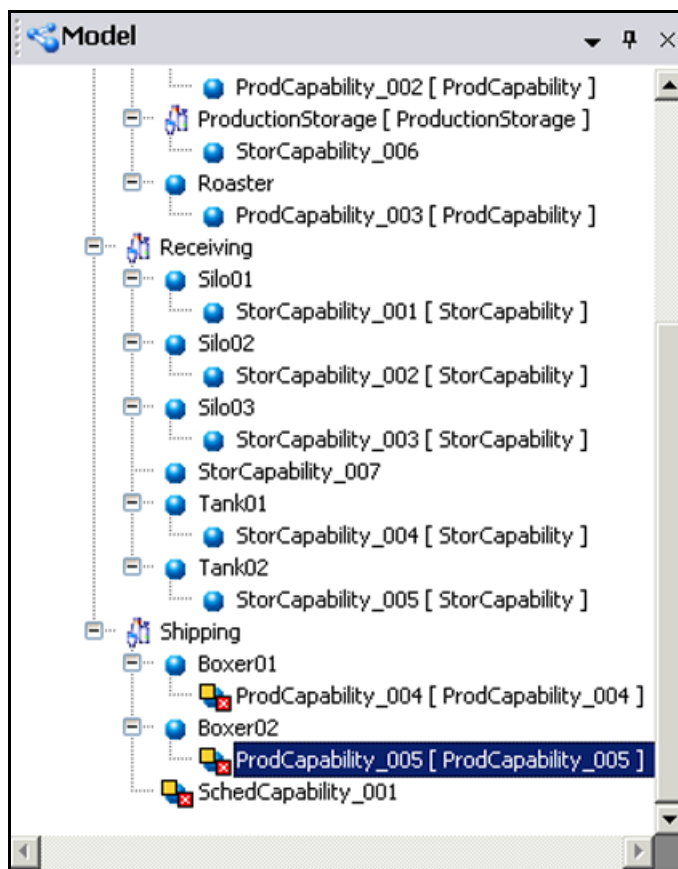


27. Save and close, and then check in the object.

Create and Assign Instances of the Operations Capability Object to the Boxers

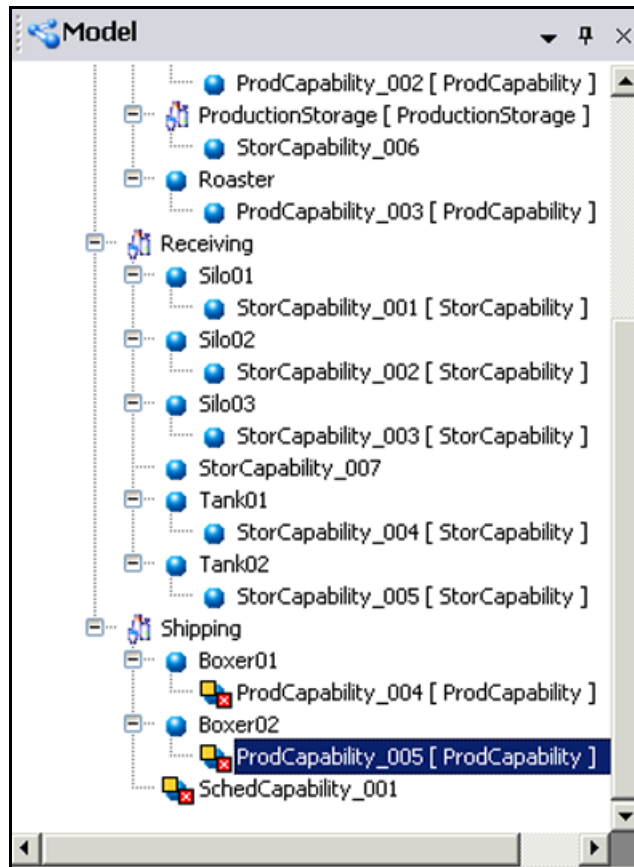
Now you will create and assign the instances of the Operations Capability Object to the boxers.

28. Create two instances of the **\$PackagingUnit.ProdCapability** template and contain them within **Boxer01** and **Boxer02**.



For the InTouch application to reference these objects, you need to be sure that the contained names match the names used for the animations. Therefore, you will change the contained names of the newly created instances.

29. Rename the contained name of both instances to **ProdCapability**.



Now, you will synchronize these entities in the MES database using the Entity Model Builder.

30. Run the Entity Model Builder for the **Shipping** area to update all information in the database.

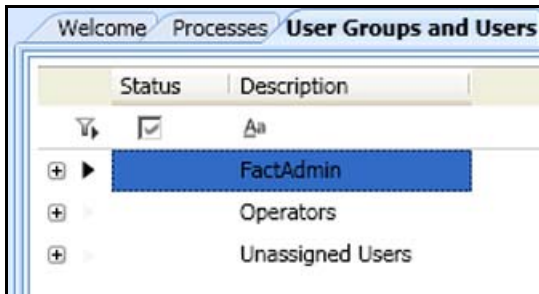
31. Deploy the new objects.

Grant Access to the Newly Created Instances

You will now grant access to the newly created instances.

32. In Wonderware MES Client, **Master Data Config** group, click **User Groups and Users**.

33. On the **User Groups and Users** tab, click **FactAdmin**.



34. On the **Entity Access** tab, expand **Shipping**, and check **Boxer01** and **Boxer02**.



This gives full access to **FactAdmin** to the boxers.

35. Repeat the previous steps to give full access to **Operators** to the boxers.

36. Save all changes and close the **User Groups and Users** tab.

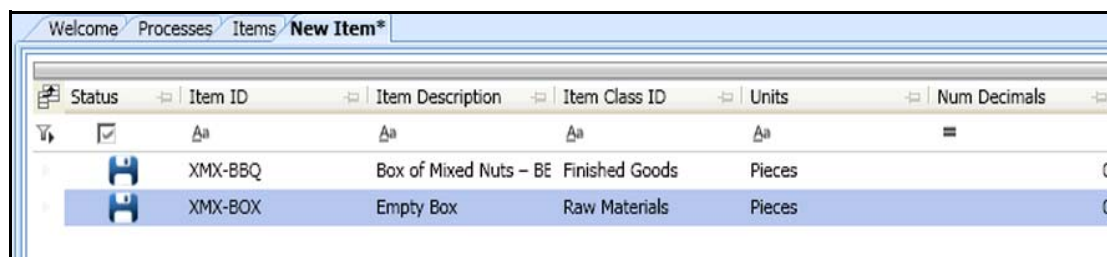
Define Materials for the Boxing Process

You will now create the items necessary to create the boxing process.

37. In the **Product Definition** group, **Items** module, click **Apply filters**.

38. Create two items and configure them as follows:

	Item1	Item2
Item ID:	XMN-BBQ	XMN-BOX
Item Class ID:	Finished Goods	Raw Materials
Item Description:	Box of Mixed Nuts – BBQ	Empty Box
Units:	Pieces	Pieces
Decimal:	0 (default)	0 (default)

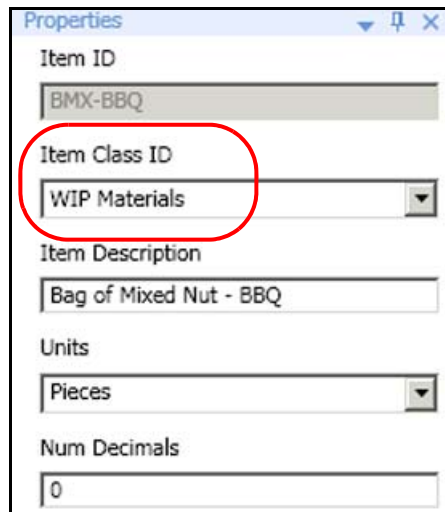


Status	Item ID	Item Description	Item Class ID	Units	Num Decimals
	XMN-BBQ	Box of Mixed Nuts – BE	Finished Goods	Pieces	0
	XMN-BOX	Empty Box	Raw Materials	Pieces	0

39. Save all changes.

The material created earlier, **BMX-BBQ**, will now be considered as WIP materials for the Boxing process. Therefore, you will change the **Item Class ID** of the **BMX-BBQ** item to **WIP Materials**.

40. On the **Items** tab, click **BMX-BBQ**, and then in the **Properties** pane, update the value of **Item Class ID** to **WIP Materials**.



Properties

Item ID
BMX-BBQ

Item Class ID
WIP Materials

Item Description
Bag of Mixed Nut - BBQ

Units
Pieces

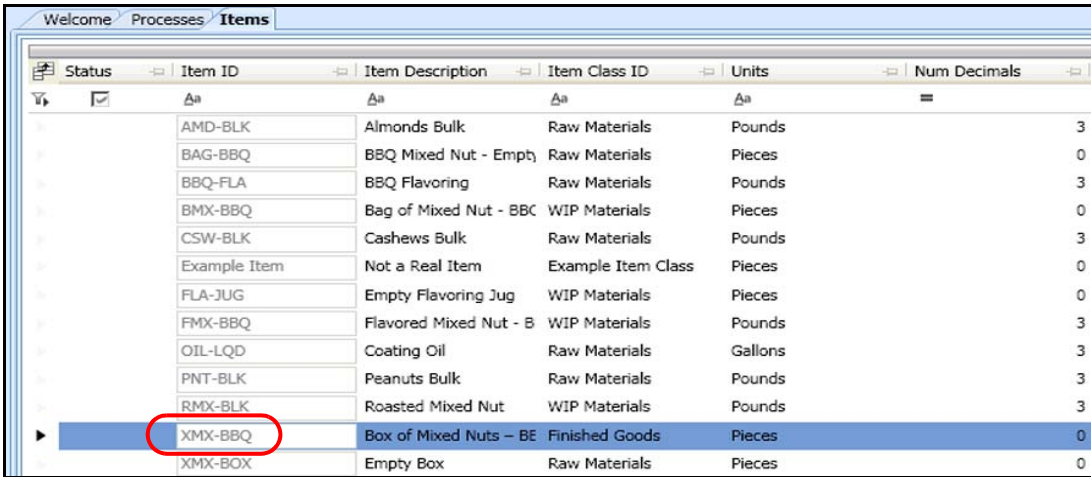
Num Decimals
0

41. Save all changes.

Define the BOM

Now, you will define a BOM for the newly created materials.

42. On the **Items** tab, click **XMX-BBQ**.



Status	Item ID	Item Description	Item Class ID	Units	Num Decimals
	AMD-BLK	Almonds Bulk	Raw Materials	Pounds	3
	BAG-BBQ	BBQ Mixed Nut - Empty	Raw Materials	Pieces	0
	BBQ-FLA	BBQ Flavoring	Raw Materials	Pounds	3
	BMX-BBQ	Bag of Mixed Nut - BBC	WIP Materials	Pieces	0
	CSW-BLK	Cashews Bulk	Raw Materials	Pounds	3
	Example Item	Not a Real Item	Example Item Class	Pieces	0
	FLA-JUG	Empty Flavoring Jug	WIP Materials	Pieces	0
	FMX-BBQ	Flavored Mixed Nut - B	WIP Materials	Pounds	3
	OIL-LQD	Coating Oil	Raw Materials	Gallons	3
	PNT-BLK	Peanuts Bulk	Raw Materials	Pounds	3
	RMX-BLK	Roasted Mixed Nut	WIP Materials	Pounds	3
	XMX-BBQ	Box of Mixed Nuts – BE	Finished Goods	Pieces	0
	XMX-BOX	Empty Box	Raw Materials	Pieces	0

43. In the **Properties** pane, expand **BOM**, and then click **Configure BOMs**.

44. On the **XMX-BBQ-BOM** tab, right-click the empty workspace and select **New**.

45. Configure the **Properties** pane as follows:

Version ID: Original BBQ
Description: BOM for Box of Mixed Nuts – BBQ
Production Details
To Storage Location: Shipping

The screenshot shows a 'Properties' dialog box with the following fields and values:

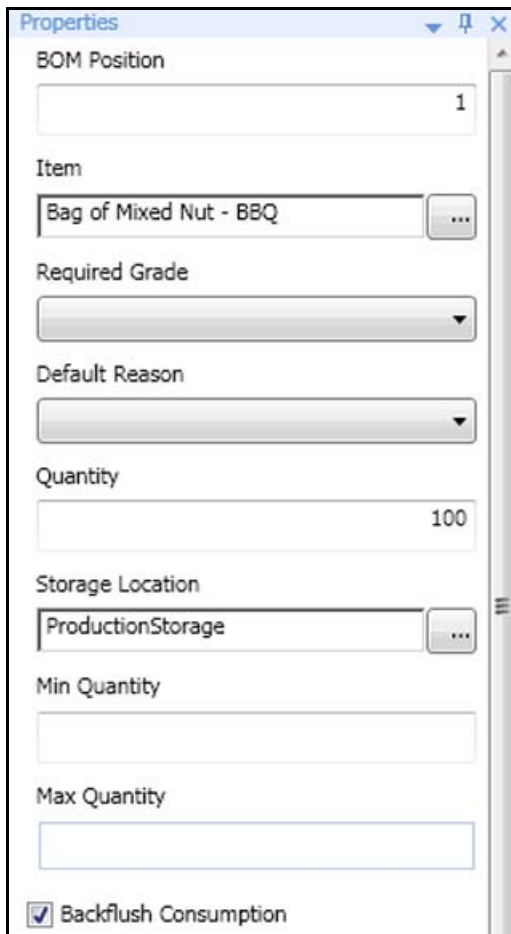
- Version ID:** Original BBQ
- Date:** 5/7/2013 2:37:10 PM
- ☒ Preferred Version
- Description:** BOM for Box of Mixed Nuts – BBQ
- Production Details** (expanded section):
 - Default Prod Code:** (empty dropdown)
 - Default Lot:** (empty text field)
 - Required Grade:** (empty dropdown)
 - To Storage Location:** Shipping (text field with a button to the right)

46. Save all changes.

You will now create two components for this BOM.

47. On the **Components** tab, right-click the empty workspace and select **Insert Component/ByProduct** to add the first component to this BOM.
48. Configure the BOM component as follows:

BOM Position:	1 (<i>default</i>)
Item:	Bag of Mixed Nut - BBQ
Quantity:	100
Storage Location:	ProductionStorage
Backflush Consumption:	<i>checked</i>



The screenshot shows a 'Properties' dialog box with the following fields and values:

- BOM Position:** 1
- Item:** Bag of Mixed Nut - BBQ
- Required Grade:** (empty dropdown)
- Default Reason:** (empty dropdown)
- Quantity:** 100
- Storage Location:** ProductionStorage
- Min Quantity:** (empty text box)
- Max Quantity:** (empty text box)
- Backflush Consumption:** ☒ Backflush Consumption

49. Repeat Steps 47 and 48 to create the second BOM component and configure it as follows:

BOM Position: 2 (*default*)
Item: Empty Box
Quantity: 1
Storage Location: Receiving
Backflush Consumption: *checked*

The screenshot shows a 'Properties' dialog box with the following fields and values:

- BOM Position:** 2
- Item:** Empty Box (with a selection button)
- Required Grade:** (empty dropdown)
- Default Reason:** (empty dropdown)
- Quantity:** 1
- Storage Location:** Receiving (with a selection button)
- Min Quantity:** (empty text box)
- Max Quantity:** (empty text box)
- Backflush Consumption:** ☒

50. Save all changes and close the **XXM-BBQ-BOM** tab.

51. Save all changes and close the **Items** tab.

Create a Process for Boxing

Now, you will create a process to fill boxes with bags of flavored mixed nuts.

52. On the **Processes** tab, right-click the empty workspace and select **New Process**.

53. In the **Properties** pane, configure the process as follows:

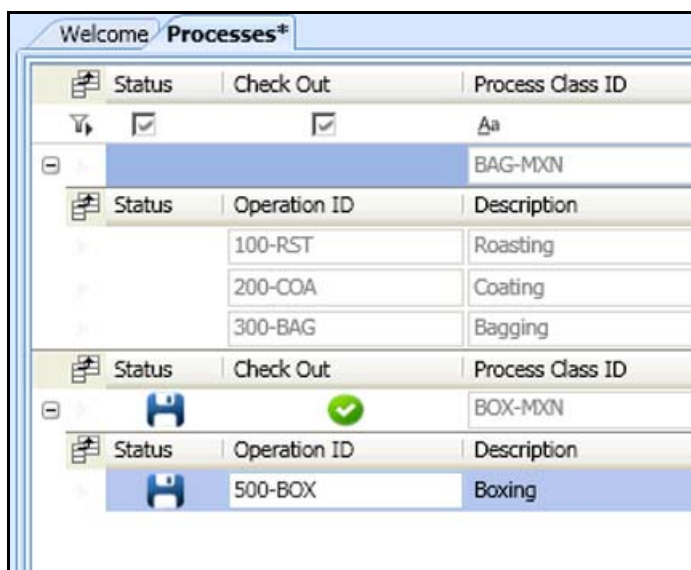
Process Class ID: BOX-MXN
Process ID: BOX-MXN-1 (*default*)
Description: Process for Box of Mixed Nuts
Status: Approved
Items to Produce: XMX-BBQ

The screenshot shows the 'Properties' pane for a new process. The fields are configured as follows:

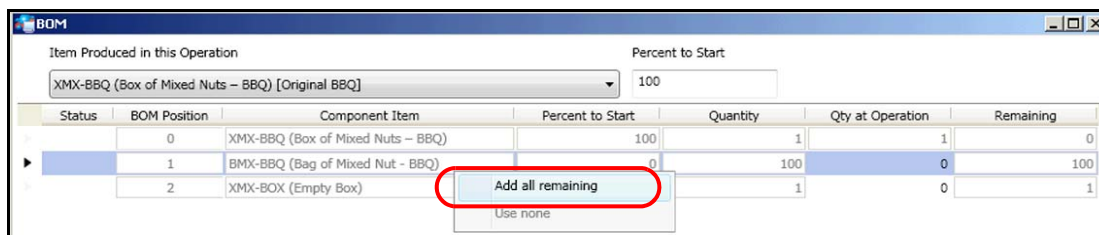
- Process Class ID:** BOX-MXN
- Process ID:** BOX-MXN-1
- Description:** Process for Box of Mixed Nuts
- Version:** 1
- Level:** General
- Status:** Approved
- Notes:** (Empty text area)
- Dynamic Routing:** ☐
- Items to Produce:**
 - Add Item:** (+) (-)
 - | Item ID | Status | Process Rank | Last Edit Comment |
|---------|----------|--------------|-------------------|
| XMX-BBQ | Approved | 1 | |

54. Save all changes.
55. In the **Checked Out Process(es)** dialog box, uncheck **BOX-MXN-1**, and then click **OK**.
56. On the **Processes** tab, right-click the **BOX-MXN-1** process and select **New Operation**.
57. In the **Properties** pane, configure the operation as follows:

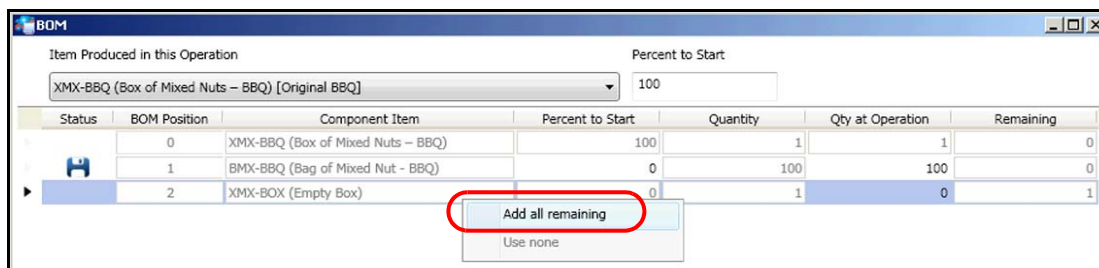
Operation ID: 500-BOX
Description: Boxing



58. Save all changes.
59. In the **Properties** pane, expand **BOM**, and then click **Configure Operation BOM**.
60. In the **BOM** dialog box, right-click **BMX-BBQ** and select **Add all remaining**.



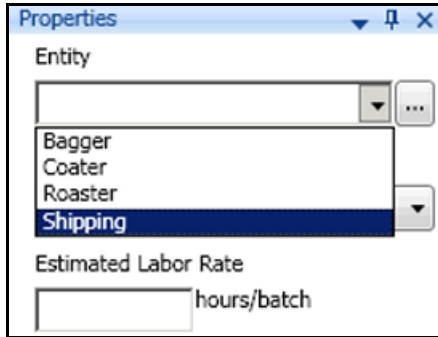
61. Right-click **XXM-BOX** and select **Add all remaining**.



62. Click **Save**, and then close the **BOM** window.

You will now add an entity to the **500-BOX** operation.

63. On the **Processes** tab, ensure the **500-BOX** operation is selected.
64. On the **Entity** tab, right-click the empty workspace and select **New**.
65. In the **Properties** pane, **Entity** drop-down list, click **Shipping**.



66. Save all changes.
67. Verify and check in the process.

68. Create a work order from **BOX-MXN-1** and configure it as follows:

Work Order ID: PKG-010
Description: <enter a description>
Required Quantity: 20

The screenshot shows a 'Create Work Order from Process' dialog box with the following fields and values:

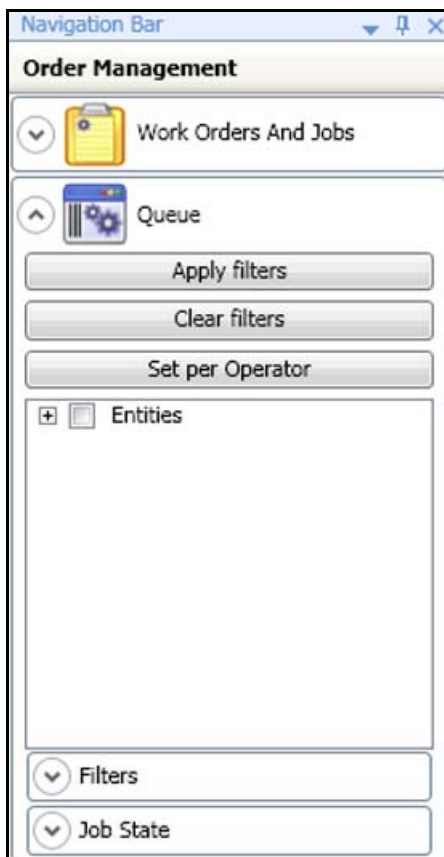
Field	Value
Process ID	BOX-MXN-1
Spec. Version	
Work Order ID	PKG-010
Description	
Item	XMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	20 Pcs.
Release Date/Time	05/08/2013 12:00 AM
Due Date/Time	05/08/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

Buttons: OK, Cancel

You will now view the new jobs on the **Queue** tab.

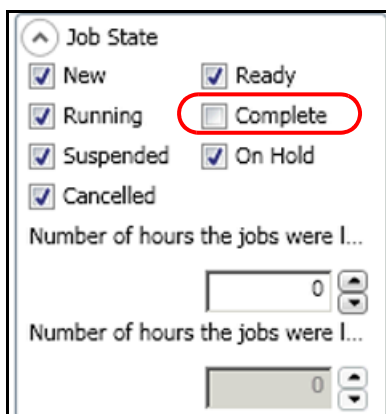
69. In the **Order Management** group, collapse the **Work Orders And Jobs** module.

70. In the **Queue** module, click **Apply filters**.



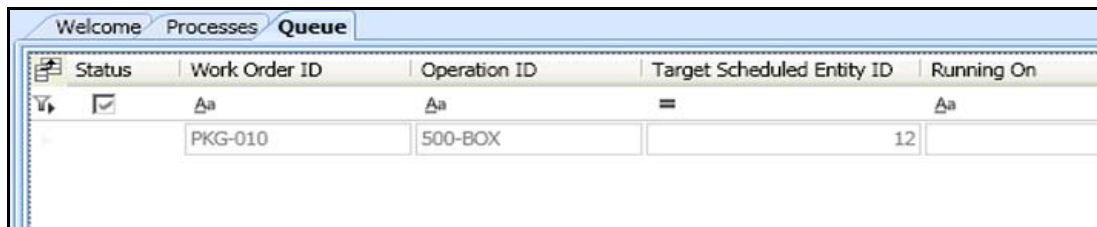
To make it easier to view the new jobs, you will now filter out the previously completed jobs.

71. Expand the **Job State** section, and uncheck **Complete**.



72. In the **Queue** module, click **Apply filters**.

The scheduled job appears on the **Queue** tab.



The screenshot shows the 'Queue' tab in a software interface. It contains a table with the following data:

Status	Work Order ID	Operation ID	Target Scheduled Entity ID	Running On
<input checked="" type="checkbox"/>	PKG-010	500-BOX	12	

73. Close the **Queue** tab.

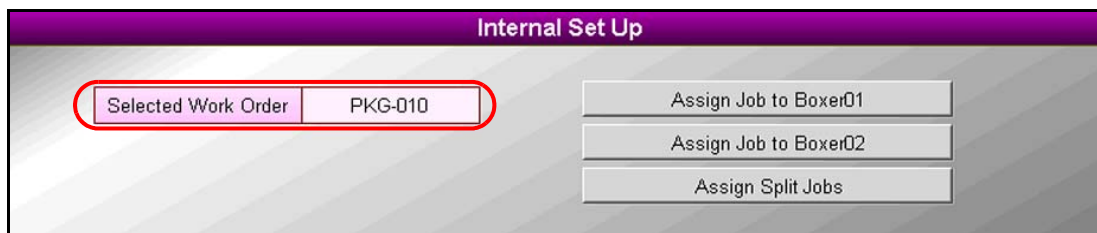
Track the Job at Runtime

Now, you will track the progress of this job at runtime.

74. On the WindowViewer **Navigation Bar**, click **Shipping**.

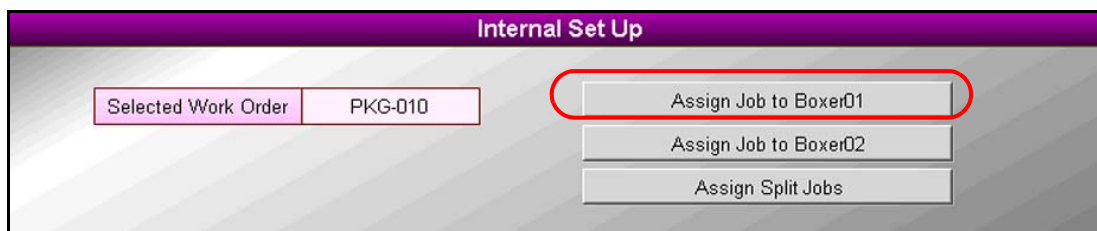


75. In the **Internal Set Up** panel, **Selected Work Order** field, enter **PKG-010**.



The screenshot shows the 'Internal Set Up' panel. It has a header bar and a main area. In the main area, there is a field labeled 'Selected Work Order' containing the text 'PKG-010'. This field is highlighted with a red circle. To the right of this field are three buttons: 'Assign Job to Boxer01', 'Assign Job to Boxer02', and 'Assign Split Jobs'.

76. Click **Assign Job to Boxer01**.



The screenshot shows the 'Internal Set Up' panel after clicking the 'Assign Job to Boxer01' button. The 'Selected Work Order' field still contains 'PKG-010'. The 'Assign Job to Boxer01' button is now highlighted with a red circle. The other buttons, 'Assign Job to Boxer02' and 'Assign Split Jobs', remain visible below it.

This populates all the fields in the **Selected Job** panel for **Boxer01**.

Selected Job	
Work Order	PKG-010
Operation	500-BOX
Sequence No	0
Start Job	Cmd <input type="checkbox"/>
Status	Ready R

77. Start the job in **Boxer01**.

Selected Job	
Work Order	PKG-010
Operation	500-BOX
Sequence No	0
Start Job	Cmd <input type="checkbox"/>
Status	Ready R


The **Currently Running Job** and **Boxer01 Signals** panels are updated.

As **Boxer01** is now running, the value in the **Units Count** field increases. When this value equals or exceeds the value in the **Batch Target** field, the job ends.

Job in Boxer01

Selected Job		Currently Running Job	
Work Order	PKG-010	Work Order	
Operation	500-BOX	Operation	
Sequence No	0	Sequence No	0
		Required Qty	0.00
Start Job	Cmd	Total Good Prod	0.00
Status	Ready		
	R		

Boxer01 Signals



Run Cmd	<input type="checkbox"/>
Stop Cmd	<input type="checkbox"/>
Running Status	<input type="checkbox"/>
Batch Target	0
Units Count	20

You will now create a work order, split it into two jobs, and run them in both boxers simultaneously.

78. In Wonderware MES Client, **Processes** tab, create a work order from the **BOX-MXN-1** process and configure it as follows:

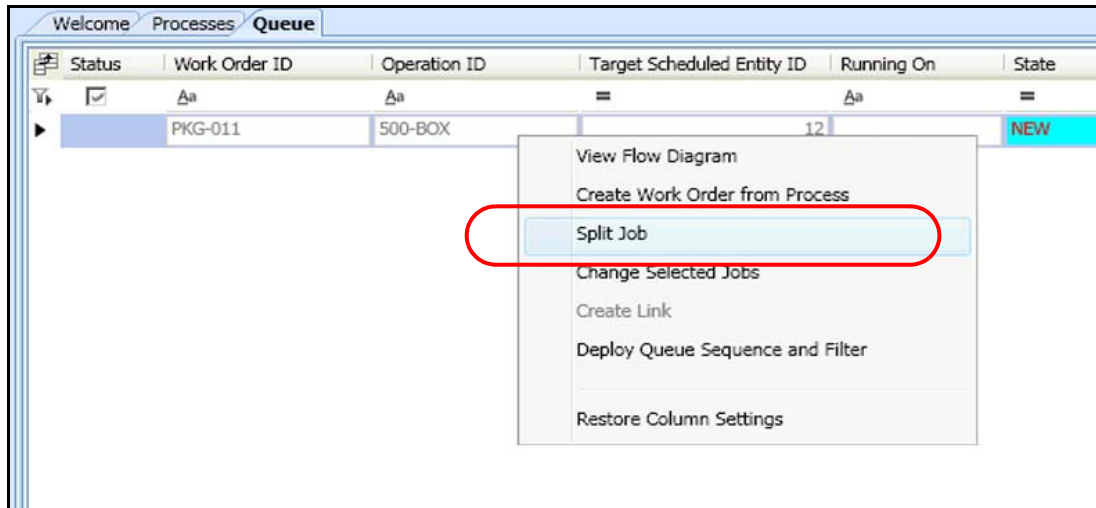
Work Order ID: PKG-011
Description: <enter a description>
Required Quantity: 72

The screenshot shows a 'Create Work Order from Process' dialog box with the following fields and values:

Field	Value
Process ID	BOX-MXN-1
Spec. Version	
Work Order ID	PKG-011
Description	
Item	XMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	72 Pcs.
Release Date/Time	05/09/2013 12:00 AM
Due Date/Time	05/09/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

Buttons: OK, Cancel

79. In the **Queue** module, click **Apply filters**.
80. On the **Queue** tab, right-click **PKG-011** and select **Split Job**.



81. Configure the **Split Job** dialog box as follows:

Split Quantity (of 72): 36
Start Qty: 36
Target Entity: Shipping (*default*)

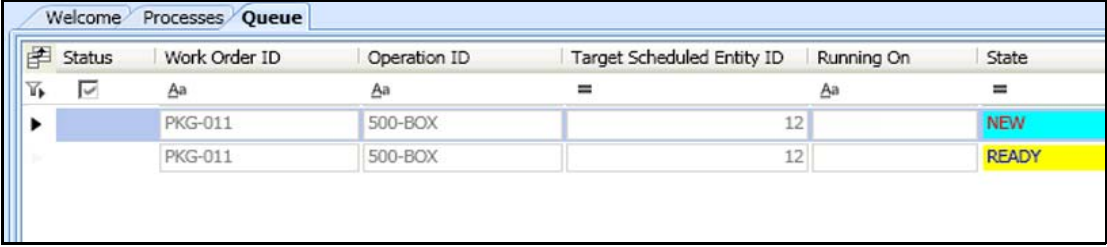
The 'Split Job' dialog box is shown with the following fields and values:

- New Sequence No:** 1
- State:** READY
- Split Quantity (of 72):** 36
- Start Qty:** 36
- Finish Time:** 05/09/2013 12:00 AM
- Target Entity:** Shipping
- Notes:** Created by Job Split

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

82. Click **OK** to split the work order.

This creates two jobs for the **PKG-011** work order. After a few moments, the second job appears.



The screenshot shows a software window with tabs: 'Welcome', 'Processes', and 'Queue'. The 'Queue' tab is active, displaying a table with the following data:

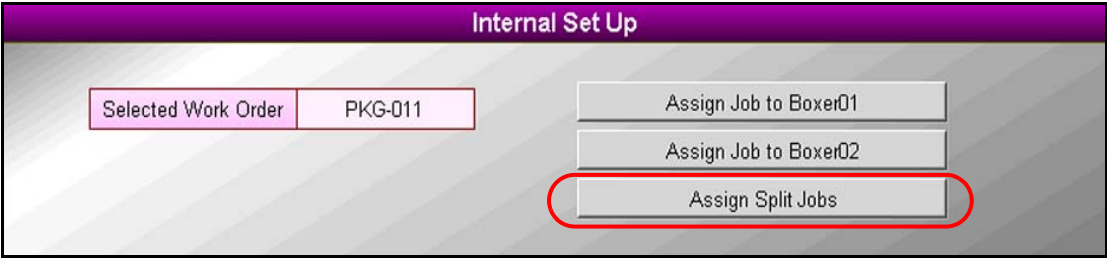
Status	Work Order ID	Operation ID	Target Scheduled Entity ID	Running On	State
	PKG-011	500-BOX	12		NEW
	PKG-011	500-BOX	12		READY

83. Close the **Queue** tab.

You will now run the jobs on both boxers simultaneously.

84. In the WindowViewer **Shipping** window, **Internal Set Up** panel, **Selected Work Order** field, enter **PKG-011**.

85. Click **Assign Split Jobs**.



The screenshot shows the 'Internal Set Up' panel. On the left, there is a 'Selected Work Order' field containing the text 'PKG-011'. On the right, there are three buttons: 'Assign Job to Boxer01', 'Assign Job to Boxer02', and 'Assign Split Jobs'. The 'Assign Split Jobs' button is highlighted with a red circle.

86. Start the jobs for **Boxer01** and **Boxer02**.

The currently running job information now gets populated for both boxers.

Job in Boxer01

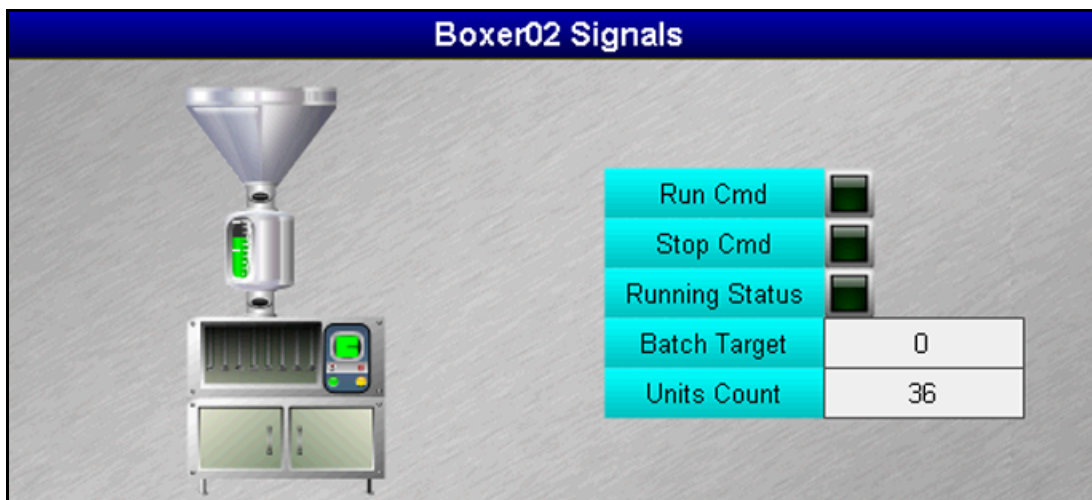
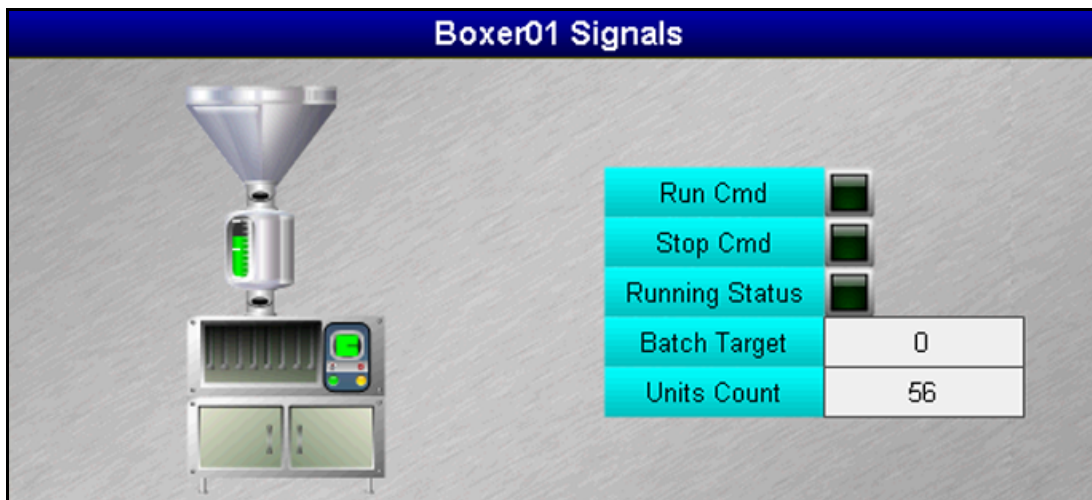
Selected Job		Currently Running Job	
Work Order	PKG-011	Work Order	PKG-011
Operation	500-BOX	Operation	500-BOX
Sequence No	0	Sequence No	0
Start Job	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">Cmd</div> <div style="width: 20px; height: 20px; background-color: black; margin-left: 5px;"></div> </div>	Required Qty	36.00
Status	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">Ready</div> <div style="width: 20px; height: 20px; background-color: black; margin-left: 5px; display: flex; align-items: center; justify-content: center; font-weight: bold; color: white;">R</div> </div>	Total Good Prod	0.00

Job in Boxer02

Selected Job		Currently Running Job	
Work Order	PKG-011	Work Order	PKG-011
Operation	500-BOX	Operation	500-BOX
Sequence No	1	Sequence No	1
Start Job	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">Cmd</div> <div style="width: 20px; height: 20px; background-color: black; margin-left: 5px;"></div> </div>	Required Qty	36.00
Status	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px;">Ready</div> <div style="width: 20px; height: 20px; background-color: black; margin-left: 5px; display: flex; align-items: center; justify-content: center; font-weight: bold; color: white;">R</div> </div>	Total Good Prod	0.00

Note: The **Sequence No** helps the OCO determine the order in which to run the work order.

Once the required quantity is produced, the boxers stop and the jobs end. The **Unit Count** field now shows the current count for each boxer.



Now, you will check the production and consumption data using the **DB Views** window.

87. In the **DB Views** window, click the **Production Data** button.
88. Group the production data by **wo_id**, **oper_id**, and **seq_no**.
89. Fully expand the report for the **PKG-011** work order.

wo_id	oper_id	seq_no	ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent_name
wo_id : PKG-010 (1 item)												
wo_id : PKG-011 (1 item)												
oper_id : 500-BOX (2 items)												
seq_no : 0 (6 items)												
			ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent_name
			Boxer01	1	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer01	5	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer01	5	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer01	6	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer01	5	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer01	5	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer01	5	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer01	4	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
seq_no : 1 (6 items)												
			ent_name	qty_prod	good_prod	qty_reqd	item_id	item_desc	units	item_class_id	lot_no	to_ent_name
			Boxer02	1	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer02	5	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer02	5	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer02	6	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer02	6	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer02	5	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer02	6	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
			Boxer02	2	✓ 36	36	XMX-BBQ	Box of Mixed N...	Pieces	Finished Goods		Shipping
wo_id : WVO-010 (3 items)												
wo_id : WVO-020 (3 items)												
wo_id : WVO-030 (3 items)												
wo_id : WVO-040 (3 items)												
wo_id : WVO-050 (3 items)												
wo_id : WVO-060 (3 items)												

For **PKG-011**, there is production for **Boxer01** and **Boxer02** in two sequence numbers. This report shows the total production for the unit. Sequence number 0, **Boxer01**, and sequence number 1, **Boxer02**, produced the required amount.

90. Click the **Consumption Data** button.
91. Group the production data by **wo_id**, **oper_id**, and **seq_no**.
92. Fully expand the report for the **PKG-011** work order.

wo_id	oper_id	seq_no	ent_name	qty_cons	item_id	item_desc	units	item_class_desc	lot_no	from_ent_name	fg_lot_no	reas
wo_id : PKG-010 (1 item)												
wo_id : PKG-011 (1 item)												
oper_id : 500-BOX (2 items)												
seq_no : 0 (2 items)												
			ent_name	qty_cons	item_id	item_desc	units	item_class_desc	lot_no	from_ent_name	fg_lot_no	reas
			Boxer01	3600	BMX-BBQ	Bag of Mixed N...	Pcs.	Intermediate Mat...		ProductionStorage		Good Co
			Boxer01	36	XMX-BOX	Empty Box	Pcs.	Raw Materials		Receiving		Good Co
seq_no : 1 (2 items)												
			ent_name	qty_cons	item_id	item_desc	units	item_class_desc	lot_no	from_ent_name	fg_lot_no	reas
			Boxer02	3600	BMX-BBQ	Bag of Mixed N...	Pcs.	Intermediate Mat...		ProductionStorage		Good Co
			Boxer02	36	XMX-BOX	Empty Box	Pcs.	Raw Materials		Receiving		Good Co
wo_id : WVO-040 (3 items)												
wo_id : WVO-050 (3 items)												
wo_id : WVO-060 (3 items)												

The report shows the consumption details for **PKG-011**.

Section 7 – Job Management

This section describes how to modify a job after a work order has been created, and explains sequencing and filtering in runtime.

Overview

Every time you create a new work order, you specify parameters, such as the due date, the release date, and priority, for that work order. After the jobs for a work order are instantiated, they make their individual copies of the operation configuration and the BOM configuration. Any subsequent modifications to the process or BOM do not affect already created or scheduled work orders. These modifications only affect the subsequent work orders you create.

You can correct the mistakes in an already created work order by modifying the work order. MES Administrators can manage, prioritize, and sequence jobs after a work order has been created, as long as those jobs are not running. This is accomplished in the **Work Orders And Jobs** module of the **Order Management** group in the Wonderware MES Client. Modify a work order by changing the properties in the **Properties** pane.

Deploy Queue Sequence and Filters

When you create a new work order, a priority is associated with that work order. This priority also gets associated with every single job because you run jobs, not work orders, in runtime.

All the jobs you create can be set to be sorted or scheduled in a particular way. You can specify the order in which you want to run these jobs in runtime. This order can be set by using filters in the queue window. The selections made in the filters are used to sort the jobs.

After the sorting order and important parameters to filter the jobs are selected, you apply that sequence to runtime. Then you can run the jobs in the selected sequence. Using this feature, the master scheduler can figure out the order to run the job based on the plant process and customer.

You can apply the current job queue sequence and filter of attributes such as states, or work orders to all of the entities selected in the entity tree. Queue sequence is used to control the **Work Queue** for the selected entities in the Wonderware MES Operator application.

To apply the sequence and filters, right-click the job in the tabbed workspace and select the **Deploy Queue and Sequence Filter** option. The filter you use to open this window is also applied in the runtime.

Lab 13 – Managing Jobs

Introduction

In this lab, you will modify work orders and the jobs associated with them after they have been scheduled. Additionally, you will prioritize job sequence based on the job priority. These tasks are important because an MES administrator needs to manage the jobs associated with work orders on a daily basis.

Objectives

Upon completion of this lab, you will be able to:

- Modify work orders and jobs
- Define the sequence of jobs
- Deploy the job sequence to all remote runtime clients

Modify a Work Order and Jobs

You will create work orders in Wonderware MES Client and modify jobs associated with these work orders.

1. In the Wonderware MES Client, on the **Processes** tab, create a new work order from **BAG-MXN-1** and configure it as follows:

Work Order ID: WO-070
Description <enter a description>
Item: BMX-BBQ
Required Quantity: 400

The screenshot shows a Windows-style dialog box titled "Create Work Order from Process". It contains the following fields and values:

- Process ID: BAG-MXN-1 (dropdown menu)
- Spec. Version: (empty dropdown menu)
- Work Order ID: WO-070 (text box)
- Description: (empty text box)
- Item: BMX-BBQ (dropdown menu)
- Bom Version: (empty dropdown menu)
- Starting Quantity: 0 (spin box) Pcs.
- Required Quantity: 400 (spin box) Pcs.
- Release Date/Time: 05/09/2013 12:00 AM (text box)
- Due Date/Time: 05/09/2013 12:00 AM (text box)
- Priority: 50 (spin box)
- Customer: (empty text box)
- Manufacturing Order: (empty text box)
- Notes: (empty text area)

At the bottom right are "OK" and "Cancel" buttons.

2. Create a second work order from **BAG-MXN-1** and configure it as follows:

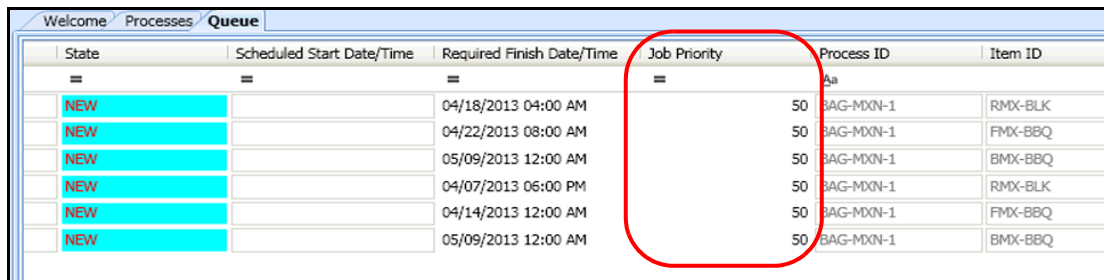
Work Order ID: WO-071
 Description: <enter a description>
 Item: BMX-BBQ
 Required Quantity: 600

3. In the **Order Management** group, **Queue** module, click **Apply filters**.

The jobs corresponding to the two new work orders are now visible on the **Queue** tab.

4. Scroll right to view the **Job Priority** column.

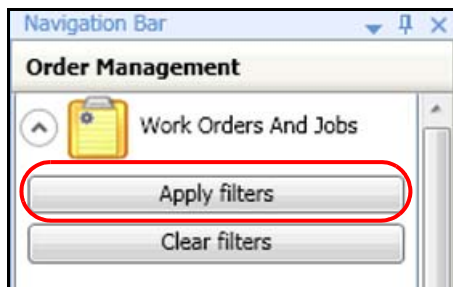
The **Job Priority** associated with both work orders is **50**.



State	Scheduled Start Date/Time	Required Finish Date/Time	Job Priority	Process ID	Item ID
NEW		04/18/2013 04:00 AM	50	BAG-MXN-1	RMX-BLK
NEW		04/22/2013 08:00 AM	50	BAG-MXN-1	FMX-BBQ
NEW		05/09/2013 12:00 AM	50	BAG-MXN-1	BMX-BBQ
NEW		04/07/2013 06:00 PM	50	BAG-MXN-1	RMX-BLK
NEW		04/14/2013 12:00 AM	50	BAG-MXN-1	FMX-BBQ
NEW		05/09/2013 12:00 AM	50	BAG-MXN-1	BMX-BBQ

For the purpose of this lab, assume that you made two mistakes while creating **WO-071**: the quantity was supposed to be **400** and the job priority was supposed to be **40**. Now, you will modify the jobs associated with **WO-071** to rectify the mistakes.

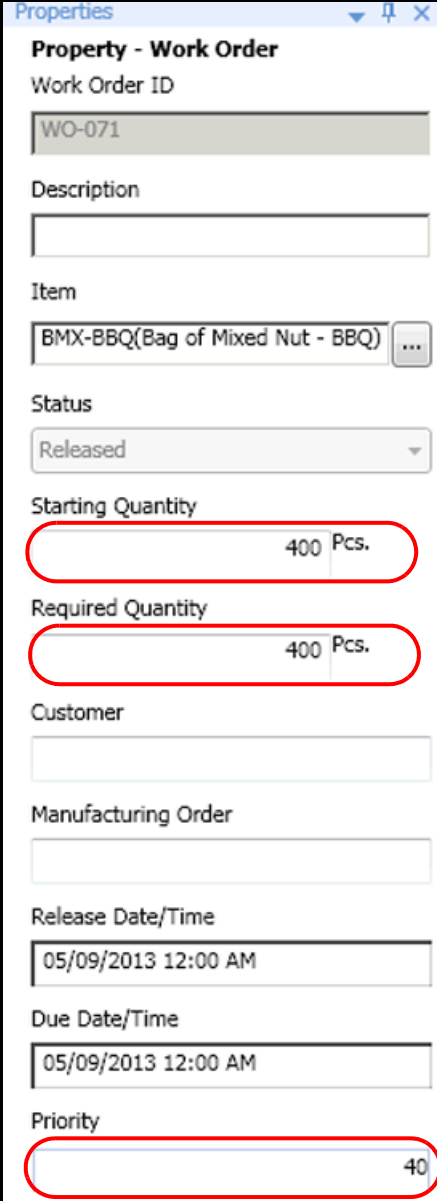
5. In the **Order Management** group, expand the **Work Orders And Jobs** module, and then click **Apply filters**.



The **Work Orders And Jobs** tab appears. This window displays all the work orders that have been created so far in the MES database and their corresponding jobs.

6. On the **Work Orders And Jobs** tab, click **WO-071**, and then in the **Properties** pane, configure it as follows:

Starting Quantity: 400
Required Quantity: 400
Priority: 40

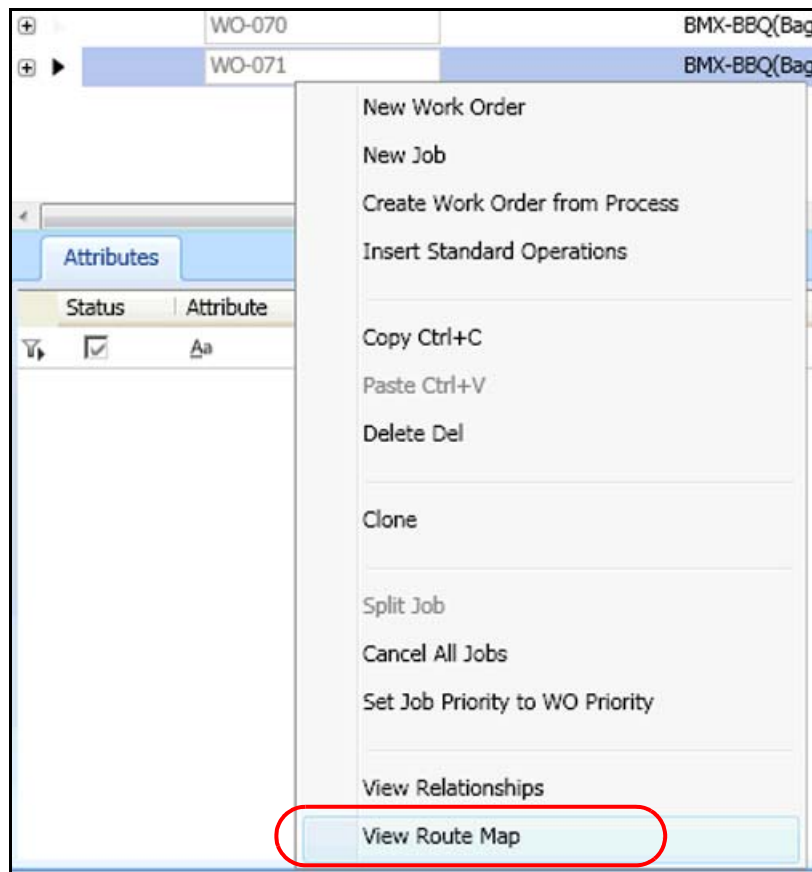


The screenshot shows the 'Properties - Work Order' dialog box. The 'Starting Quantity' field is set to 400 Pcs., the 'Required Quantity' field is set to 400 Pcs., and the 'Priority' field is set to 40. These three fields are highlighted with red rounded rectangles. Other fields include Work Order ID (WO-071), Description, Item (BMX-BBQ(Bag of Mixed Nut - BBQ)), Status (Released), Customer, Manufacturing Order, Release Date/Time (05/09/2013 12:00 AM), Due Date/Time (05/09/2013 12:00 AM), and Priority (40).

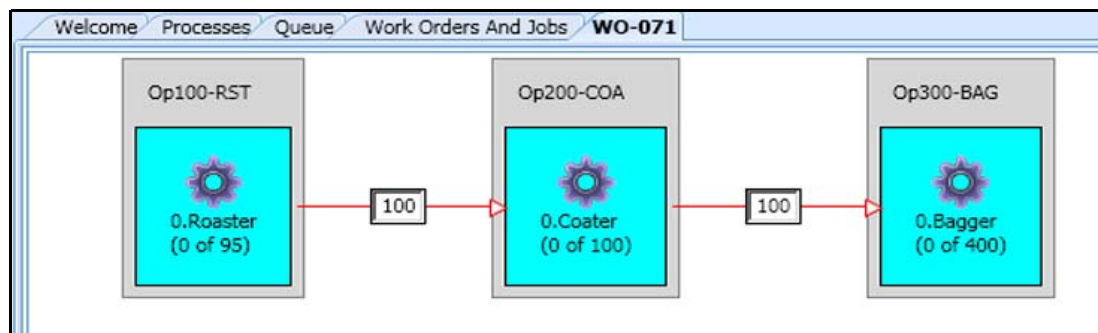
7. Save all changes and close the **Work Orders And Jobs** tab.
8. Reopen **Work Orders And Jobs**.
- This refreshes the **Work Orders And Jobs** tab and shows the updated information.

Now, you will verify that the quantity associated with each job under the work order has also been updated.

9. On the **Work Orders And Jobs** tab, right-click **WO-071** and select **View Route Map**.



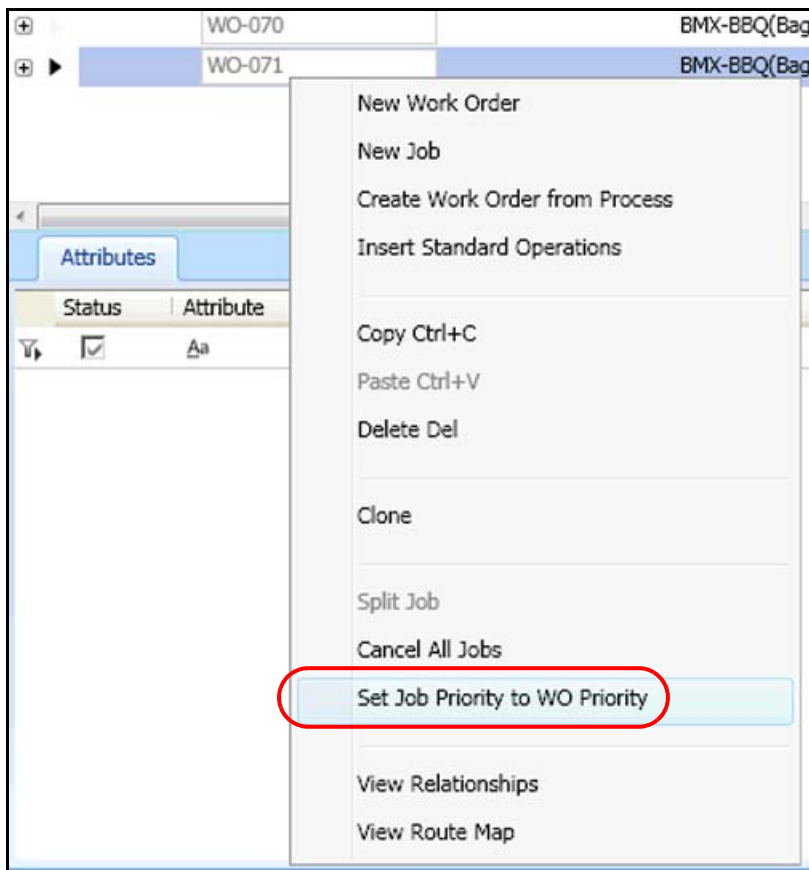
The **WO-071** tab appears. This window displays the updated quantities for each of the three jobs.



10. Close the **WO-071** tab.

When you update the priority of a work order, the priorities of the jobs associated with the work order are not updated automatically. Therefore, you will update the priority of the jobs based on the priority of the work order.

11. On the **Work Orders And Jobs** tab, right-click **WO-071** and select **Set Job Priority to WO Priority**.



This propagates the work order priority for all the jobs belonging to the work order. The **Queue** tab will display the job priority in the correct column.

Welcome Processes Queue Work Orders And Jobs							
Work Order ID	Operation ID	Target Scheduled Entity ID	Running On	State	Scheduled Start Date/Time	Required Finish Date/Time	Job Priority
WO-070	100-RST		2	NEW		04/18/2013 04:00 AM	50
WO-070	200-COA		3	NEW		04/22/2013 08:00 AM	50
WO-070	300-BAG		4	NEW		05/09/2013 12:00 AM	50
WO-071	100-RST		2	NEW		04/07/2013 06:00 PM	40
WO-071	200-COA		3	NEW		04/14/2013 12:00 AM	40
WO-071	300-BAG		4	NEW		05/09/2013 12:00 AM	40

This can also be verified on the **Work Orders And Jobs** tab.

12. Close the **Work Orders And Jobs** tab.

Define Job Sequence in the Queue

For the purpose of this lab, assume that you need to establish the sequence of the queue based on job priority and required finish date. The **Job Priority** needs to be the primary sorting column and **Required Finish Date/Time** needs to be the secondary sorting column. Additionally, these columns need to be arranged in ascending order.

You will now define the job sequence on the basis of the assumptions mentioned above.

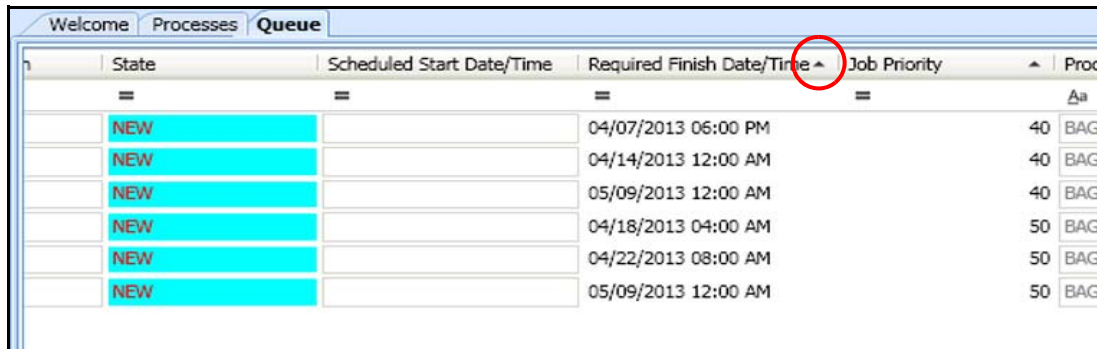
13. On the **Queue** tab, click the **Job Priority** column header so it displays an arrow pointing up.

The up arrow indicates that the column is sorted in ascending order.



State	Scheduled Start Date/Time	Required Finish Date/Time	Job Priority	Proc
NEW		04/07/2013 06:00 PM	40	BAG-
NEW		04/14/2013 12:00 AM	40	BAG-
NEW		05/09/2013 12:00 AM	40	BAG-
NEW		04/18/2013 04:00 AM	50	BAG-
NEW		04/22/2013 08:00 AM	50	BAG-
NEW		05/09/2013 12:00 AM	50	BAG-

14. Hold the **Ctrl** key and click the **Required Finish Date/Time** column header so it displays an arrow pointing up.



State	Scheduled Start Date/Time	Required Finish Date/Time	Job Priority	Proc
NEW		04/07/2013 06:00 PM	40	BAG-
NEW		04/14/2013 12:00 AM	40	BAG-
NEW		05/09/2013 12:00 AM	40	BAG-
NEW		04/18/2013 04:00 AM	50	BAG-
NEW		04/22/2013 08:00 AM	50	BAG-
NEW		05/09/2013 12:00 AM	50	BAG-

Deploy the Queue Sequence and Filter

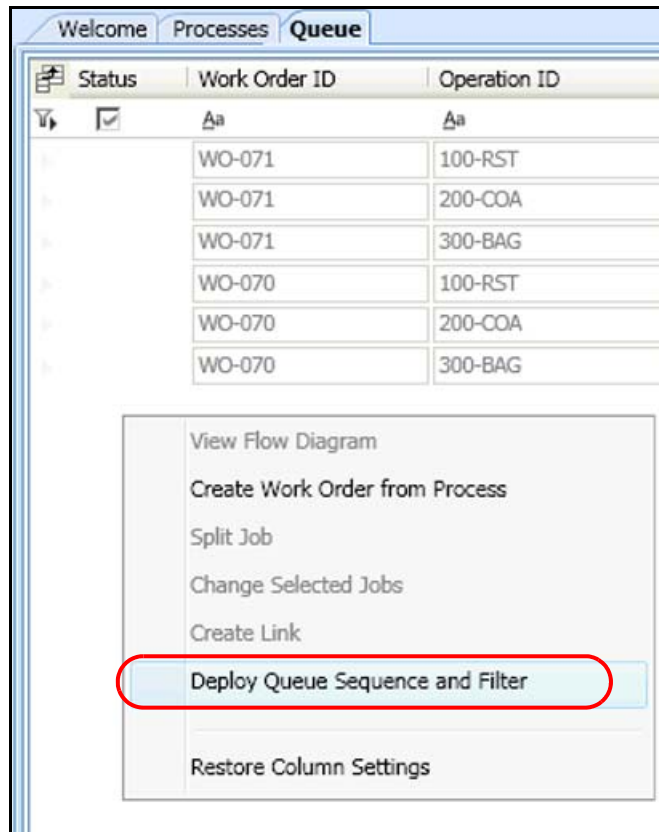
Now, you will deploy the sequence filter to ensure that all entities enforce this sequence by default in runtime. This enforces the order to all operators in the field.

15. In the **Order Management** group, collapse **Work Orders and Jobs**, and then in the **Queue** module, expand the **Entities** tree and ensure all the entities are checked.



16. Click **Apply filters**.

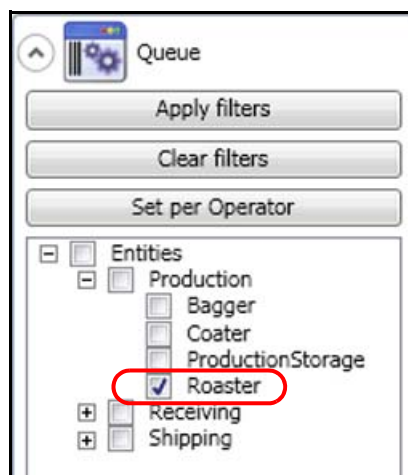
17. On the **Queue** tab, right-click the empty workspace and select **Deploy Queue Sequence and Filter**.



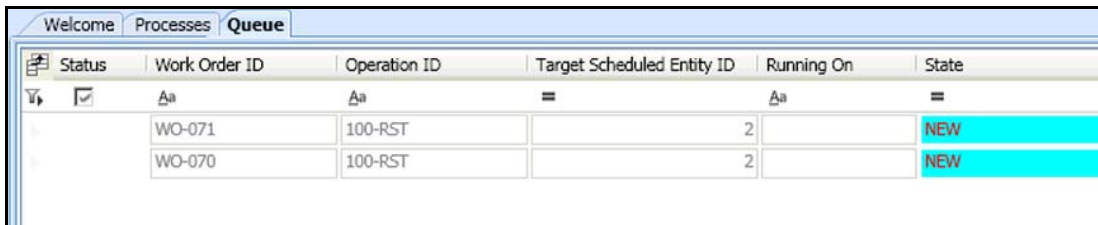
This will automatically sort the entities as per the job sequence specified earlier.

You will now filter the job sequence by entity.

18. In the **Queue** module, expand **Production** and uncheck all the entities except for the **Roaster** entity, and then click **Apply filters**.



This displays the jobs created for the **Roaster** entity only. Additionally, these jobs are sorted according to the queue sequence specified earlier.



Status	Work Order ID	Operation ID	Target Scheduled Entity ID	Running On	State
	WO-071	100-RST	2		NEW
	WO-070	100-RST	2		NEW

Note: Although the **Queue** tab displays the sequence in which jobs are to be run in the **Roaster** entity, users can be granted privileges to override the queue sequence.

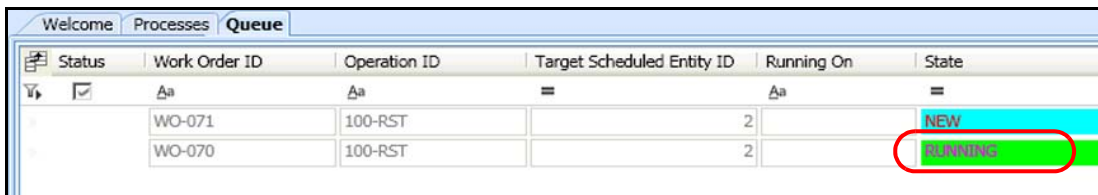
Use the InTouch Application to Run Jobs

Now, you will perform steps to run **WO-070** before **WO-071**.

19. In the WindowViewer **Production** window, set the jobs for **WO-070**.
20. Click **Generate Lots**.
21. Start the roasting job.

No errors are reported and the job is started successfully because the current user has the necessary permissions to override the queue.

22. In the Wonderware MES Client, **Queue** tab, verify that the job is running out of sequence.

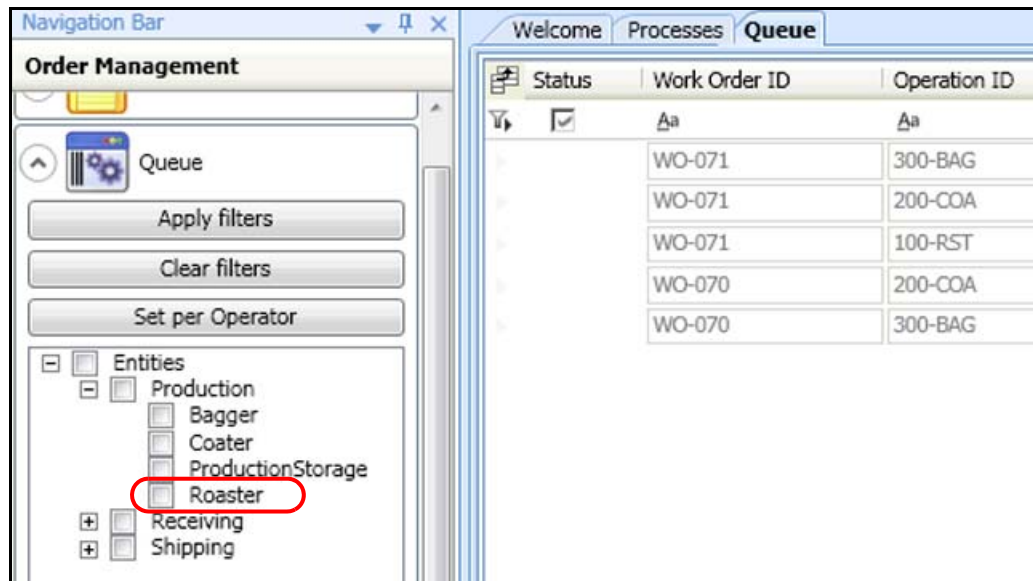


Status	Work Order ID	Operation ID	Target Scheduled Entity ID	Running On	State
	WO-071	100-RST	2		NEW
	WO-070	100-RST	2		RUNNING

WO-070 is in a **RUNNING** state out of queue sequence.

You will now reset the filter to view all of the active jobs.

23. In the **Queue** module, uncheck the **Roaster** check box, and then click **Apply filters**.



24. Close the **Queue** tab.

25. In WindowViewer, run all of the jobs for **WO-070** as follows:

Operation	Production Quantity	BOM 1 Quantity	BOM 2 Quantity	BOM 3 Quantity
Roasting	95	45	25	25
Coating	100	95	2	3
Bagging	400	100	Set as Default	

26. Run all of the jobs for **WO-071** as follows:

Operation	Production Quantity	BOM 1 Quantity	BOM 2 Quantity	BOM 3 Quantity
Roasting	95	45	25	25
Coating	100	95	2	3
Bagging	400	100	Set as Default	

Section 8 – Job Creation

Describe how to create a job with the Operations Capability Object and compare a data entry job with a process job.

Overview

You can use the **Create Job Attributes** tab to create a new data entry job or work order from an existing process by configuring job attributes and triggering commands.

To view the Create Job Attributes tab in the object editor, select the **Entity Can Run Jobs** and **Enable Create Job Attribute** check boxes in the **General** tab.

You can configure the following information in the **Create Job Attributes** tab to create a job:

- Item information, such as item name, item class, item unit of measure for the item
- Job information, such as work order, manufacturing order, operation, process, and operator
- Start and required quantities
- Job production rate information
- Inventory information

Data Entry Jobs

You can trigger the **Create New Job Command** to create a new data entry job.

If you do not specify values for the job attributes, the default values configured in the database are used while creating a new data entry job.

When the **Create New Job Command** is triggered, the middleware creates the item, item class, and **Units of Measure (UOM)** as per the specified values and if these attributes are not already configured in the database.

A new work order is created if the specified work order is different than the existing work order. The newly configured job attributes are associated with the new work order.

If the specified value of a job attribute does not match with the existing value of the attribute in the database, a warning message describing the mismatch is logged. But if the specified information is sufficient, a job is created.

To retrieve the value of an attribute from other object instance, you must select the corresponding **Use Input Source** check box. When you select the **Use Input Source** check box, the default value and the browse button appear in the corresponding attribute box. You can specify the **Bill of Material (BOM)** item, BOM item class, and **Units of Measure (UOM)** that are associated with a job.

Process Jobs

You can create a new work order from an existing process by using **Create New Jobs From Process Command**. To do this, first ensure that an already configured process exists in the Wonderware MES Client with its corresponding operation and the corresponding items associated with it. If the process exists, a work order is created based on the process.

Creating a new work order from an existing process is similar to creating a work order in the process window. The only difference is that the work order from an existing process is created in runtime.

The **Create New Jobs From Process Command** uses the existing process data, for example work ID, item ID, and required quantity, to create a new work order but it does not create any new items or UOM. If you do not use other optional information, such as due date and release date, the default values are used.

However, you should not use some of the process data, such as operation ID, batch size, or inventory, while creating a work order from an existing process because these values are already configured in the process.

The **Create New Jobs from Process Command** dialogue box must have a reference to a job command entered, to create a new work order based on the specified process.



inventorys
Learning Services



Module 5 – Operator Visualization

Section 1 – MES Operator Client	5-3
Lab 14 – Manually Tracking Work Orders	5-5
Section 2 – MES .NET Controls	5-37
Lab 15 – Using Wonderware MES .NET Controls	5-51

Module Objectives

- Explain the Operator client
- Discuss manual tracking of production activities
- Discuss the MES .NET Controls

Section 1 – MES Operator Client

This section discusses the Operator Client, how to manually track production, and explains the MES .NET client controls.

Overview

Wonderware MES Operator is an application typically used on the shop floor. It is an out-of-the-box production interface to the MES system. Operator is used to:

- Execute a Process
- Claim quantities produced and report consumption
- Enter data into the system using **Steps**, **Specifications**, and **Data Logger**
- Capture machine utilization and labor data.

Operator supports a number of login scenarios such as multiple users logged in to one or multiple machines, or a user logged into multiple machines.

The system can be set up to require a significant amount of interaction between the production employees and the application or minimal interaction. Many of the production employee transactions with Operator can be automated by directly linking Wonderware MES with shop floor PLCs.

Operator has a window that is split horizontally. The top portion of the screen summarizes the current job information. The bottom portion of the screen has a tabular display. The tabs correspond to unique product functionality. The sections licensed to a respective customer dictate the availability of each tab. Tabs can be hidden.

- The **Entity** tab gives information and function tabs required for each entity. From this tab a user will be able to view job information and enter required data such as production and consumption counts, labor states, utilization reasons, and step information.
- The **Job Summary** screen is located in the top half of the Operator interface. It summarizes all of the pertinent Job information and the display is automatically refreshed when Job conditions change.
- The **Work Queue** tab is used to manipulate the **Job Queue** for the active entity or the entity selected in the **Accessible Entities** drop down, and to change the state of a job at an entity. A production employee uses the **Work Queue** tab to change the state of jobs queued to a given entity, split jobs, or link jobs together.
- The **Production** tab is used for reporting produced items. The reporting of production can be reported as either good or rejected pieces. This screen also allows you to change the lot data.
- The **Genealogy** tab shows the consumption history against the running work order.
- The **Util/OEE** tab displays the history of entity utilization and allows for the entry of changes to the entity state. The tab also displays some analysis data tools.
- The **Folders** tab allows an operator to view, edit, and print files. The folders tab can be displayed two different formats. If a job is running on an entity when the **Folders Tab** is selected, the display will show only the files associated to that job. A user can then select the View button to open the file.

- The **Steps** tab is used as a step-by-step procedure guide to the currently running job. The user is presented with a sequence of activities that must be performed in order to complete the operation. Steps can link to a document file, require data entry, require inspector sign-off, or simply a verification that the step was completed. Individual steps can be bypassed if given permission to do so. Each step requires the operator to log in and then mark the step COMPLETED when done. Time stamps are recorded for login and completion of each step.
- The **Labor** tab displays a history of the current user's labor activity. It also allows users to login, users to log out, change the current user, change the current user's labor codes, change the current user's logged in entities and modify bulk labor users.
- The **Audit** tab displays all certifications required for a Job to be completed. This tab also allows the user to sign off these certifications and enter comment for each.
- The **Data Log** tab allows users to record any type of information about the current job that is being run on this entity. The data collected is typically not a value that is specified prior to running the job. The fields that appear in this tab are created in Supervisor.
- The **Inventory** tab displays the current inventory status of the selected entity. This tab allows the user to transfer in, transfer out and reclassify inventory in the selected location only. It also provides filtering and the ability to view and modify lot attributes for the selected row in the tab.
- The **Storage** tab displays the configured storage locations their location, status and the lots that are currently stored there. From this tab the user can update the location of a storage entity (if it is movable) and the status of the entity (if it allows a dirty state). Selecting an entity from the left hand table will refresh the right hand table to display all inventory lots for the selected entity.

Manually Tracking Production

You can track production manually by using the MES Operator Client. After creating the work order in the Wonderware MES Client, open the MES Operator Client. Log on to the entities that will be producing the items that you wish to track. The work order will be displayed in the **Work Queue** tab.

Execute the jobs, by navigating to the first entity, select the job, then manually start the job. The details of the job will display at the top of the MES Operator Client screen. Navigate to the next job and start the next job. Complete this sequence until all jobs have been run.

To create genealogy for the job, go to the **Production** tab and add lot information for the production items created.

To report consumption, go to the **BOM** tab and add consumption information.

To view the result of the consumption, go to the **Genealogy** tab to see that the consumption went through, it was reported to the correct lot, and the entity names and quantities are correctly linked.

Lab 14 – Manually Tracking Work Orders

Introduction

In this lab, you will use Wonderware MES Operator to track the running of a work order in runtime. Wonderware MES Operator only allows for manual operations, whereas the Operations Capability Object allows input from both manual and automatic sources. You will create a new work order in Wonderware MES Client. Then, you will use Wonderware MES Operator to run the work order manually at runtime. Finally, you will view a genealogy report to verify the production and consumption details of each job associated with the work order.

Objective

Upon completion of this lab, you will be able to:

- Track the running of work orders in Wonderware MES Operator

Run the Work Order in Wonderware MES Operator

First, you will create a work order in Wonderware MES Client.

1. In the Wonderware MES Client, **Processes** tab, create a work order from **BAG-MXN-1** and configure it as follows:

Work Order ID: WO-080
Description: <enter a description>
Item: BMX-BBQ
Required Quantity: 200

Next, you will run the work order in Wonderware MES Operator.

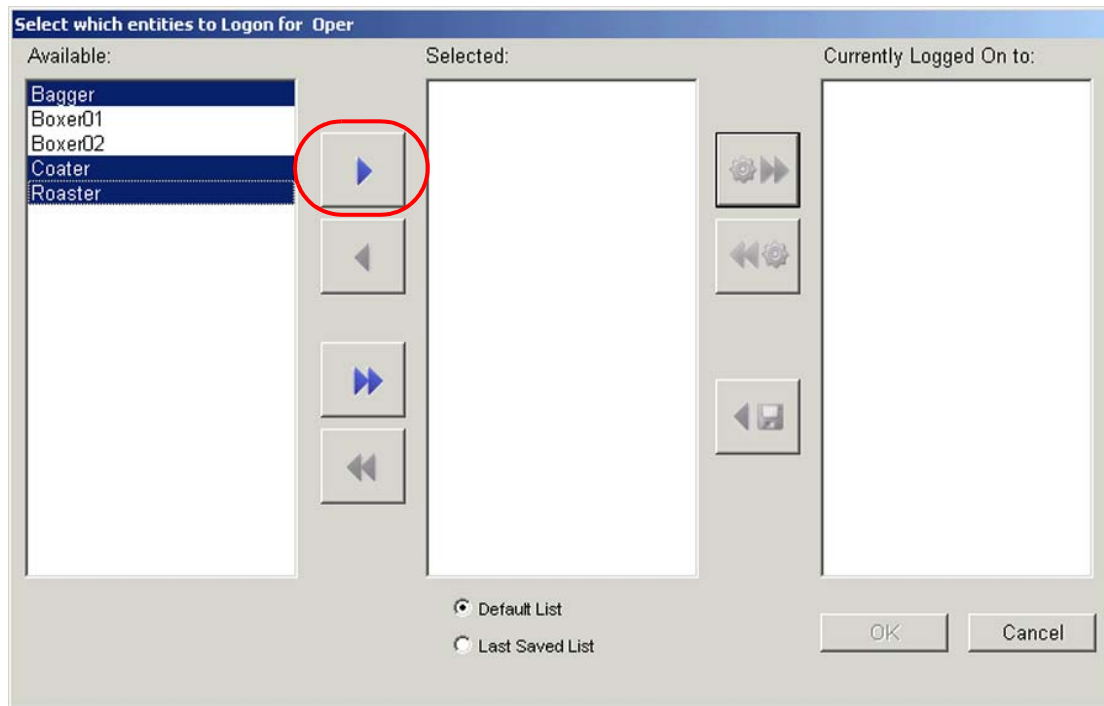
2. Open Wonderware MES Operator (**Start | All Programs | Wonderware | MES | Operator**).
3. In Wonderware MES Operator, log on as follows:

User Name: Oper
Password: ww

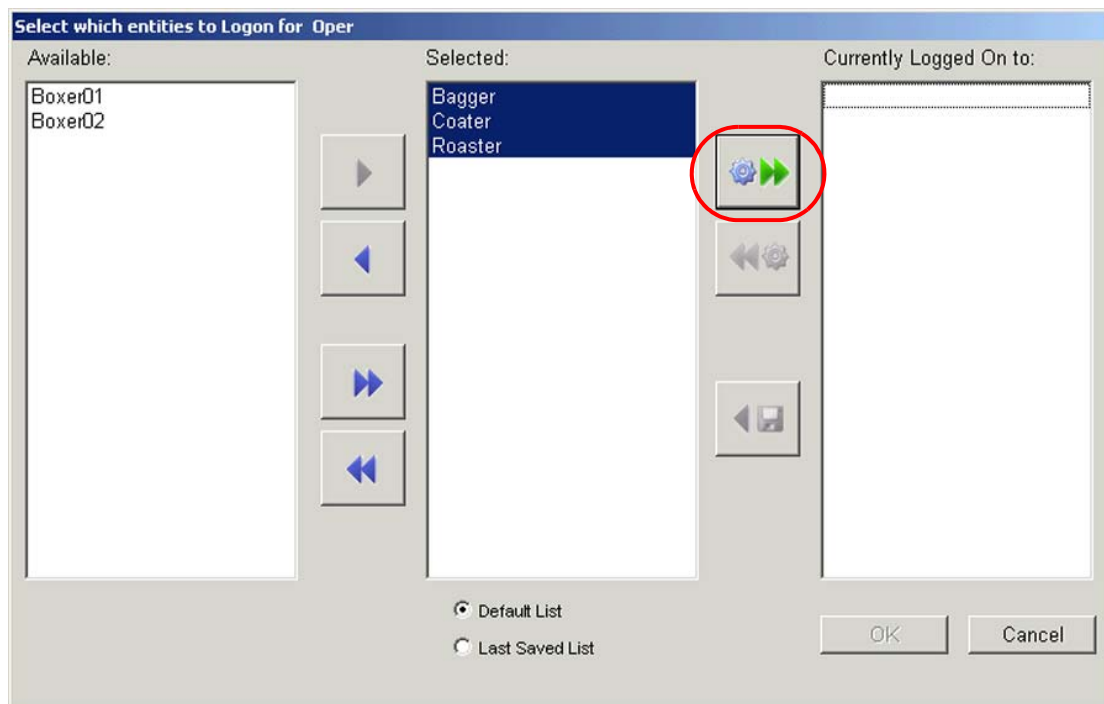


The **Select which entities to Logon for Oper** dialog box appears.

4. In the **Available** list, select the **Bagger**, **Coater**, and **Roaster** entities, and then click the right arrow button.



5. Click the **Log On** button to log on to the selected entities.



- Click the **Save List** button to save the currently logged on entities to the **Default List**.

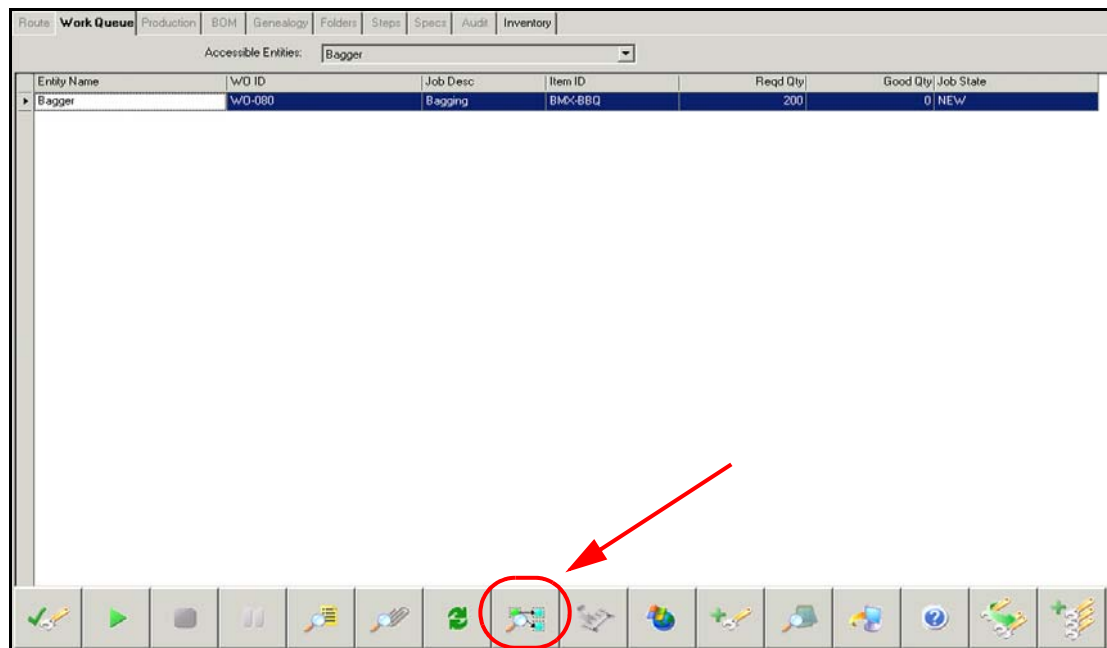
Note: The next time **Select which entities to Logon for Oper** displays, **Bagger**, **Coater**, and **Roaster** will appear in the **Selected** list.

- Click **OK**.

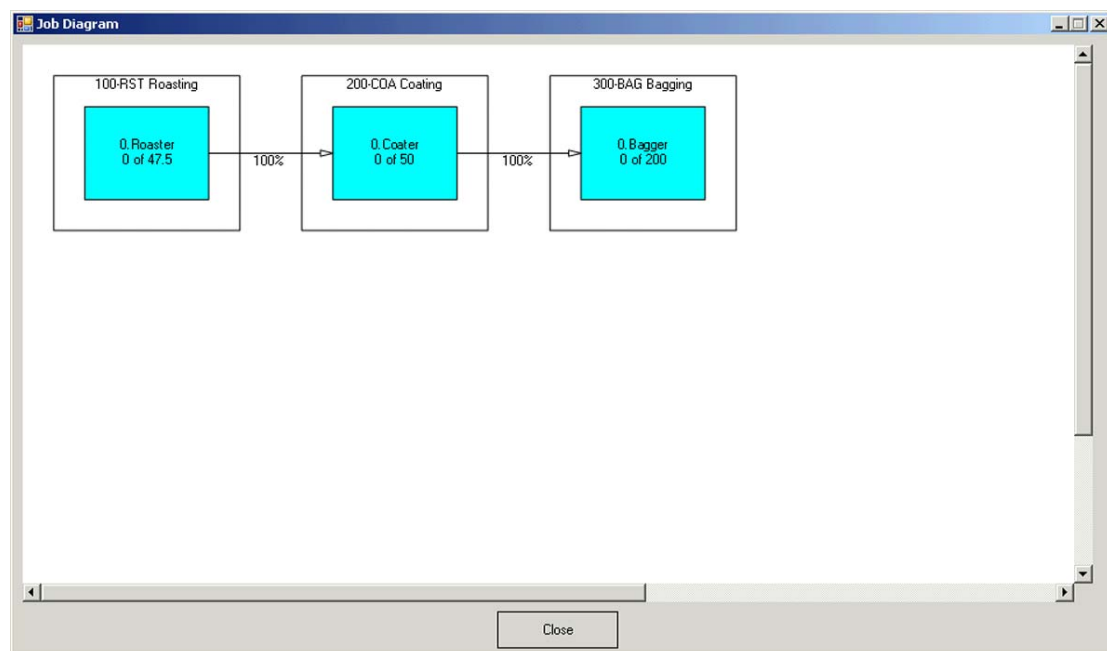
The **Bagger** entity appears in Wonderware MES Operator.

Entity Name	WO ID	Job Desc	Item ID	Reqd Qty
Bagger	WO-080	Bagging	BMX-BBQ	200

8. On the **Work Queue** tab, ensure that the job for **WO-080** is selected, and then click the **View job flow diagram** button.



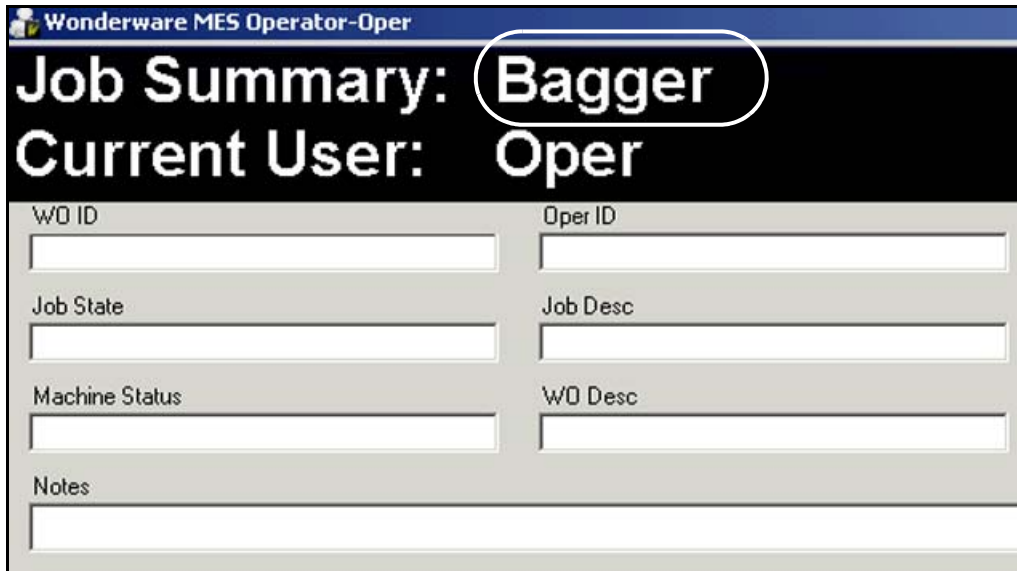
The **Job Diagram** window with the three jobs associated with **WO-080** appears.



9. Click **Close** to close the **Job Diagram** window.

Now, you will track the running of the roasting job.

10. In the **Job Summary** area, click the **Bagger** entity.



Wonderware MES Operator-Oper

Job Summary: **Bagger**

Current User: Oper

WO ID

Oper ID

Job State

Job Desc

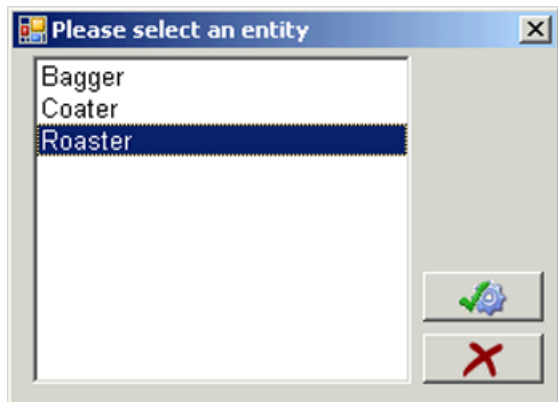
Machine Status

WO Desc

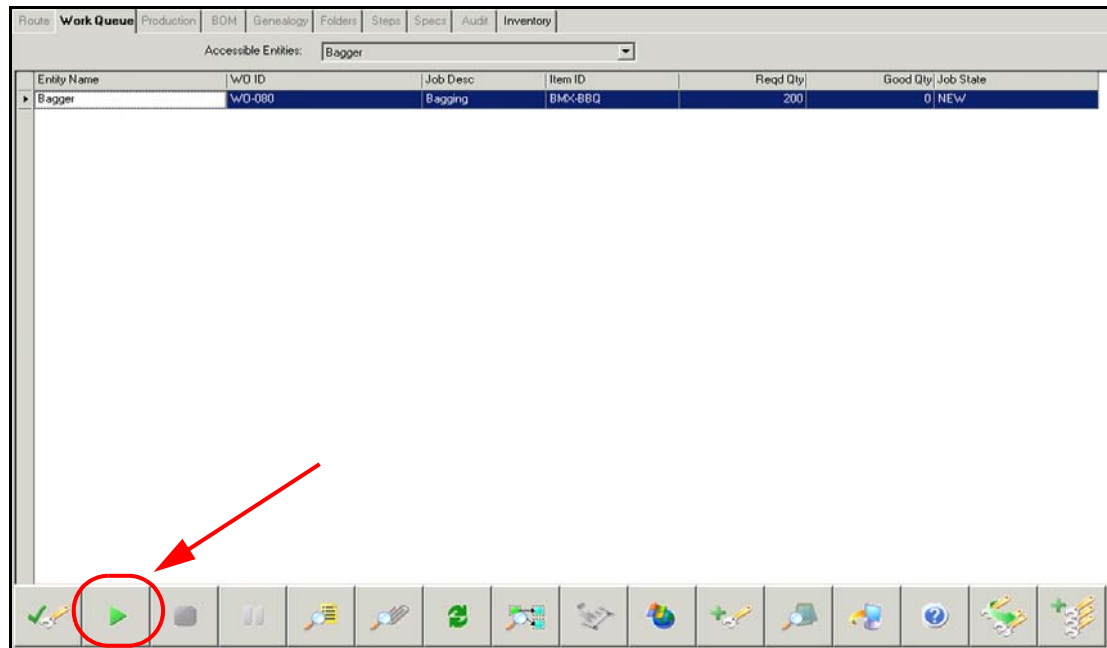
Notes

The **Please select an entity** dialog box appears.

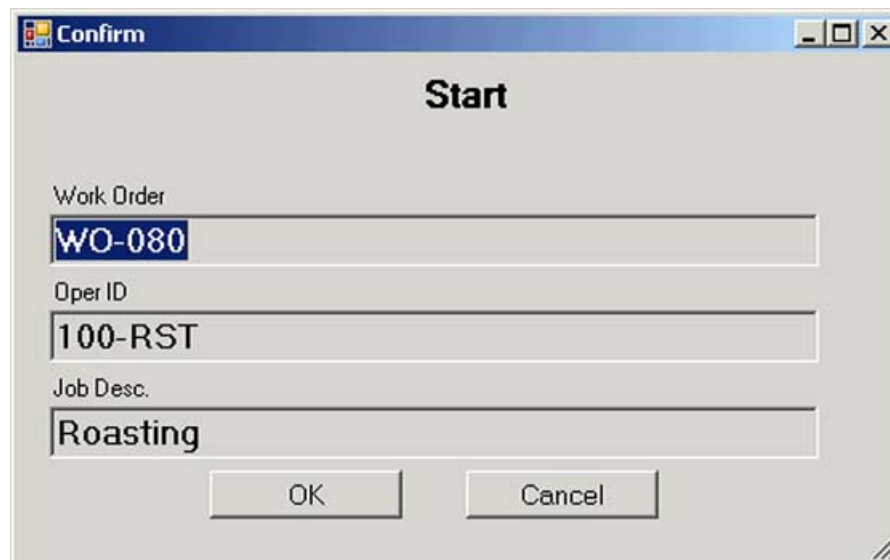
11. Click the **Roaster** entity.



12. On the **Work Queue** tab, ensure **WO-080** is selected, and then click the **Start the selected job** button to start the job.



The **Confirm** dialog box appears.



13. Click **OK**.

The **Job Summary** screen updates the information associated with the currently running job.

14. Click the **Production** tab.

You will use this tab to set the finished good lot information for the job.



15. Click the **Set new lot information** button.

The **Set Lot Data** window appears.

16. Configure the lot information as follows:

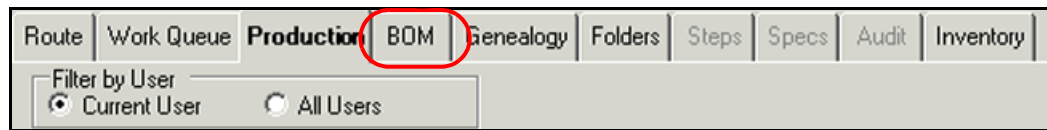
Item: RMX-BLK (Roasted Mixed Nut) (*default*)
Production Code: Good WIP Production
Lot No: RMX-080
To Storage Location: Roaster (*default*)


The **Item** and **To Storage Location** fields are populated based on the configuration of the Bill of Materials (BOM) for **RMX-BLK**.

17. Click **OK**.

Now, you will report consumption of three items: peanuts, cashews, and almonds.

18. Click the **BOM** tab.



19. Click the **Peanuts Bulk** item, and then click the **Add consumption quantity** button .

The **Enter Consumption for Roasting** dialog box appears.

20. Configure the consumption information as follows:

Quantity: 22.5
Lot No: PNT-080

Enter Consumption for Roasting

Quantity 0.474 per unit
22.5 (Pounds)

Consumption Code
Good Consumption

Item Desc
Peanuts Bulk

Item ID
PNT-BLK

Lot No
PNT-080

Storage Location
Silo01

Expiration Date

Work Order ID

Actual Qty
22.515

Remaining Qty
22.515

7 8 9
4 5 6
1 2 3
. 0 <---

OK Cancel

The **Enter Consumption for Roasting** dialog box exposes fields where you can specify the expiration date and work order ID for consumption. In most cases, this information should be provided by the system since the job associated with a work order ID and the expiration date is a configuration parameter in the job. To enable the system to use the default values for the two items, you need to hide these fields. This configuration is retained, but it must be done on each entity.

You will now hide the **Expiration Date** and **Work Order ID** fields in the **Enter Consumption for Roasting** dialog box. The MES system will automatically calculate the values associated with these two fields.

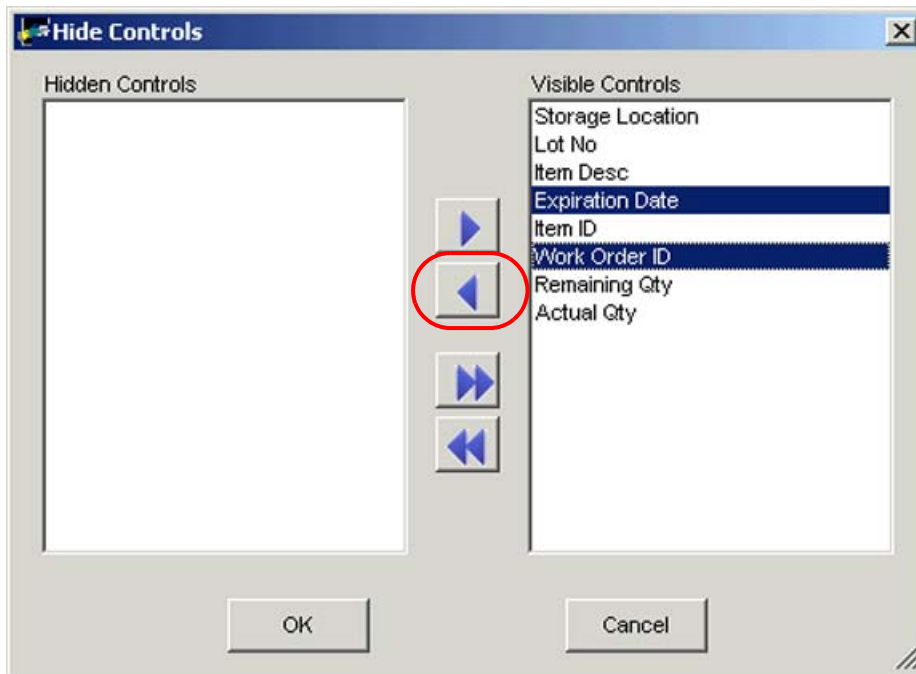
21. In the **Enter Consumption for Roasting** dialog box, right-click in the empty area and select **Configure Fields**.

The screenshot shows the 'Enter Consumption for Roasting' dialog box. On the left, there are several input fields: 'Quantity' (22.5), 'Consumption Code' (Good Consumption), 'Item Desc' (Peanuts Bulk), 'Item ID' (PNT-BLK), 'Lot No' (PNT-080), 'Storage Location' (Silo01), 'Expiration Date' (empty), 'Work Order ID' (empty), 'Actual Qty' (22.515), and 'Remaining Qty' (22.515). On the right, there is a numeric keypad with buttons for digits 0-9, a decimal point, and a back arrow. A context menu is open over the keypad, with 'Configure Fields' highlighted. The menu options are: 'Configure Fields', 'Hide Numeric Keypad', 'Read Qty from FC Tag', and 'Hide per unit label'. At the bottom of the dialog are 'OK' and 'Cancel' buttons.

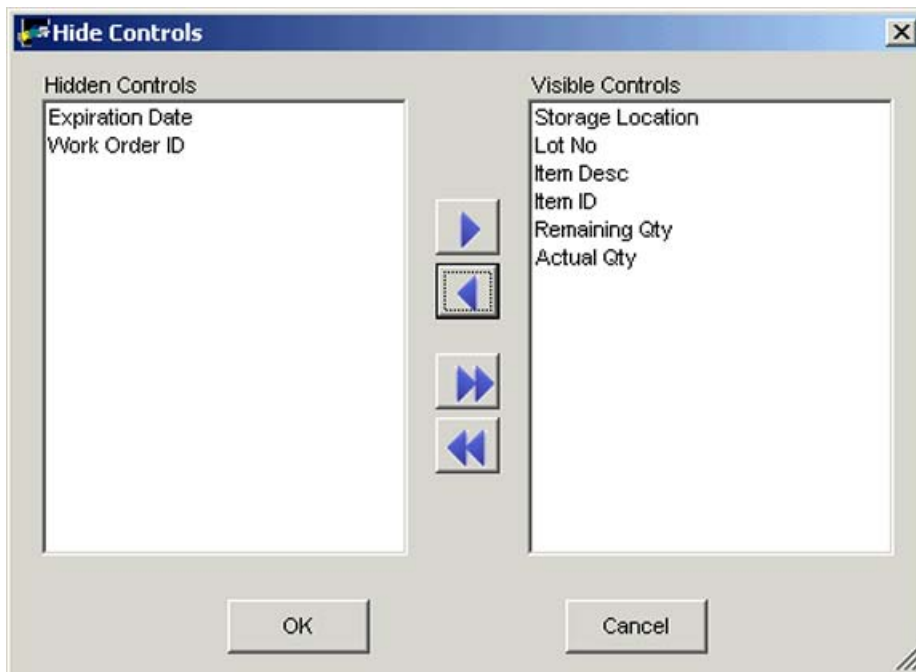
Field	Value
Quantity	22.5
Consumption Code	Good Consumption
Item Desc	Peanuts Bulk
Item ID	PNT-BLK
Lot No	PNT-080
Storage Location	Silo01
Expiration Date	
Work Order ID	
Actual Qty	22.515
Remaining Qty	22.515

The **Hide Controls** dialog box appears.

22. In the **Visible Controls** list, select **Expiration Date** and **Work Order ID**, and then click the left arrow button.



In the **Hidden Controls** list, **Expiration Date** and **Work Order ID** appear.



23. Click **OK**.
24. In the **Enter Consumption for Roasting** dialog box, click **OK**.



25. Click the **Cashews Bulk** item, and then click the **Add consumption quantity** button .
26. In the **Enter Consumption for Roasting** window, configure the consumption information as follows:

Quantity: 12.5
Lot No: CSW-080

Enter Consumption for Roasting

Quantity: 12.5 0.263 per unit (Pounds)

Consumption Code: Good Consumption

Item Desc: Cashews Bulk

Item ID: CSW-BLK

Lot No: CSW-080

Storage Location: Silo02

Actual Qty: 12.4925

Remaining Qty: 12.4925

OK Cancel

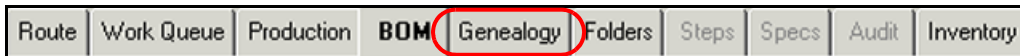
27. Click **OK**.

5-18 Module 5 – Operator Visualization

28. Click the **Almonds Bulk** item, and then report good consumption of **12.5** pounds of almonds against lot **AMD-080**.

You will now verify that the consumption data has been assigned appropriately for genealogy purposes.

29. Click the **Genealogy** tab.



This tab displays the consumption details of peanuts, cashews, and almonds. It also displays the **Lot No** and **FG Lot No** associated with the three consumptions.

Item	Shift Start	Reason	Status	Lot No	FG Lot No
Almonds Bulk	4/16/2013 2:54:56 PM	Good Consumption	Raw Materials	AMD-080	RMX-080
Cashews Bulk	4/16/2013 2:54:56 PM	Good Consumption	Raw Materials	CSW-080	RMX-080
Peanuts Bulk	4/16/2013 2:54:56 PM	Good Consumption	Raw Materials	PNT-080	RMX-080

Now, you will report production associated with the roasting job.



30. On the **Production** tab, click the **Add production to the current job** button .

The **Enter Production for Roasting** window appears.

31. In the **Good Qty** field, enter **47.5**.

Enter Production for Roasting

☒ **Good Quantity**
☐ **Reject Quantity**

Good Qty
47.5 (Pounds)

Good Qty Production Code
Good WIP Production

Item Desc
Roasted Mixed Nut

Item ID
RMX-BLK

Lot No
RMX-080

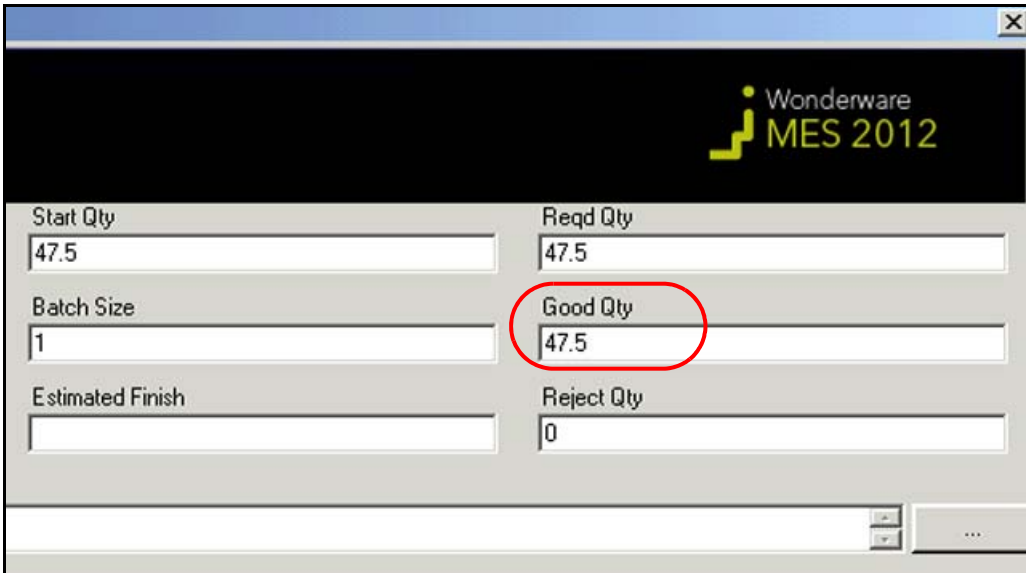
To Storage Location
Roaster

7 8 9
4 5 6
1 2 3
. 0 <---

Save Clear Close

32. Click **Save**, and then click **Close**.

In the **Job Summary** area, the value in the **Good Qty** field updates to reflect the quantity you just produced.



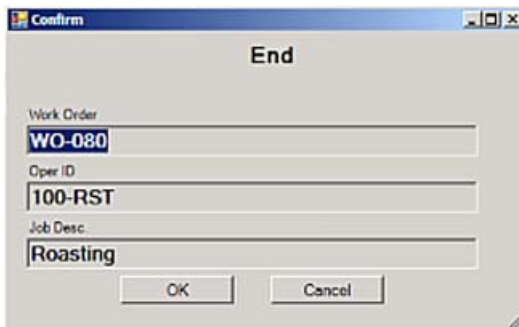
The screenshot shows the 'Job Summary' dialog box in Wonderware MES 2012. The dialog has a title bar with a close button. The main area contains several input fields arranged in two columns. The 'Good Qty' field is highlighted with a red circle. The 'Reqd Qty' field also contains the value 47.5. The 'Reject Qty' field contains the value 0. The 'Batch Size' field contains the value 1. The 'Start Qty' field contains the value 47.5. The 'Estimated Finish' field is empty. The 'Job Summary' title is visible in the top right corner of the dialog area.

Field	Value
Start Qty	47.5
Batch Size	1
Estimated Finish	
Reqd Qty	47.5
Good Qty	47.5
Reject Qty	0

33. On the **Work Queue** tab, click the **Stop the selected job** button



The **Confirm** dialog box appears.



The screenshot shows the 'Confirm' dialog box. The title bar says 'Confirm'. The main area has a title 'End'. Below the title are three input fields: 'Work Order' with the value 'WO-080', 'Oper ID' with the value '100-RST', and 'Job Desc.' with the value 'Roasting'. At the bottom are two buttons: 'OK' and 'Cancel'.

Field	Value
Work Order	WO-080
Oper ID	100-RST
Job Desc.	Roasting

34. Click **OK**.

The roasting job is now successfully completed.

Next, you will run the coating job associated with the work order.

35. In the **Job Summary** area, click the **Roaster** entity, and then in the **Please select an entity** dialog box, click the **Coater** entity.



The **Coater** entity set appears.

36. On the **Work Queue** tab, select the job associated with **WO-080**, and then click the **Start the selected job** button.
37. In the **Confirm** dialog box, click **OK**.



38. On the **Production** tab, click the **Set new lot information** button and configure the lot information as follows:

Item: FMX-BBQ (Flavored Mixed Nut - BBQ) (*default*)
Production Code: Good WIP Production
Lot No: FMX-080
To Storage Location: Coater (*default*)

A screenshot of a 'Set Lot Data' dialog box. It has a title bar with a yellow arrow icon and a close button. The dialog contains four fields: 'Item' with a dropdown menu showing 'FMX-BBQ (Flavored Mixed Nut - BBQ)'; 'Production Code' with a dropdown menu showing 'Good WIP Production'; 'Lot No' with a text box containing 'FMX-080' and a small '...' button to its right; and 'To Storage Location' with a dropdown menu showing 'Coater'. At the bottom are three buttons: 'Apply', 'OK', and 'Cancel'.

39. Click **OK**.

You will now report consumption of three items: roasted mixed nuts, coating oil, and BBQ flavoring. For the coating oil, you will consume most of the required quantity from Tank01 and the rest from Tank02.

40. On the **BOM** tab, select the **Roasted Mixed Nut** item, and then click the **Add consumption quantity** button.
41. In the **Enter Consumption for Coating** dialog box, hide the **Expiration Date** and **Work Order ID** for the **Coater** entity.

Enter Consumption for Coating

Quantity: 0.95 per unit (Pounds)

Consumption Code: Good Consumption

Item Desc: Roasted Mixed Nut

Item ID: RMX-BLK

Lot No:

Storage Location: Coater

Actual Qty: 47.5

Remaining Qty: 47.5

OK Cancel

The fields are no longer displayed.

42. Report consumption as follows:

Note: You must change the **Storage Location** before entering the **Lot No.**

Quantity: 47.5
Consumption Code: WIP Consumption
Storage Location: Roaster
Lot No: RMX-080

Enter Consumption for Coating

Quantity 0.95 per unit
47.5 (Pounds)

Consumption Code
WIP Consumption

Item Desc
Roasted Mixed Nut

Item ID
RMX-BLK

Lot No
RMX-080

Storage Location
Roaster

Actual Qty
47.5

Remaining Qty
47.5

OK Cancel

Next, you will report consumption of the coating oil from both tanks.

43. On the **BOM** tab, select the **Coating Oil** item, and report good consumption as follows:

Item ID: OIL-LQD (*default*)
Quantity: 0.9
Lot No: COA-080-1
Storage Location: Tank01 (*default*)

44. Report good consumption again as follows:

Item ID: OIL-LQD (*default*)
Quantity: 0.1
Lot No: COA-080-2
Storage Location: Tank02

You will now report the consumption of the BBQ flavoring.

45. Report consumption of the flavoring as follows:

Quantity: 1.5
Item ID: BBQ-FLA (*default*)
Storage Location: Receiving (*default*)
Lot No: FLA-080

46. Click the **Genealogy** tab to view details of the four consumptions associated with the coating job.

Route	Work Queue	Production	BOM	Genealogy	Folders	Steps	Specs	Audit	Inventory	
Filter Genealogy By										Filter Genealogy By
<input checked="" type="radio"/> Current User <input type="radio"/> All Users										<input checked="" type="radio"/> Current User <input type="radio"/> All Users
Drag a column header here to group by that column.										
Work Order	Operation	Seq No	Item ID	Item	Shift Start	Reason	Status	Lot No	FG Lot No	
W/O-080	200-COA	0	BBQ-FLA	BBQ Flavoring	4/16/2013 2:54:56 PM	Good Consumption	WIP Materials	FLA-080	FMX-080	
W/O-080	200-COA	0	OIL-LQD	Coating Oil	4/16/2013 2:54:56 PM	Good Consumption	WIP Materials	COA-080-1	FMX-080	
W/O-080	200-COA	0	OIL-LQD	Coating Oil	4/16/2013 2:54:56 PM	Good Consumption	WIP Materials	COA-080-2	FMX-080	
W/O-080	200-COA	0	RMX-BLK	Roasted Mixed...	4/16/2013 2:54:56 PM	WIP Consumption	WIP Materials	RMX-080	FMX-080	

You will now report production associated with the coating job.

47. On the **Production** tab, report **50** pounds of good quantity.

Enter Production for Coating [X]

☒ **Good Quantity**
☐ **Reject Quantity**

Good Qty
50 (Pounds)

Good Qty Production Code
Good WIP Production

Item Desc
Flavored Mixed Nut - BBQ

Item ID
FMX-BBQ

Lot No
FMX-080 [Copy]

To Storage Location
Coater

7 8 9
4 5 6
1 2 3
. 0 <---

Save Clear Close

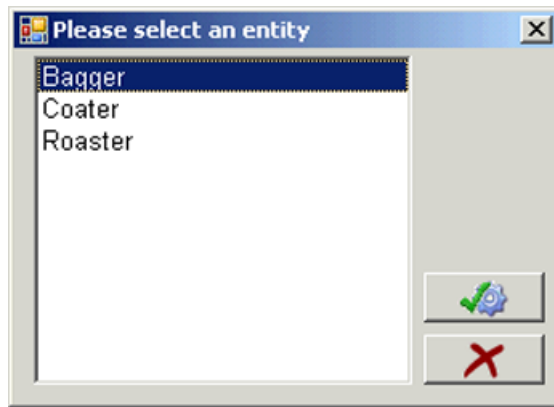
48. On the **Work Queue** tab, click the **End the selected job** button.

49. In the **Confirm** dialog box, click **OK**.

Next, you will run the last operation associated with the work order.

For the purpose of this lab, since each box of finished goods contains 100 pieces of bagged, flavored mixed nuts, assume that the production from this job needs to be split into two lots, **BMX-080-A** and **BMX-080-B**.

50. Use the **Job Summary** area to switch to the **Bagger** entity.



51. On the **Work Queue** tab, click **WO-080**, and start the job.

52. On the **Production** tab, set the lot data as follows:

Item: BMX-BBQ (Bag of Mixed Nut - BBQ) (*default*)
Production Code: Good WIP Production
Lot No: BMX-080-A
To Storage Location: ProductionStorage (*default*)



You will now report consumptions associated with the bagging job.

53. On the **BOM** tab, click the **Flavored Mixed Nut - BBQ** item.

54. Click **Add consumption quantity**.

55. Hide the **Expiration Date** and **Work Order ID** for the **Bagger** entity.

56. Report consumption as follows:

Quantity: 50
Consumption Code: WIP Consumption
Lot No: FMX-080
Storage Location: Coater (*default*)

Enter Consumption for Bagging [X]

Quantity 0.25 per unit
50 (Pounds)

Consumption Code
WIP Consumption

Item Desc
Flavored Mixed Nut - BBQ

Item ID
FMX-BBQ

Lot No
FMX-080

Storage Location
Coater

Actual Qty
50

Remaining Qty
50

7 8 9
4 5 6
1 2 3
. 0 <---

OK Cancel

The BOM associated with this process is using the backflush option for the empty bags. Therefore, you will not explicitly report consumption for this part of the job; instead, you will set the default lot information for the backflush consumption.

57. Click the **Empty Bags** item and set the lot data as follows:

Item: BAG-BBQ (BBQ Mixed Nut - Empty) (*default*)
Production Code: Good Consumption
Lot No: BAG-080
To Storage Location: Receiving (*default*)



The image shows a 'Set Lot Data' dialog box with the following fields and values:

Field	Value
Item	BAG-BBQ (BBQ Mixed Nut - Empty)
Consumption Code	Good Consumption
Lot No	BAG-080
Storage Location	Receiving

Buttons: OK, Cancel

Now, you will report production associated with the bagging job.

58. On the **Production** tab, report **100** pieces of good quantity.

Enter Production for Bagging [X]

☒ **Good Quantity**
☐ **Reject Quantity**

Good Qty
100 (Pieces)

Good Qty Production Code
Good WIP Production

Item Desc
Bag of Mixed Nut - BBQ

Item ID
BMX-BBQ

Lot No
BMX-080-A

To Storage Location
ProductionStorage

7 8 9
4 5 6
1 2 3
. 0 <---

Save Clear Close

Next, you will set the lot information for the second produced lot.

59. On the **Production** tab, set the lot data as follows:

Item: BMX-BBQ (Bag of Mixed Nut - BBQ) (*default*)
Production Code: Good WIP Production (*default*)
Lot No: BMX-080-B
To Storage Location: ProductionStorage (*default*)



The image shows a 'Set Lot Data' dialog box with the following fields and values:

Field	Value
Item	BMX-BBQ (Bag of Mixed Nut - BBQ)
Production Code	Good WIP Production
Lot No	BMX-080-B
To Storage Location	ProductionStorage

Buttons at the bottom: Apply, OK, Cancel.

60. On the **Production** tab, report **100** pieces of good quantity.

Enter Production for Bagging [X]

☒ **Good Quantity**
☐ **Reject Quantity**

Good Qty
100 (Pieces)

Good Qty Production Code
Good WIP Production

Item Desc
Bag of Mixed Nut - BBQ

Item ID
BMX-BBQ

Lot No
BMX-080-B [Printer Icon]

To Storage Location
ProductionStorage


7 8 9
4 5 6
1 2 3
. 0 <---

Save Clear Close

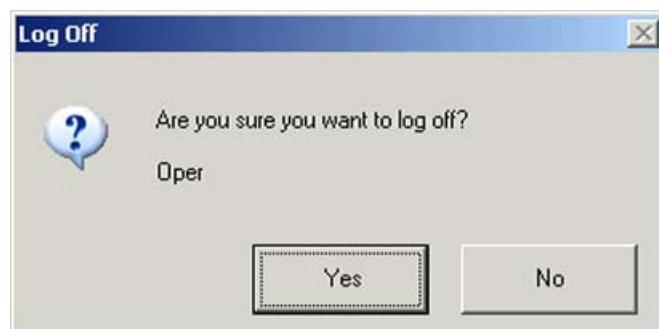
61. Click the **Genealogy** tab to view details of the consumptions associated with the bagging job.

Route	Work Queue	Production	BOM	Genealogy	Folders	Steps	Specs	Audit	Inventory
Filter Genealogy By									
<input checked="" type="radio"/> Current User <input type="radio"/> All Users									
Drag a column header here to group by that column.									
Work Order	Operation	Seq No	Item ID	Item	Shift Start	Reason	Status	Lot No	FG Lot No
W/O-080	300-BAG	0	BAG-BBQ	BBQ Mixed Nut ..	4/16/2013 2:54:56 PM	Good Consumption	Good Consumption	BAG-080	BMX-080-A
W/O-080	300-BAG	0	BAG-BBQ	BBQ Mixed Nut ..	4/16/2013 2:54:56 PM	Good Consumption	Good Consumption	BAG-080	BMX-080-B
W/O-080	300-BAG	0	FMX-BBQ	Flavored Mixed...	4/16/2013 2:54:56 PM	WIP Consumption	WIP Materials	FMX-080	BMX-080-A

62. On the **Work Queue** tab, end the job.

63. In the top-right corner, click the **Close** button  to log off and close Wonderware MES Operator.

The **Log Off** dialog box appears.

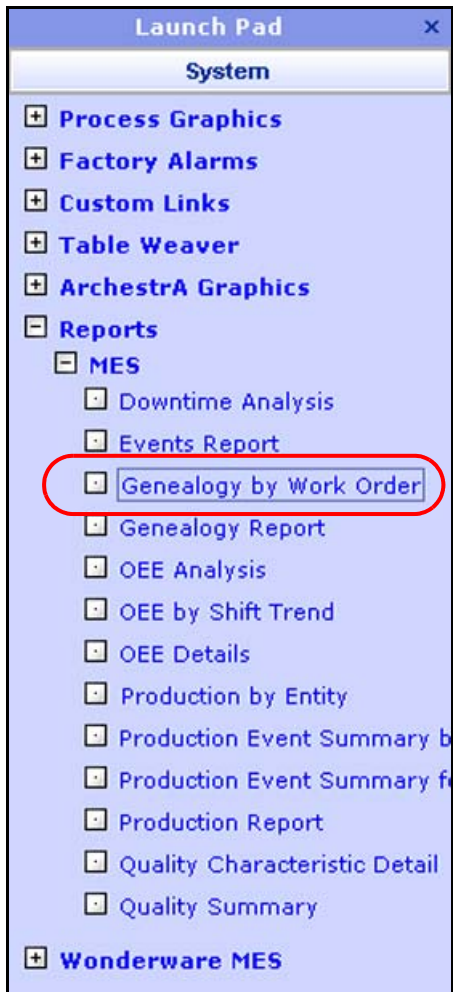


64. Click **Yes** to continue.

Run the Genealogy Report in Wonderware Information Server

Now, you will create a genealogy report of the consumption items.

65. In the Wonderware Information Server, **Launch Pad** pane, click **Genealogy by Work Order**.



66. In the **Date Time** area, select a start date and time that corresponds to the beginning of the week and an end date and time that corresponds to the end of the week and click **Execute**.

Date Time

5/ 6/2013 12:00:00 AM [5] 00:00:00.000 5/11/2013 12:00:00 AM

Time zone: (GMT-08:00) Pacific Time (US & Canada); Tijuana

Filter

Do not auto-populate list boxes: ☒ True ☐ False

Item Name Pattern:

Select Specific Item Name: ☒ True ☐ False

Items List: ALL

Select Specific Entity Name: ☒ True ☐ False

Show Data Filtering Criteria: On

Work Order Id Pattern:

Work Order Select Specific: ☒ True ☐ False

Work OrderID List: ALL

Entity Pattern:

Entities List: ALL

Show Expanded: Collapsed

Execute

67. Expand **Work Order ID: WO-080** to view the report.

Work Order ID: WO-040	
Work Order ID: WO-050	
Work Order ID: WO-060	
Work Order ID: WO-070	
Work Order ID: WO-071	
Work Order ID: WO-080	
Operation ID: 100-RST	Entity Name: Roaster
Produced Item: Roasted Mixed Nut(RMX-BLK)	Job Start Time:5/8/2013 2:46:23 PM
	Job End Time:5/9/2013 11:35:02 AM
Operation ID: 200-COA	Entity Name: Coater
Produced Item: Flavored Mixed Nut - BBQ (FMX-BBQ)	Job Start Time:5/9/2013 11:37:58 AM
	Job End Time:5/9/2013 12:46:44 PM
Operation ID: 300-BAG	Entity Name: Bagger
Produced Item: Bag of Mixed Nut - BBQ(BMX-BBQ)	Job Start Time:5/9/2013 1:34:19 PM
	Job End Time:5/9/2013 1:54:15 PM

68. Expand each of the three operations and browse through the consumption and production details associated with them.

<div> <div> Produced Item: Roasted Mixed Nut(RMX-BLK) Job Start Time:5/8/2013 2:46:23 PM </div> <div> Job End Time:5/9/2013 11:35:02 AM </div> </div>				
Produced Lot	Target Entity Name	Grade	State	Produced Quantity
RMX-080	Roaster	Normal	WIP Materials	47.5 Pounds
	Consumed Item ID (Description)	Lot	Entity Name	
	Almonds Bulk	AMD-080	Silo03	
	Cashews Bulk	CSW-080	Silo02	
	Peanuts Bulk	PNT-080	Silo01	
<div> <div> Operation ID: 200-COA Entity Name: Coater </div> <div> Produced Item: Flavored Mixed Nut - BBQ (FMX-BBQ) Job Start Time:5/9/2013 11:37:58 AM </div> <div> Job End Time:5/9/2013 12:46:44 PM </div> </div>				
Produced Lot	Target Entity Name	Grade	State	Produced Quantity
FMX-080	Coater	Normal	WIP Materials	50 Pounds
	Consumed Item ID (Description)	Lot	Entity Name	
	BBQ Flavoring	FLA-080	Receiving	
	Coating Oil	COA-080-1	Tank01	
	Coating Oil	COA-080-2	Tank02	
	Roasted Mixed Nut	RMX-080	Roaster	
<div> <div> Operation ID: 300-BAG Entity Name: Bagger </div> <div> Produced Item: Bag of Mixed Nut - BBQ(BMX-BBQ) Job Start Time:5/9/2013 1:34:19 PM </div> <div> Job End Time:5/9/2013 1:54:15 PM </div> </div>				
Produced Lot	Target Entity Name	Grade	State	Produced Quantity
BMX-080-A	ProductionStorage	Normal	WIP Materials	100 Pieces
	Consumed Item ID (Description)	Lot	Entity Name	
	BBQ Mixed Nut - Empty	BAG-080	Receiving	
	Flavored Mixed Nut - BBQ	FMX-080	Coater	
BMX-080-B	ProductionStorage	Normal	WIP Materials	100 Pieces
	Consumed Item ID (Description)	Lot	Entity Name	
	BBQ Mixed Nut - Empty	BAG-080	Receiving	

Section 2 – MES .NET Controls

This section provides an overview of the .NET controls included with Wonderware MES - Operations. It describes the Operations .NET controls and shows how to import them into a Galaxy and use them in an ArchestrA symbol.

Overview

Wonderware MES Software/Operations contains a comprehensive set of .NET controls which facilitate the inclusion of production operations data in HMI applications based on ArchestrA, Web-based information portals, and other third-party applications.

Wonderware MES Software/Operations includes controls for **Production, Route, Inventory, Folders, Labor, Consumption, Work/Job Queue, Job Summary, Specifications, Steps/Procedures, Data Log and Audit/Certification**. For descriptions of these controls, see the following pages.

You can embed ArchestrA symbols containing these .NET controls directly into an InTouch application and use them at runtime in WindowViewer.

You can place multiple Wonderware MES Software/Operations .NET controls into one single ArchestrA symbol. You can also place multiple instances of the same .NET control into one single ArchestrA control. There is no limit to the number of Wonderware MES Software/Operations .NET controls you can embed into an ArchestrA symbol.

Installing and Importing the Controls

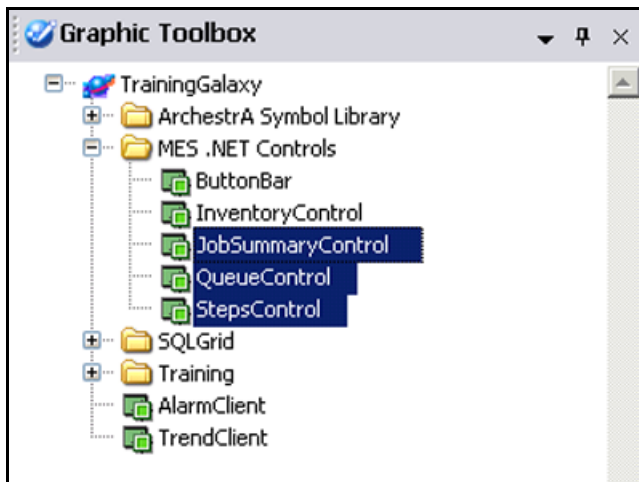
If you selected the .NET Controls files to be installed during installation of Wonderware MES Software/Operations, they were copied onto your local hard drive in the following folder:

C:\Program Files\Wonderware\MES\Controls

Note: You can also browse onto the MES Installation CD and copy these files manually from the \MES\Controls default folder.

You import the Wonderware MES Software/Operations into the ArchestrA IDE as you would any other .NET client control, by using the **Galaxy** menu **Import | Client Control** command.

The imported controls appear in the **Graphic Toolbox**.



After you import the controls, you can embed them into ArcestraA symbols and configure them as you would configure other .NET client controls embedded into ArcestraA symbols. For example, you can:

- Bind .NET control properties to ArcestraA attributes, InTouch tags, properties of elements, or symbol custom properties
- Write scripts and associate them with Wonderware MES Software/Operations .NET controls events
- Access Wonderware MES Software/Operations.NET controls properties and methods from other elements in the ArcestraA symbol

Operations .NET controls

Wonderware MES Software/Operations includes the following .NET controls.

Tab/Component in Operator	Control Name	DLL
Button bar	ButtonBar	Fact.Controls.ButtonBar
Audit tab	AuditControl	FactMES.Controls.Audit
BOM tab	ConsumptionControl	FactMES.Controls.Consumption
Data Log tab	DataLogControl	FactMES.Controls.DataLog
Genealogy tab	GenealogyControl	FactMES.Controls.Genealogy
Inventory tab	InventoryControl	FactMES.Controls.Inventory
Job Summary	JobSummaryControl	FactMES.Controls.JobSummary
Production tab	ProductionControl	FactMES.Controls.Production
Work Queue tab	QueueControl	FactMES.Controls.Queue
Route tab	RouteControl	FactMES.Controls.Route
Specs tab	SpecControl	FactMES.Controls.Spec
Steps tab	StepsControl	FactMES.Controls.Steps

These controls are described on the following pages. For a list of all available controls, and instructions on how to configure and use them, see the *MES .NET Controls Programmer's Guide*.

ButtonBar

The **ButtonBar** control is a special control that provides a set of buttons at runtime that send commands to other associated Wonderware MES Software/Operations .NET controls in the same ArcestraA symbol.




Note: A symbol containing other .NET controls does not require the **ButtonBar** control. But, a symbol containing only a **ButtonBar** control does not provide any functionality.



AuditControl

The **AuditControl** shows all audit-type certifications required for a job to be completed and provides a way for users to sign-off on these certifications.

	Certification	Level	Audited By	Date Audited	Comments
1 ▶	Inspection	1			

Operators can use the **AuditControl** at runtime to:

- Refresh the **Audit** grid
- Sign-off and add comments to the selected certification
- Change the active user
- Start an external application
- Start Internet Explorer
- Open the **Operations Help** window








ConsumptionControl

The **ConsumptionControl** lists the BOM (Bill of Materials) items for the active job. It can be used to report consumption for those BOM items, and to change their lot numbers or storage locations.

Route
Work Queue
Production
BOM
Genealogy
Folders
Steps
Specs
Data Log
Audit
Inventory

Drag a column header here to group by that column.

	Work Order	Operation	Seq No	BOM Pos	Item ID	Item	Substitute Item Us
▶	WO-060	100	0	1			<input checked="" type="checkbox"/>
	WO-060	100	0	2			<input type="checkbox"/>

The operator can use the **ConsumptionControl** to:

- Add consumption
- Record scrap of consumable items
- Set the lot data
- Refresh the **ConsumptionControl**
- Filter the entries on the **ConsumptionControl**
- Switch the active user
- View item attributes

DataLogControl

The **DataLogControl** shows the “log” of data values recorded for the active job and allows new data values to be entered. The collected data is typically not a value that is specified prior to running the job. The fields that appear in this control are created in **Supervisor**.

The screenshot displays the **DataLogControl** interface. At the top, there is a navigation bar with tabs: Route, Work Queue, Production, BOM, Genealogy, Folders, Steps, Specs, **Data Log**, Audit, and Inventory. Below the tabs, there is a checkbox labeled "Hide completed rows" and a dropdown menu labeled "Process Data Log". The main area contains a table with the following columns: Group Description, Sample Time, WO ID, Item, Temperature, and Viscosity. Below the table, there is a toolbar with icons for adding a new row, saving all entered data, refreshing the grid, deleting the selected row, opening the MES Help window, starting an external application, starting Internet Explorer, switching between grid and chart display, and switching the active user.

The operator can use the **DataLogControl** to:

- Add a new row to the grid
- Save all entered data
- Refresh the **Data Log** grid
- Delete the selected row from the grid
- Open the **MES Help** window
- Start an external application
- Start Internet Explorer
- Switch between grid display and chart display
- Switch the active user

GenealogyControl

The **GenealogyControl** shows the consumption history against the running work order. These records include goods and waste consumption. It also allows an operator to change previously reported consumption information.

Work Order	Operation	Seq No	Item ID	Item	Shift Start	Reason
WO-060	100	0			3/6/2009 8:00:00 AM	Good Consumption

The operator can use the **GenealogyControl** to:

- Reduce consumption in the current job
- Change the reason the item was consumed by the job (this is known as “Reclassify”)
- Refresh the **GenealogyControl**
- Switch the active user
- Open the **Operations Help** window

InventoryControl

The **InventoryControl** shows the current inventory status of a given entity.

Entity Name	Status	Maximum Capacity
Roaster	Available	0

Item ID	Item	Lot No	Entity Name
RMX-BLK	Roasted Mixed Nut	RMX-130	Roaster

The operator can use the **InventoryControl** to:

- Transfer inventory from another entity to the selected storage location (this is known as “transfer in”)
- Transfer inventory from the selected entity to another storage location (this is known as “transfer out”)
- Change the grade and status of the selected lot (this is known as “reclassify”)
- Remove all or some of the items from the inventory of the selected storage location (this is known as “scrap”)
- Add, remove, and change the attributes of the selected lot
- Filter parameters to limit the view of the **InventoryControl**
- Refresh the **InventoryControl**
- Switch the active user

JobSummaryControl

The **JobSummaryControl** shows all current job information of a given entity. When multiple jobs are running at once, it determines which job is active so that you can view and work with that job's data. The **JobSummaryControl** corresponds to the top pane of the window in Wonderware MES Software/Operations.

Job Summary: Roaster					
Current User: Oper					
WO ID	Oper ID	Part Number	Start Qty	Reqd Qty	
WVO-090	100-RST	RMX-BLK	95	95	
Job State	Job Desc	Part Desc	Batch Size	Good Qty	
RUNNING	Roasting	Roasted Mixed Nut	1	0	
Machine Status	WO Desc	Reqd By	Estimated Finish	Reject Qty	
		4/23/2013 4:00:00 AM		0	

ProductionControl

The **ProductionControl** reports produced items and allows the operator to change the lot data and quantity amounts for each job, and to include good and rejected production of the produced item and its by-products.

Route	Work Queue	Production	BOM	Genealogy	Folders	Steps	Specs	Data Log	Audit	Inventory
<div> Filter by User <input checked="" type="radio"/> Current User <input type="radio"/> All Users </div> <div> Filter Production by <input checked="" type="radio"/> Current Shift <input type="radio"/> All Shifts </div>										
Shift Start	Qty Produced	Lot No	Reason Desc	Grade	Status					
3/6/2009 8:00:00 AM	10	CHMX-060	WIP Production	NORMAL	WIP MATERIALS					
<div> </div>										

The operator can use the **ProductionControl** to:

- Add good units to the production
- Add rejected units to the production
- Mark the production lot as processed
- Set a new lot number, production code and storage location
- Reduce units from the production
- Refresh the **ProductionControl**

QueueControl

The **QueueControl** allows the operator to log on and log off from jobs of a given entity, manipulate the job queue of a given entity, and to change the state of a job at a given entity.

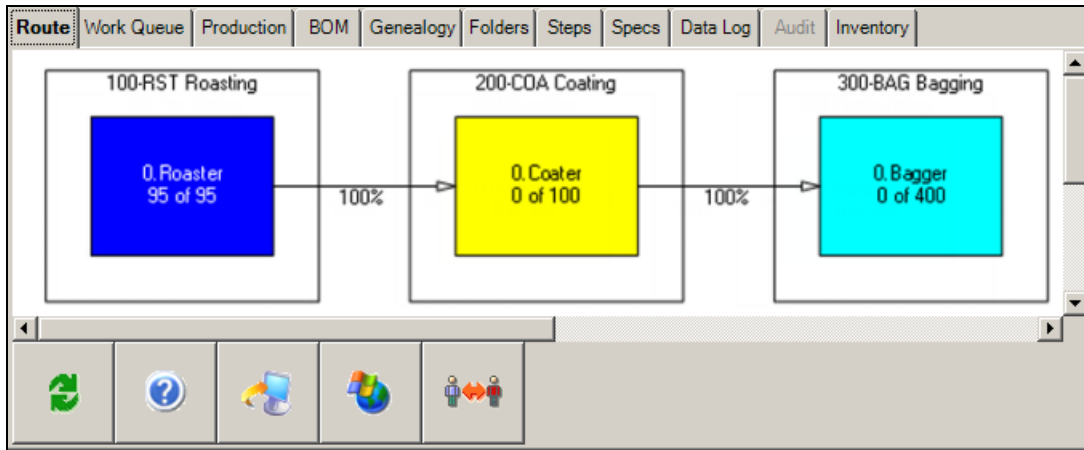
Route	Work Queue	Production	BOM	Genealogy	Folders	Steps	Specs	Data Log	Audit	Inventory
Accessible Entities: Production										
Entity Name	WO ID	Operation	Job Desc	Item ID	Reqd Qty	Good Qty	Job State			
Production	WO-060	100			30	10	RUNNING			
Production	WO-060	200			100	0	READY			
Production	WO-060	300			100	0	NEW			

The operator can use the **Queue** control to:

- Start the selected job
- Stop the currently running job
- Pause the currently running job
- Changes the selected job's state from "New" to "Ready"
- Show the routing diagram for either the currently running job, or the selected job
- Show all required components for either the currently running job, or the selected job
- Create a new work order to replenish the inventory level for a selected item
- Show attributes of the currently running job, or the selected job
- Refresh the **QueueControl**
- Download specs for the currently running job
- Switch the active user
- Start Internet Explorer
- Open the **Operations Help** window

RouteControl

The **RouteControl** shows the routing and status of all jobs of a given work order.



The operator can use the **RouteControl** to:

- Refresh the **RouteControl**
- Open the **Operations Help** window
- Start an external application
- Start Internet Explorer
- Switch the active user

SpecControl

The **SpecControl** shows the specifications assigned to the active job, but not assigned to any particular step.

Description	Value	Current...	Minimum...	Maximum value	Access...	Variance
	120		100	150	0	-120
	90		60	120	0	-90

The operator can use the **SpecControl** to:

- View and modify the minimum, maximum, and “set point” values
- View and modify attached files or comments or instructions
- View the actual value for the active job
- Change the specification guidelines, for a specified job or for subsequent jobs

StepsControl

The **StepsControl** shows the steps of the currently running job as a procedure guide if steps have been defined for this job.

The screenshot displays the StepsControl interface. At the top, there is a navigation bar with tabs: Route, Work Queue, Production, BOM, Genealogy, Folders, **Steps**, Specs, Data Log, Audit, and Inventory. Below the tabs, there are three input fields: Operator (oper), Serial Number (CHMX-060), and Step Group (- All -). The main area contains a table with the following data:

Step No	Step Desc	Grp Seq	Seq	Document	View	Data
1		1	1			
2		1	2			
3		2	3			
4		2	4			
5		3	5			

Below the table, there are several control fields: Step Desc. (Turn Mixer on, and set mixing time and speed), Documents, Data Edit, Form Name, Status (READY), Action (Normal), Start, Cert Name, Required for Step Completion, and Finish. At the bottom, there is a row of icons for various actions: Log on, Log off, List users, View document, Initiate action, Sign-off, Refresh, Mark completed, Mark bypassed, Show Job Event Log, Mark rework, and Write SPC values.

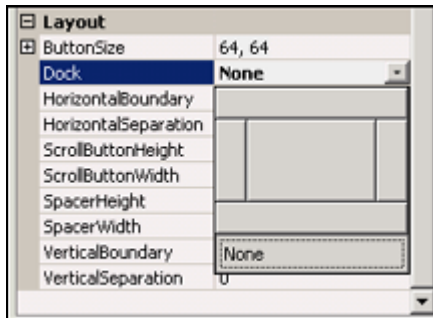
The operator can use the **Steps** control to:

- Log on to the selected step
- Log off from the selected step
- List all users currently logged on to the selected step
- View a document that is associated with the selected step
- Initiate the action defined for the selected step
- Sign-off the selected step
- Refresh the **Steps** control
- Mark the state of the active step to "completed"
- Mark the state of the active step as "bypassed"
- Show the **Job Event Log** dialog box
- Mark the state of any completed step as requiring rework
- Write the current SPC values to Factory Connector

Docking the Controls Within a Symbol

Docking allows you to automatically position controls in relation to the other elements on the canvas. You can dock a control to the top, bottom, left, or right of a symbol. If you want to dock a control, you must draw a rectangle first; then you can dock the control to the rectangle. This establishes clear boundaries for the symbol and provides a reference for docking the control to the edges of the symbol. After docking, the control is moved accordingly.

To dock a control, select the **Dock** property, and then click on the appropriate layout option to position the control in relation to the symbol.



Associating the ButtonBar Control With Other Controls

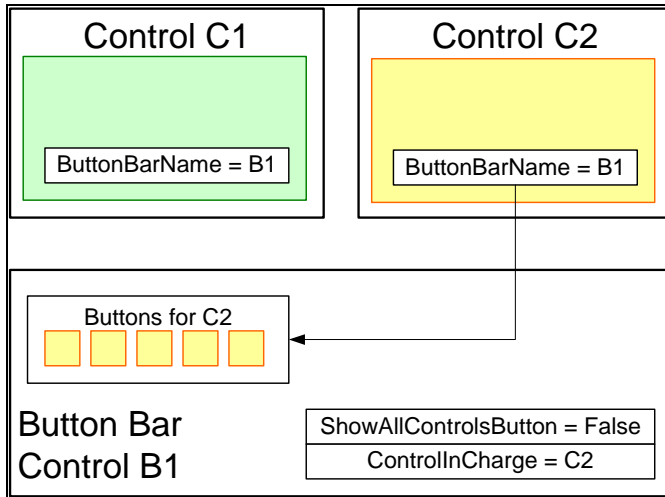
The **ButtonBar** control shows buttons for other controls that are embedded on the canvas in the same ArchestrA symbol. To show the buttons for a control, you must associated the control with the **ButtonBar** control by setting its **ButtonBarName** property to the name of the **ButtonBar** control. You can also associate multiple controls with the same **ButtonBar** control.

The **ButtonBar** control can either show the buttons for:

- A specific control
- All associated controls

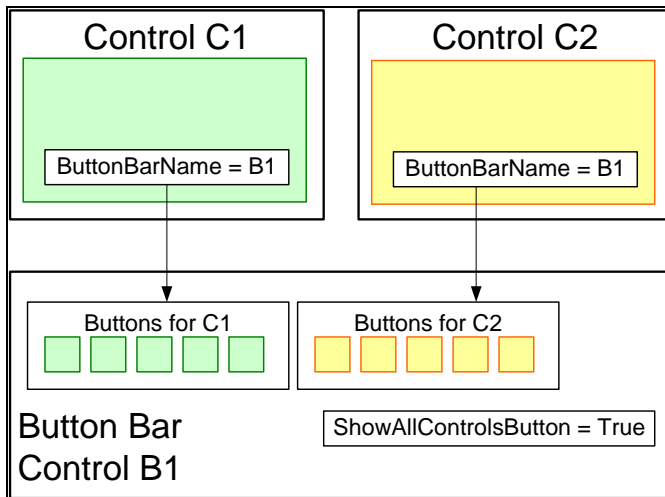
Showing the Buttons for a Specific Control

To configure the **ButtonBar** control to show the buttons for a specific control, set the **ShowAllControlsButton** property to **False** and the **ControllnCharge** property to the name of the control for which you want to show the buttons.



Showing the Buttons for all Associated Controls

To configure the **ButtonBar** control to show the buttons of all controls that are associated with it, set the **ShowAllControlsButton** property of the **ButtonBar** control to **True**.



Logging on and Refreshing the .NET Controls Automatically

You can configure the Wonderware MES Software/Operations .NET controls to automatically log on users when they access the controls at runtime, automatically log on to entities, and automatically refresh the controls.

Logging on the Controls Automatically

You can configure the controls to log on an operator at runtime automatically by setting the **AutoLoginUsers** property to **True**. Then, at runtime, either the logon dialog box appears for the control, or the current InTouch user is logged on automatically. If the **AutoLoginUsers** property is set to **False**, you need to configure a script to log on users to the controls.

Logging on to Entities Automatically

If one or more controls in your symbol require the runtime operator to log on to an entity, you can set the **AutoLogOnEnt** property of those controls that require a logon to **True**. At runtime, the control then opens the logon dialog box for the control. If the **AutoLogOnEnt** property is set to false, you need to configure a script to log on users to the controls.

Refreshing the Controls Automatically

You can configure controls to ignore any:

- Internal attempt to refresh the control
- External attempt to refresh the control with the **RefreshData** command

To ignore refresh events, you set the **IgnoreRefreshEvents** property to **True**. This setting is useful if the symbol contains more than one control and only one of the controls is visible at a time. Ignoring refresh events also improves performance because hidden controls are not refreshed. For the visible control, set the **IgnoreRefreshEvents** property to **False** so that it can show the latest data.

Using the Operations .NET Controls in InTouch

You can configure InTouch to use the MES controls just as you would any other .NET control that you indirectly embed by using ArchestrA symbols. For more information about embedding ArchestrA symbols that contain .NET controls, see the *ArchestrA and InTouch Integration Guide*.

Logging On and Off Operations Controls

The Wonderware MES Software/Operations .NET controls can use ArchestrA security in InTouch to authenticate a runtime operator.

When using ArchestrA security, the Wonderware MES Software/Operations controls are disabled until you log on to InTouch.

When you attempt to use a .NET control that requires authentication, and identical users are set up, you are automatically logged on. Depending on the control type, a list is shown for you to pick an entity, or the control is ready for use.

However, if you are using a user name that is not configured in Wonderware MES Software/Operations the logon dialog box appears. Do one of the following:

- Enter a Wonderware MES Software/Operations user name and password to log on to the control. Depending on the control type, a list appears to pick an entity, or the control is ready for use.
- Click **Cancel**. The control shows only the No User button. If you click this button, either the **Switch User** dialog box appears (if other users are already logged on), or the **Login** dialog box appears.

If you log off from the control, you remain logged on to InTouch. If you log off from InTouch, you can no longer use the control until you log on to InTouch again.

Lab 15 – Using Wonderware MES .NET Controls

Introduction

In the previous lab, you used Wonderware MES Operator to manually track work orders in runtime using a visualization interface. In this lab, you will create a similar visualization interface, like the one shown below, by importing Wonderware MES .NET Controls into the Galaxy.

The screenshot shows the InTouch WindowViewer application. At the top, there is a menu bar with 'File', 'Logic', and 'Special'. Below the menu bar is a toolbar with buttons for 'Production', 'Shipping', 'Manual', 'Specs', 'Inventory', 'DB Views', and 'Create Job'. The main area displays a 'Job Summary' for 'Bagger' and the 'Current User' as 'Oper'. Below this, there are several input fields for 'WO ID', 'Oper ID', 'Part Number', 'Start Qty', 'Reqd Qty', 'Job State', 'Job Desc', 'Part Desc', 'Batch Size', 'Good Qty', 'Machine Status', 'WO Desc', 'Reqd By', 'Estimated Finish', and 'Reject Qty'. A 'Notes' section is also present. Below the notes, there is a dropdown menu for 'Accessible Entities' with 'Bagger' selected. A table with columns 'Entity Name', 'WO ID', 'Job Desc', 'Item ID', 'Reqd Qty', 'Good Qty', and 'Job State' is shown. To the right of the table, there are buttons for 'Work Queue' and 'Steps'. At the bottom, there is a toolbar with various icons for navigation and actions.

You will use the InTouch application to host the .NET Controls in ArchestrA graphics. Then, you will configure the controls through manual settings and scripting to send and receive information to the MES database. Finally, you will run a new work order in runtime, using the InTouch application.

Objectives

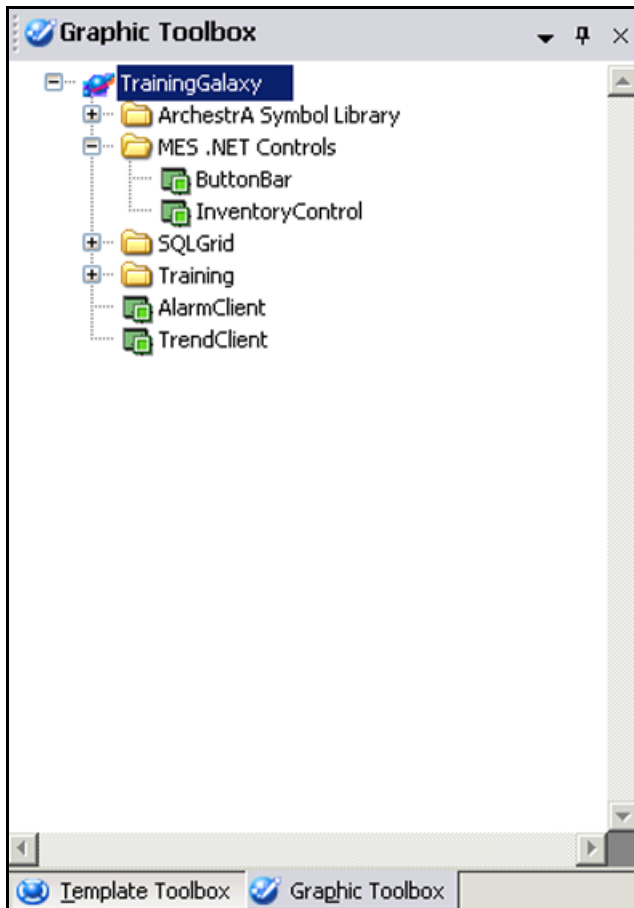
Upon completion of this lab, you will be able to:

- Import Wonderware MES Software/Operations .NET Controls into a Galaxy
- Use Wonderware MES Software/Operations .NET Controls in ArchestrA symbols
- Configure MES .NET Controls
- Send and receive information to the MES database through scripts and manual action

Import Wonderware MES .NET Controls

First, you will open the **Graphic Toolbox** in the ArchestrA IDE and import controls.

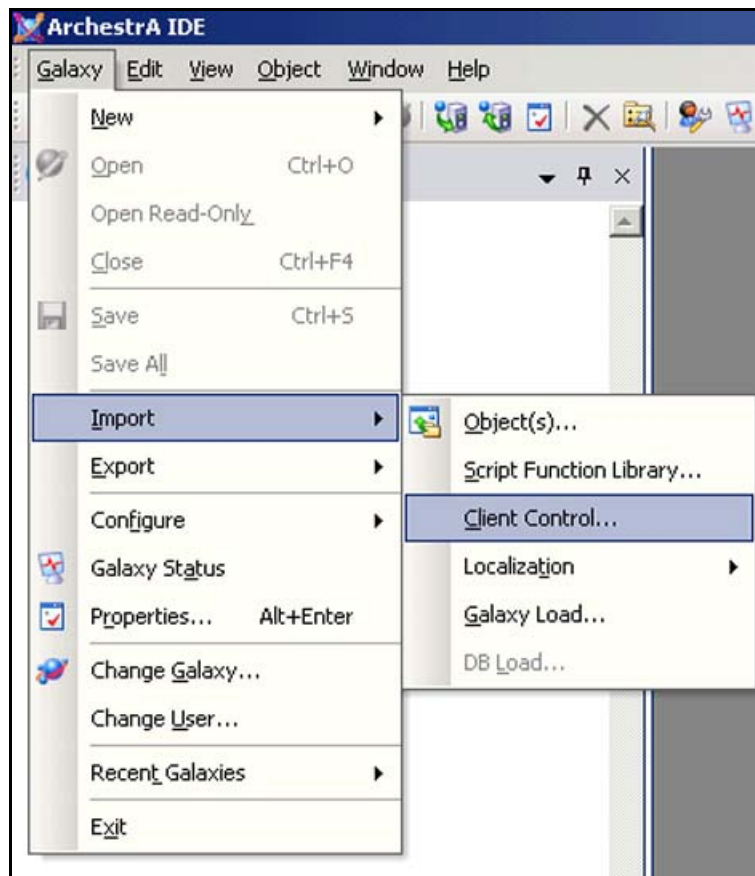
1. In the ArchestrA IDE, **Graphic Toolbox**, expand **TrainingGalaxy** and **MES .NET Controls**.



The **MES .NET Controls** toolset already contains the **ButtonBar** and **InventoryControl** controls, as the InTouch application already has a prebuilt inventory window that uses these controls.

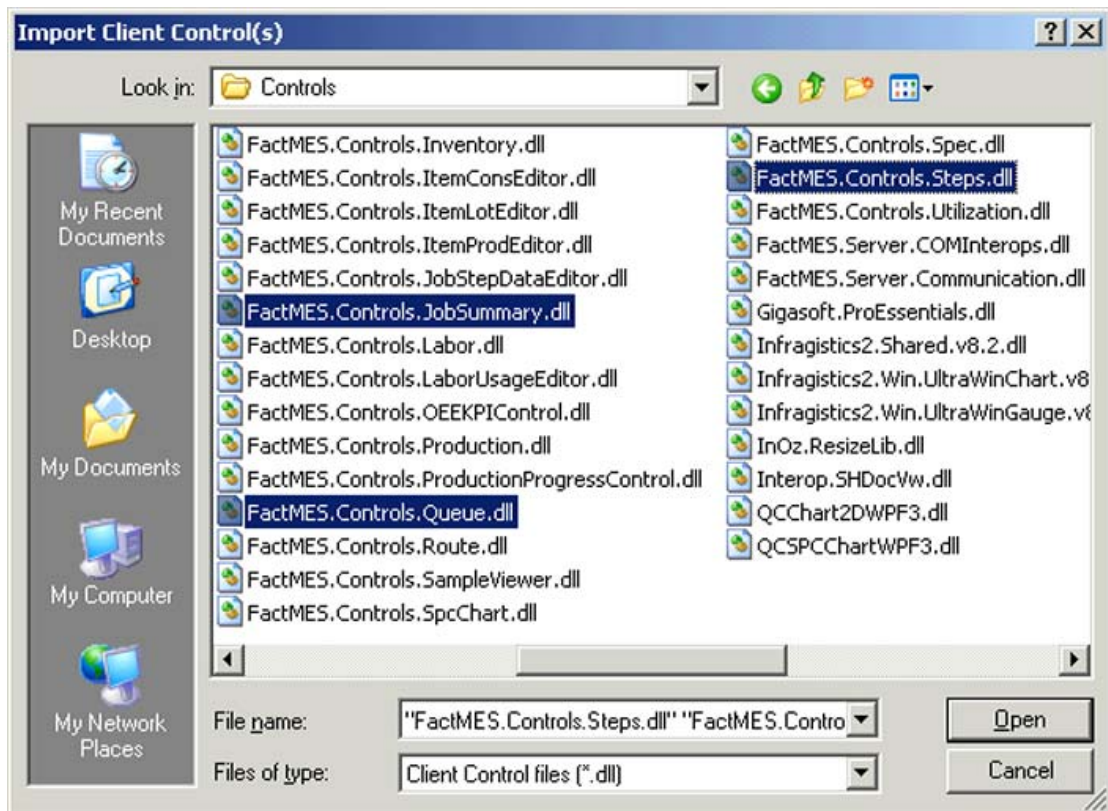
You will now import three additional controls: **JobSummaryControl**, **QueueControl**, and **StepsControl**.

2. On the **Galaxy** menu, click **Import | Client Control**.



The **Import Client Control(s)** dialog box appears.

3. Navigate to **C:\Program Files\Wonderware\MES\Controls** and select the following files:
 - FactMES.Controls.JobSummary.dll
 - FactMES.Controls.Queue.dll
 - FactMES.Controls.Steps.dll



4. Click **Open**.

The **Import Preferences** dialog box appears.

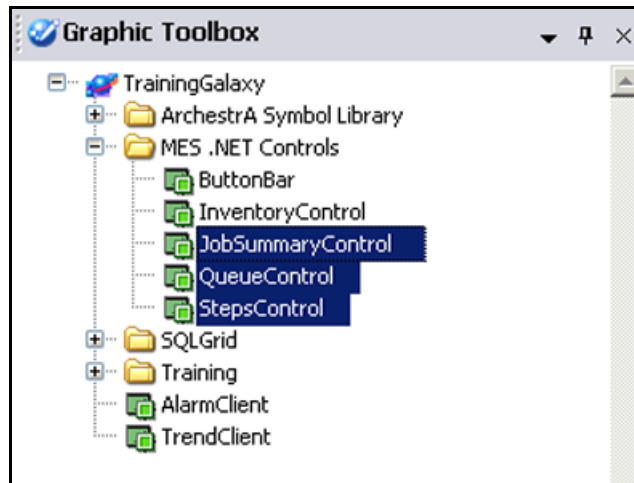
5. Leave the default selection and click **OK**.



6. When the **Import Client Controls** dialog box displays **Import completed**, click **Close**.

Note: This may take a few moments.

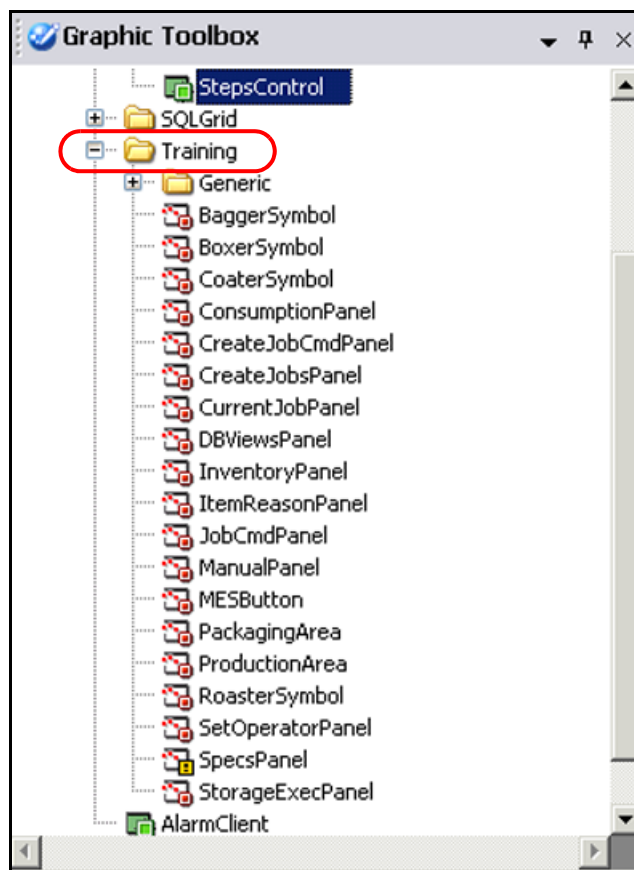
7. In the **Graphic Toolbox**, select the newly imported controls, and then drag them to **MES .NET Controls**.



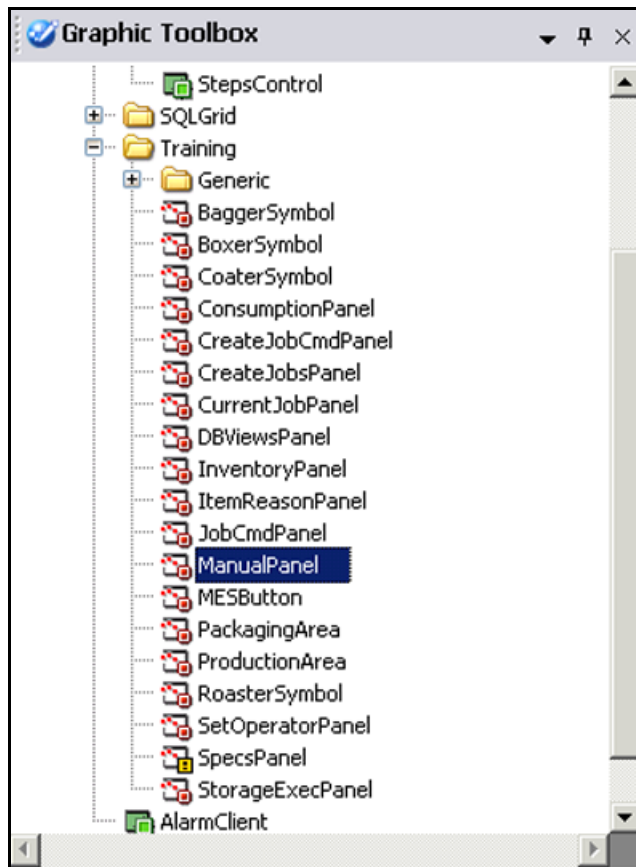
Modify the ManualPanel Symbol

Now, you will insert additional Wonderware MES Software/Operations .NET Controls into the **ManualPanel** symbol that is already embedded in the InTouch application you have been using.

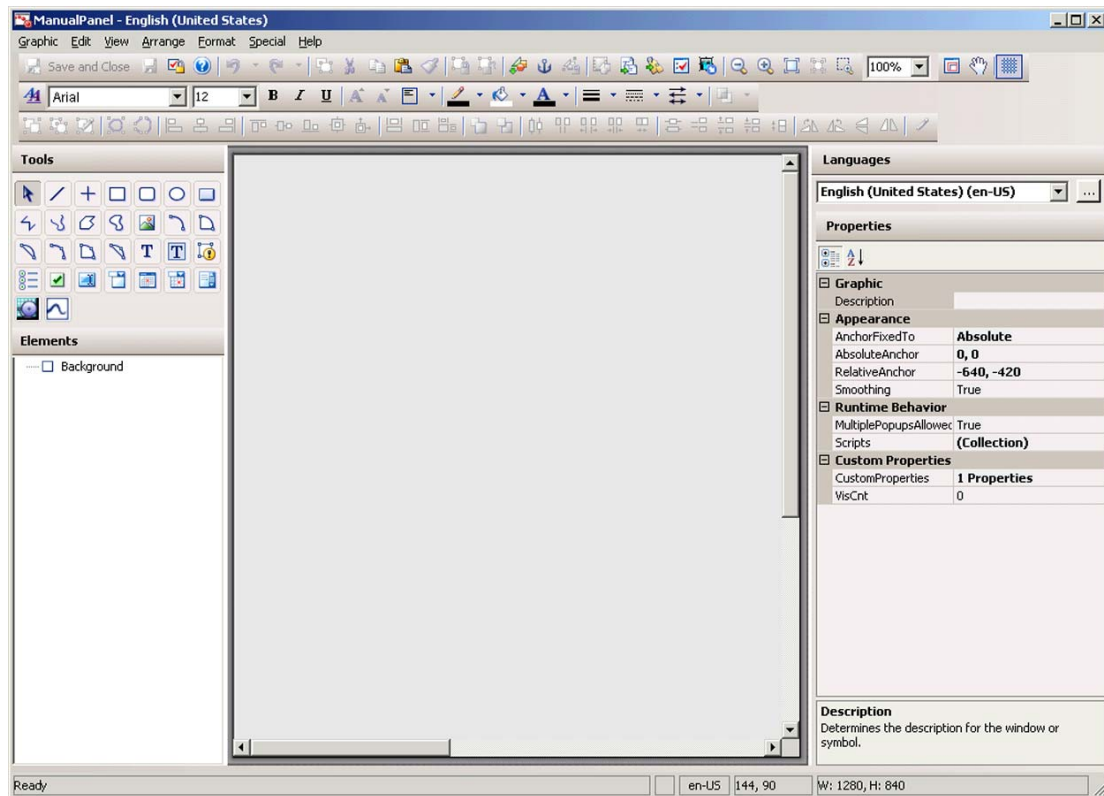
8. In the **Graphic Toolbox**, expand **Training**.



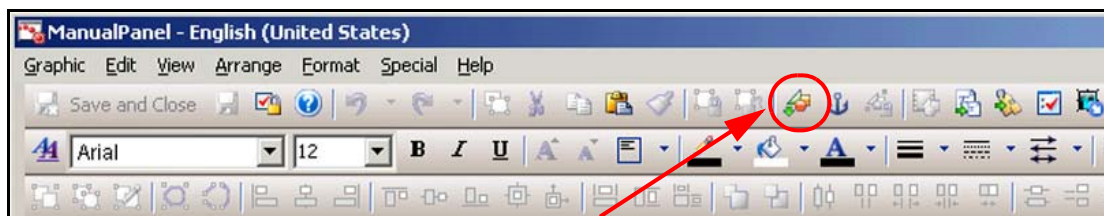
9. Double-click **ManualPanel**.



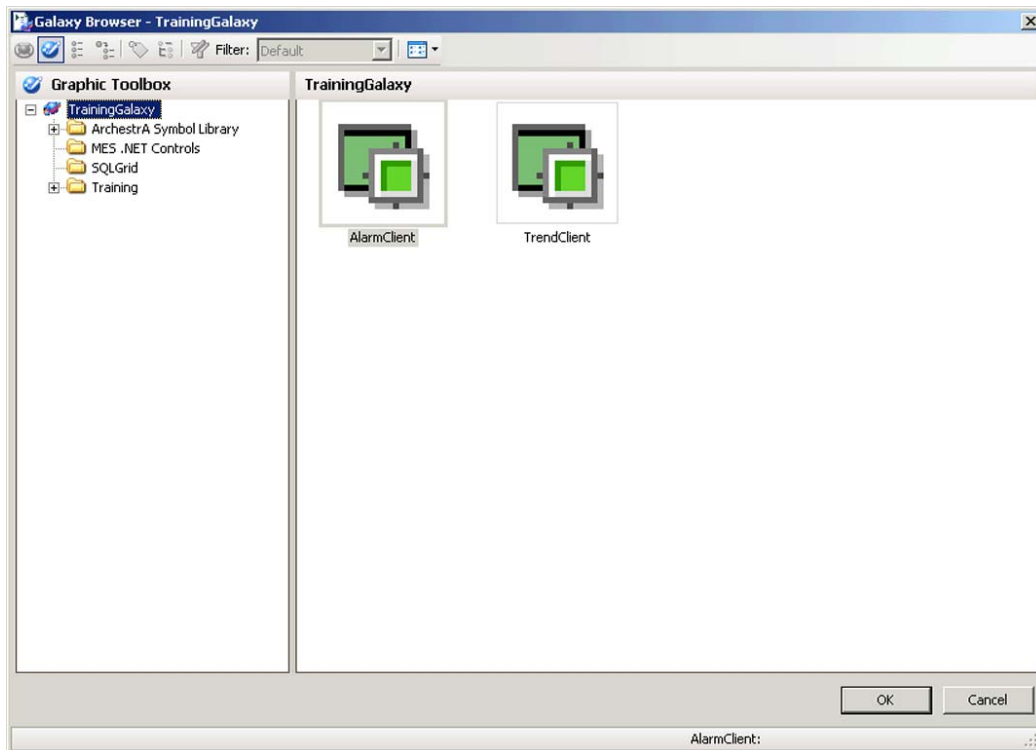
The symbol editor appears.



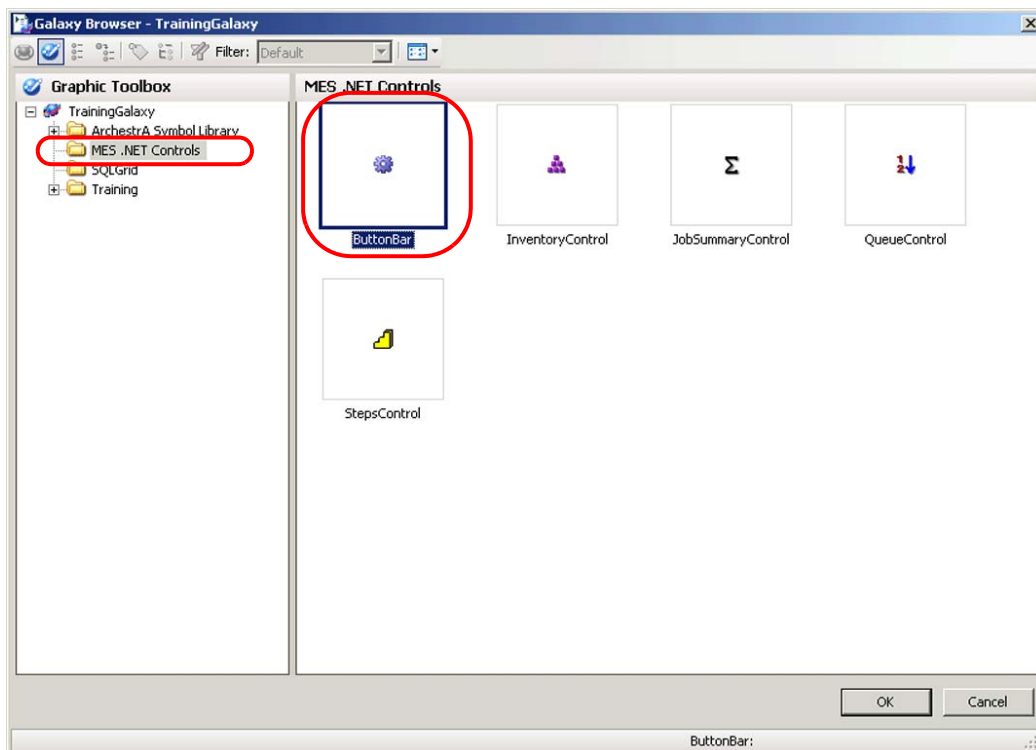
10. On the toolbar, click **Embed Graphic**.




The **Galaxy Browser** appears.



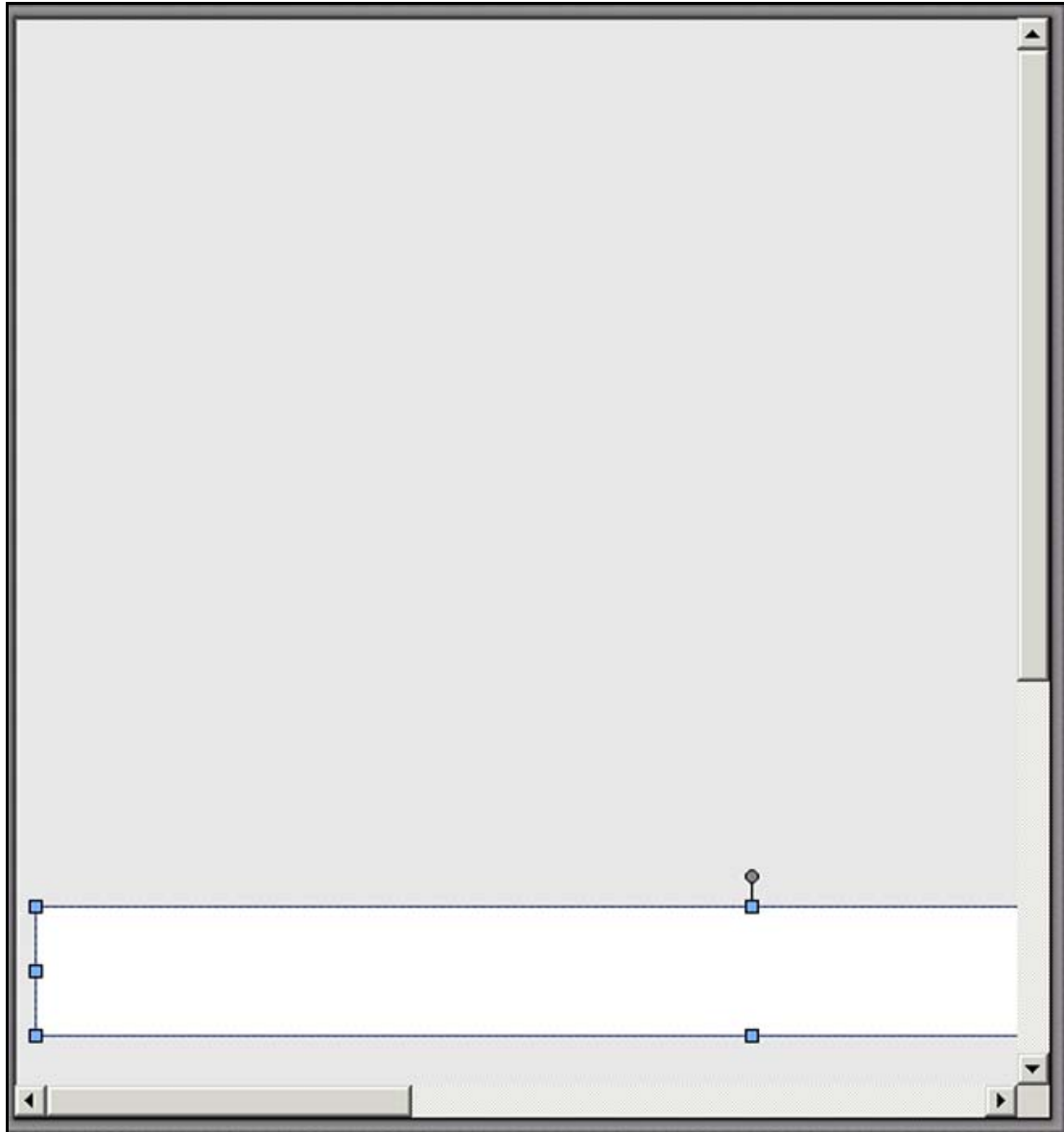
11. In the **Graphic Toolbox** pane, click **MES .NET Controls**, and then in the **MES .NET Controls** pane, click **ButtonBar**.



12. Click **OK**.

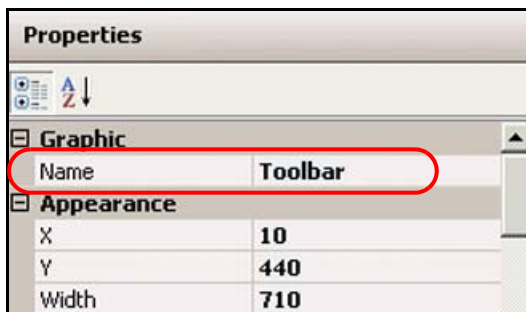
The mouse pointer changes to an angle .

13. Click at the bottom of the symbol to insert the **ButtonBar** control.

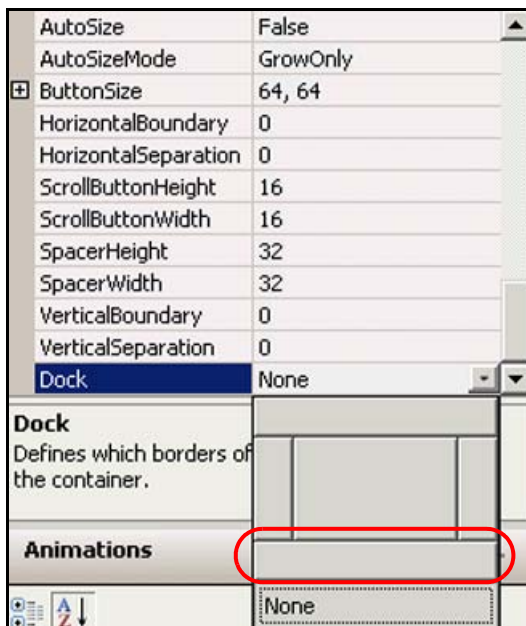


You will now modify the properties of the button bar control you just inserted.

14. Ensure the button bar control is selected, and then in the **Properties** pane, **Name** field, enter **Toolbar**.



15. Scroll to the bottom of the **Properties** pane, and then in the **Dock** drop-down list, click the bottom dock button.



The **Dock** field now displays **Bottom** and the control is positioned at the bottom of the symbol.

16. Repeat Steps 10 through 13 to insert a **JobSummaryControl** at the top of the symbol, and then configure the **Properties** as follows:

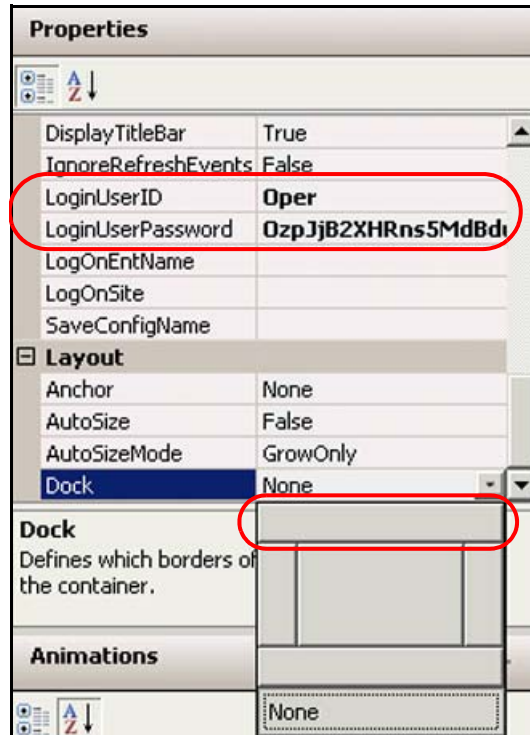
Factelligence

LoginUserID: Oper

LoginUserPassword: ww

Layout

Dock: Top



Note: The **LoginUserPassword** field will automatically encrypt the password.

17. Resize the height of the control so that the bottom is just below the **Notes** field.

The screenshot shows a 'Job Summary' control in the Wonderware MES 2012 interface. The control has a title bar with 'Job Summary<3490>' and a 'Current User' field. Below the title bar, there are several data fields: 'Machine Status<1360>', 'WO Desc<1121>', 'Req'd By<1127>', 'Estimated Finish<1123>', and 'Reject Qty<1130>'. A large 'Notes<500>' field is located below these. The control is being resized, with a blue handle bar at the bottom. The background is a light gray.

18. Repeat Steps 10 through 13 to insert two more controls in the space between **JobSummaryControl1** and **Toolbar**, and then configure them as follows:

Control	Properties	
QueueControl	<i>Runtime Behavior</i>	
	Visible:	True (default)
StepsControl	<i>Factelligence</i>	
	ButtonBarName:	Toolbar
StepsControl	<i>Runtime Behavior</i>	
	Visible:	False
StepsControl	<i>Factelligence</i>	
	ButtonBarName:	Toolbar

19. Resize both **QueueControl1** and **StepsControl1** so that they have the same height and width and are located in the center of the symbol on top of each other.
20. Line up the right side of both **QueueControl1** and **StepsControl1** with the right edge of the ellipsis button in the **JobSummaryControl1**.

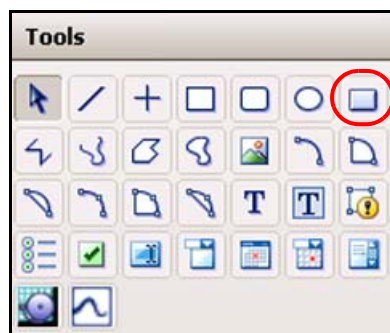
The screenshot shows the 'Job Summary' form for job <3490>. It includes a 'Current User' section with a 'UserName' field. Below this are several data entry fields for job details like 'Machine Status', 'WO Desc', 'Reqd By', 'Estimated Finish', and 'Reject Qty'. A large central area is reserved for a list or table. At the bottom, there are fields for 'Step Desc', 'Documents', 'Data Edit', 'Form Name', 'Status', 'Action', 'Start', 'Cert Name', 'Required For Step Completion', and 'Finish'. A red vertical oval on the right side of the form indicates the alignment point for the QueueControl1 and StepsControl1 controls.

This ensures that there is enough space on the right to add buttons later in this lab.

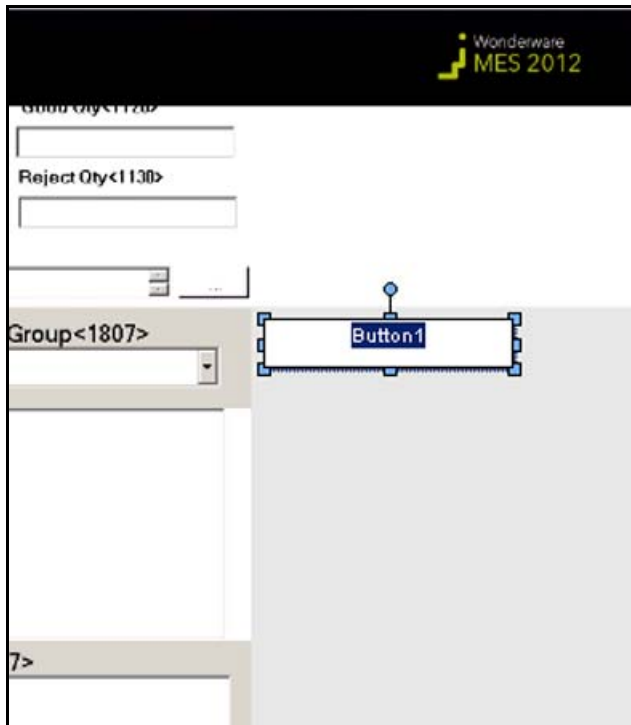
Add and Configure the Navigation Bar

Now, you will insert buttons and then write scripts to associate the controls with the buttons. These buttons will show or hide the controls and also associate the toolbar with the currently showing control.

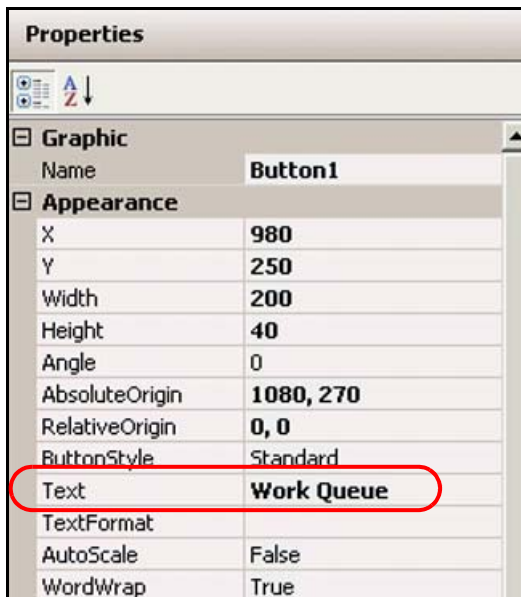
21. In the **Tools** pane, click **Button**.



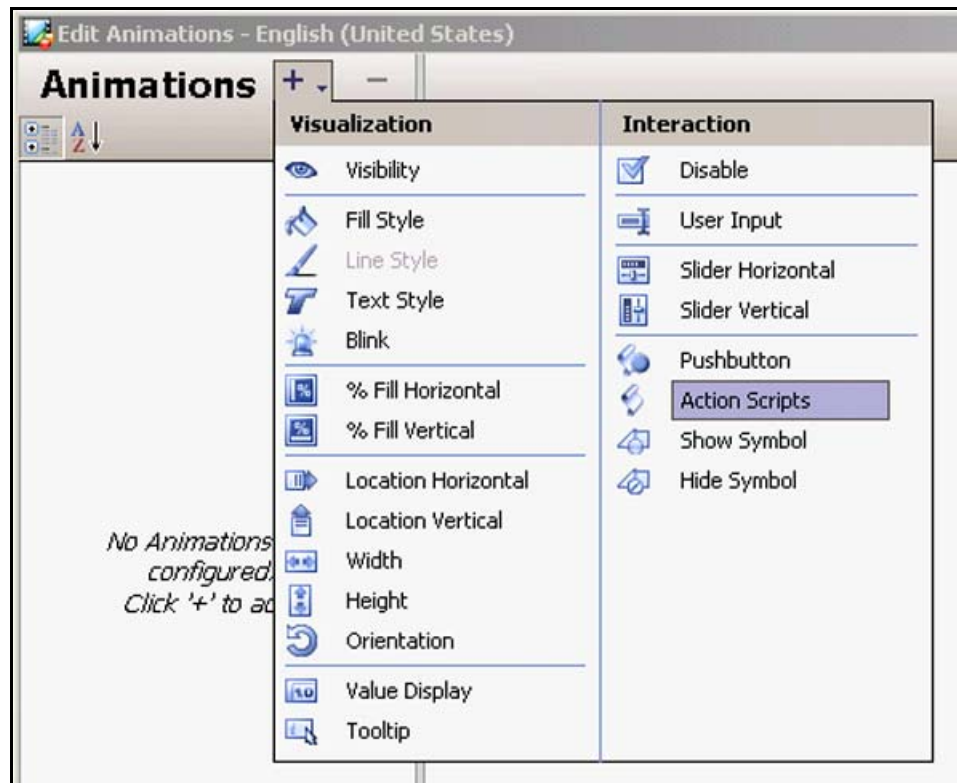
22. In the empty space on the right side of the middle controls, draw a new button.



23. In the **Properties** pane, **Text** field, enter **Work Queue**.



24. Double-click the **Work Queue** button to add an animation link.
25. In the **Edit Animations** dialog box, click the **Add Script** button, and then click **Action Scripts**.

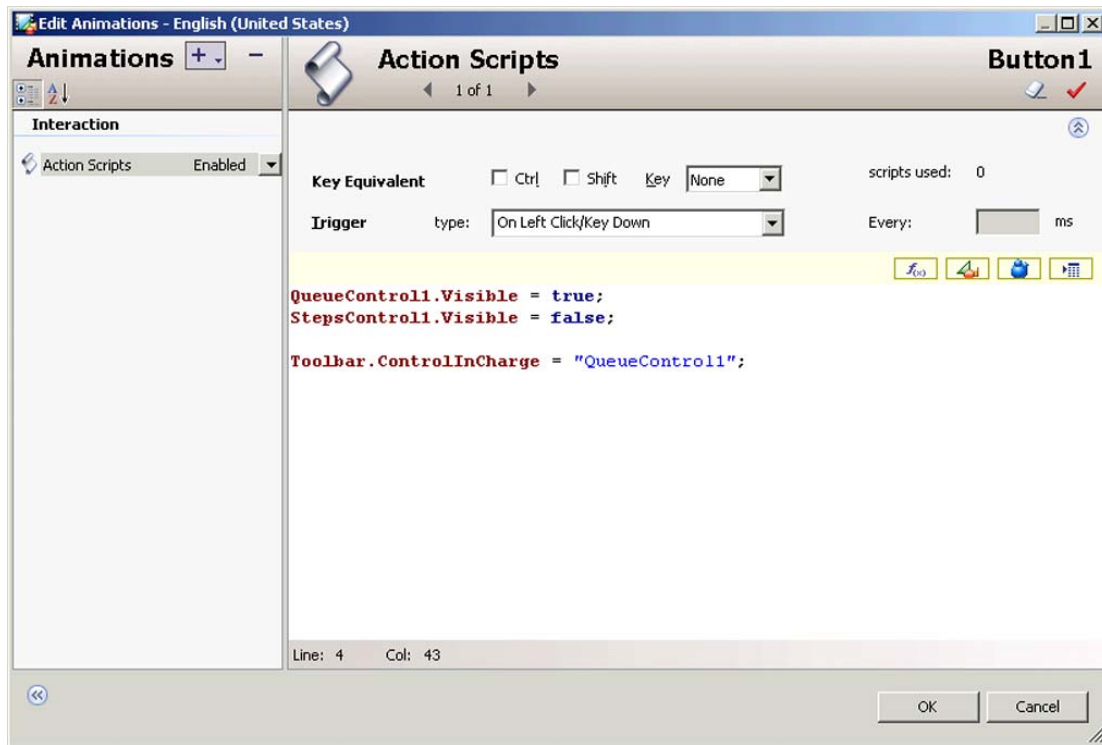


26. In the script body, enter the following:

Note: You can search the **C:\Training** folder for the **Lab 15 - Button Scripts.txt** file to copy and paste the contents of this script.

```
QueueControl1.Visible = true;
StepsControl1.Visible = false;

Toolbar.ControlInCharge = "QueueControl1";
```



27. Click **OK**.

Now, you will create a second button and associate it with **StepsControl**.

28. Repeat Steps 21 through 27 to create a button labeled **Steps**, and then configure the action script as follows:

```
QueueControl1.Visible = False;
StepsControl1.Visible = True;

Toolbar.ControlInCharge = "StepsControl1";
```

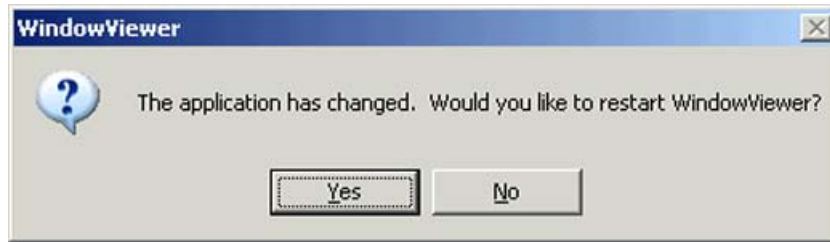
29. Click the **Save and Close** button  and check in the symbol.

You will now redeploy the InTouch application to ensure that the changes are propagated to the currently running application and are available in runtime.

30. In the ArchestrA IDE, **Model** view, **ControlSystem** area, redeploy **MESApp**.

An instance of WindowViewer is already running this application. Therefore, after the application is redeployed, you will be prompted to load the changes in WindowViewer.

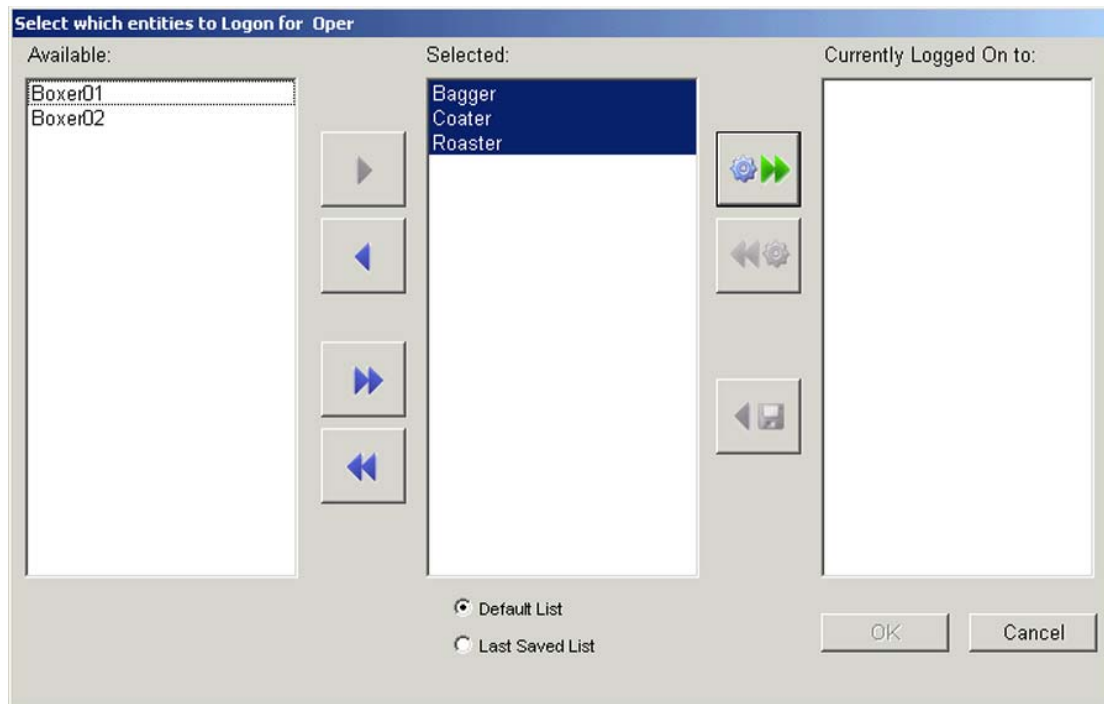
31. In the **WindowViewer** dialog box, click **Yes** to restart the application.



32. After WindowViewer restarts, on the **Navigation Bar**, click **Manual**.



This loads the controls with the user information you have set and prompts you to select the entities you want to log on to. The **Bagger**, **Coater**, and **Roaster** entities are selected by default because you saved these on the default list in the previous lab using Wonderware MES Operator. Now, you will log on to the selected entities.



33. Click the **Log On** button, and then click **OK**.

The **Work Queue** control appears by default. You can display the different controls by using the buttons in the navigation area on the right side.

The screenshot displays the InTouch WindowViewer application. At the top, there is a navigation bar with buttons for Production, Shipping, Manual, Specs, Inventory, DB Views, and Create Job. Below this, the Job Summary section shows the current user as 'Oper' and the job as 'Bagger'. The summary includes fields for WO ID, Oper ID, Part Number, Start Qty, Reqd Qty, Job State, Job Desc, Part Desc, Batch Size, Good Qty, Machine Status, WO Desc, Reqd By, Estimated Finish, and Reject Qty. A Notes section is also present. The Accessible Entities dropdown is set to 'Bagger'. The main area shows a table with columns: Entity Name, WO ID, Job Desc, Item ID, Reqd Qty, Good Qty, and Job State. On the right side, there is a vertical panel with buttons for 'Work Queue' and 'Steps'. The bottom of the screen features a toolbar with various icons for navigation and actions.

Track the Progress of a New Work Order in Runtime

You will now track the progress of a new work order.

34. In the Wonderware MES Client, **Processes** tab, create a work order from **BAG-MXN-1** and configure it as follows:

Work Order ID:	WO-090
Description:	<enter a description>
Item:	BMX-BBQ
Required Quantity:	400

The screenshot shows the 'Create Work Order from Process' dialog box. The fields are filled as follows:

Process ID	BAG-MXN-1
Spec. Version	
Work Order ID	WO-090
Description	
Item	BMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	400 Pcs.
Release Date/Time	05/14/2013 12:00 AM
Due Date/Time	05/14/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

Buttons: OK, Cancel

35. In the WindowViewer **Manual** window, **Job Summary** panel, ensure you are in the **Roaster** entity, and then verify **WO-090** is in the **Work Queue** control.

Job Summary: Roaster
Current User: Oper

WO ID	Oper ID	Part Number	Start Qty
Job State	Job Desc	Part Desc	Batch Size
Machine Status	WO Desc	Reqd By	Estimated Finish

Notes

Accessible Entities: Roaster

Entity Name	WO ID	Job Desc	Item ID	Reqd Qty	Good Qty	Job State
Roaster	WO-090	Roasting	RMX-BLK	95	0	NEW

Now, you will use the Operations Capability Object to start the production.

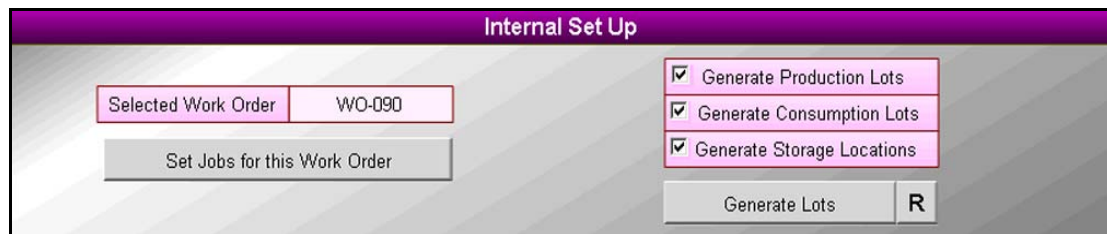
36. On the **Navigation Bar**, click **Production**.
37. In the **Enable Options** panel, check the following:

- BAD Counter
- Lots
- Storage Locations
- BOM Consumption
- Reasons
- BOM Position

Enable Options

- ☒ BAD Counter
- ☒ Lots
- ☒ Storage Locations
- ☒ BOM Consumption
- ☒ Reasons
- ☒ BOM Position
- ☐ Spares

38. In the **Internal Set Up** panel, set the jobs for **WO-090**.
39. Check **Generate Production Lots**, **Generate Consumption Lots**, and **Generate Storage Locations**, and then generate the lots.



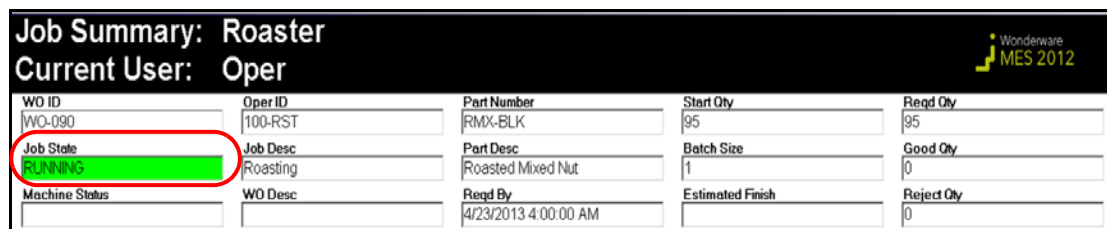
The screenshot shows the 'Internal Set Up' panel. On the left, there is a text box labeled 'Selected Work Order' containing 'WO-090' and a button labeled 'Set Jobs for this Work Order'. On the right, there are three checked checkboxes: 'Generate Production Lots', 'Generate Consumption Lots', and 'Generate Storage Locations'. Below these is a 'Generate Lots' button and a small box containing the letter 'R'.

40. Start the roasting job.

The updated Wonderware MES .NET Control can be viewed from the **Manual** window.

41. On the **Navigation Bar**, click **Manual**.

In the **Manual** window, **JobSummaryControl** displays the **WO-090** work order as **RUNNING**.



The screenshot shows the 'Job Summary: Roaster' window. At the top, it says 'Current User: Oper'. Below this is a table with various fields. The 'Job State' field is highlighted in green and contains the word 'RUNNING'. Other fields include 'WO ID' (WO-090), 'Oper ID' (100-RST), 'Part Number' (RMX-BLK), 'Start Qty' (95), 'Reqd Qty' (95), 'Job Desc' (Roasting), 'Part Desc' (Roasted Mixed Nut), 'Batch Size' (1), 'Good Qty' (0), 'Machine Status', 'WO Desc', 'Reqd By' (4/23/2013 4:00:00 AM), 'Estimated Finish', and 'Reject Qty' (0).

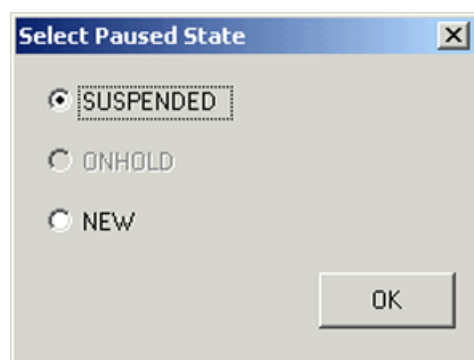
You can use the **Manual** window to pause a job.

42. In the **Work Queue** control, click the **WO-090** job.



43. On the button bar, click the **Pause** button.

The **Select Paused State** dialog box appears.



The screenshot shows the 'Select Paused State' dialog box. It has three radio button options: 'SUSPENDED' (which is selected), 'ONHOLD', and 'NEW'. There is an 'OK' button at the bottom right.

44. Leave the default option and click **OK**.

The **Confirm** dialog box appears.



Confirm

Job State : SUSPENDED

Work Order

Oper ID

Job Desc.

45. Click **OK**.

The job is now suspended.

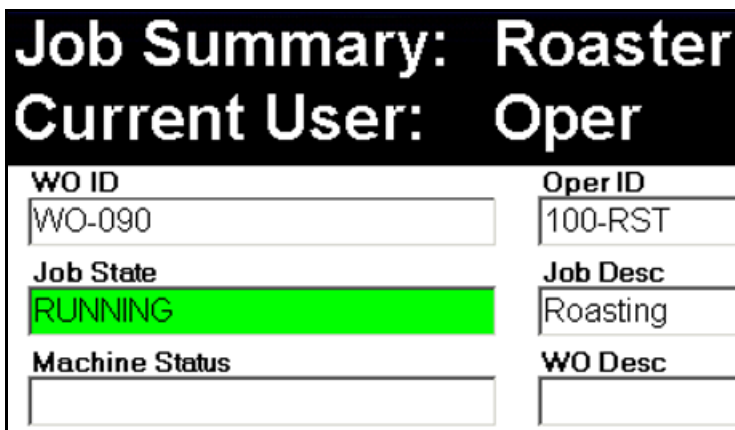
Accessible Entities: <input type="text" value="Roaster"/>						
Entity Name	WO ID	Job Desc	Item ID	Reqd Qty	Good Qty	Job State
▶ Roaster	WO-090	Roasting	RMX-BLK	95		SUSPENDED

You will now restart the job.

46. On the button bar, click the **Start the selected job** button.

47. In the **Confirm** dialog box, click **OK**.

The job state appears as **RUNNING** again and the information of the running job appears in the job summary area.



Job Summary: Roaster

Current User: Oper

WO ID	Oper ID
<input type="text" value="WO-090"/>	<input type="text" value="100-RST"/>
Job State	Job Desc
<input type="text" value="RUNNING"/>	<input type="text" value="Roasting"/>
Machine Status	WO Desc
<input type="text"/>	<input type="text"/>

48. On the **Navigation Bar**, click **Production**.
49. In the **BOM Component 1** panel, consume peanuts as follows:

Quantity: 45.00
Lot: PNT-090
Location: Silo01

BOM Component 1

45.00 ?

Cmd ☒

Ready R

PNT-090

RMX-090

Silo01

1 ?

Set as Default ☒

50. In the **BOM Component 2** panel, consume cashews as follows:
- Quantity:** 25.00
Lot: CSW-090
Location: Silo02
51. In the **BOM Component 3** panel, consume **25.00** pounds of almonds from lot **AMD-090** out of **Silo03**.

You will now produce roasted mixed nuts.

52. In the **GOOD Prod Counter** panel, report good production as follows:

Quantity: 95.00
Lot: RMX-090
Location: Roaster
BOM Position: 0

GOOD Prod Counter	
Quantity	95.00
Add Quantity	Cmd <input type="checkbox"/>
Status	Ready R
Lot	RMX-090
FG Lot	
Location	Roaster
Prod. Reason	2 ?
BOM Position	0

53. On the **Navigation Bar**, click **Manual**.

Good Qty shows 95.

Wonderware MES 2012	
Reqd Qty	95
Good Qty	95
Reject Qty	0

54. Stop the roasting job.

Now, you will switch to the **Coater** entity.

55. In the **Job Summary** panel, click **Roaster** and select the **Coater** entity.

This displays the coating job for **WO-090**.

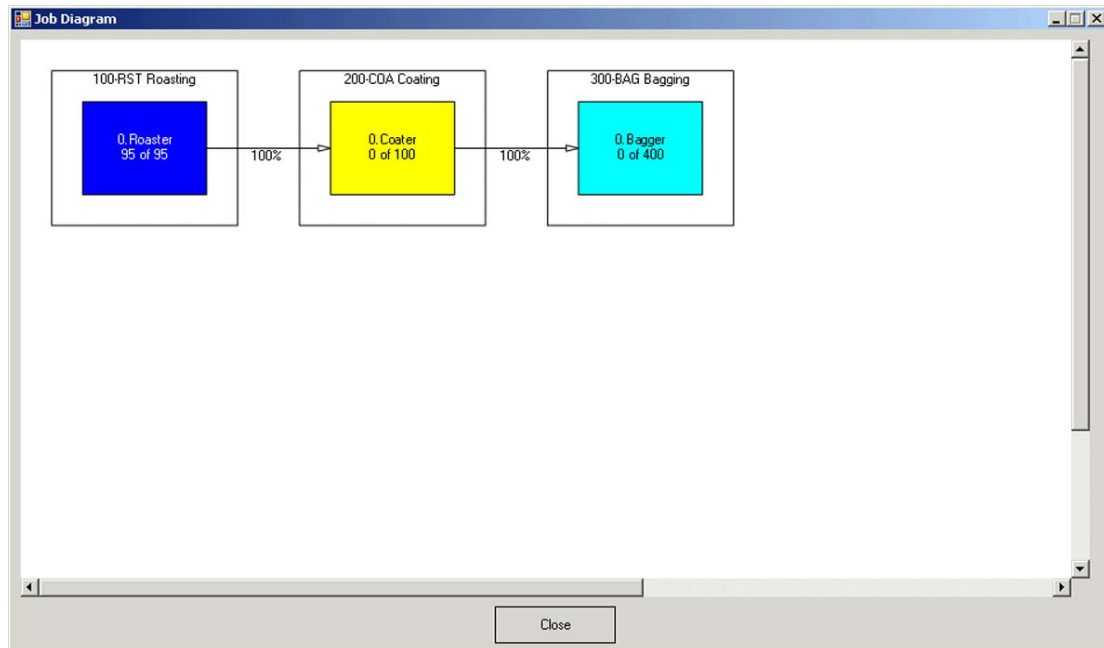
You will now verify that the roasting job has ended and you are ready for the coating job.

56. Ensure that **WO-090** is selected, and then on the button bar, click the **View job flow diagram**



button

The **Job Diagram** window displays that the roasting job is complete and the coating job is ready to be started.



57. Click **Close**.

You will now check that the consumption was successful.

58. On the **Navigation Bar**, click **DB Views**.

59. Click the **Consumption Data** button.

60. Organize the data by **wo_id** and **oper_id**.

61. Expand **WO-090** and **100-RST**.

The data displays all of the quantities consumed.

seq_no	ent_name	qty_cons	item_id	item_desc	units	item_class_desc	lot_no	from_ent_name	fg_lot_no
wo_id : PKG-010 (1 item)									
wo_id : PKG-011 (1 item)									
wo_id : WO-040 (3 items)									
wo_id : WO-050 (3 items)									
wo_id : WO-060 (3 items)									
wo_id : WO-070 (3 items)									
wo_id : WO-071 (3 items)									
wo_id : WO-080 (3 items)									
wo_id : WO-090 (1 item)									
oper_id : 100-RST (3 items)									
0	Roaster	45	PNT-BLK	Peanuts Bulk	lbs	Raw Materials	PNT-090	Silo01	RMC-090
0	Roaster	25	CSW-BLK	Cashews Bulk	lbs	Raw Materials	CSW-090	Silo02	RMC-090
0	Roaster	25	AMD-BLK	Almonds Bulk	lbs	Raw Materials	AMD-090	Silo03	RMC-090

62. In the **Production** window, run the remaining operations for **WO-090** as follows:

Operation	BOM 1	BOM 2	BOM 3	Production
200-COA	95	2	3	100
300-BAG	100	Set as Default		400



Module 6 – Steps, Specifications, Spares, and MES Attributes

Section 1 – Operation Steps	6-3
Lab 16 – Tracking Operations Steps	6-5
Section 2 – Specifications	6-27
Lab 17 – Managing Specifications	6-33
Section 3 – Spares and MES Attributes	6-55
Lab 18 – Using Spares and MES Attributes	6-59

Module Objectives

- Discuss Operation Steps, Specifications, Spares, and custom MES Attributes

Section 1 – Operation Steps

This section explains steps and sequence numbers and describes how to execute steps in an operation.

Overview

You can track operator actions by assigning steps to an operation. These steps can be performed once or multiple times as required. You can also specify the order in which the steps will be performed by adding sequence numbers to steps.

Steps and Sequence Numbers

You can assign steps to an operation so that tracking of the discrete operator work or actions within an operation can be controlled and sequenced. **Step Groups** can be repeatable or non-repeatable. Repeatable **Steps Groups** contain individual steps so that an Operator is allowed to perform the steps multiple times, if necessary, and the system tracks the events for the individual steps within the **Step Group**. Repeatable **Step Groups** contain steps that must be performed for every batch or group of work against a job at an operation. Non-repeatable **Step Groups** contain steps that need to be performed only once in the operation, such as setup and teardown steps.

The screenshot shows a software interface titled 'Welcome - Processes'. It contains two main tables. The top table lists operations with columns: Status, Check Out, Process Class ID, Process ID, Description, Version, and Level. The bottom table, titled 'Steps', shows the sequence of steps for a selected operation. It has columns: Status, ID, Description, Sequence, Repeatability, and Standard Time (In h).

Status	Check Out	Process Class ID	Process ID	Description	Version	Level
		BAG-MXN	BAG-MXN-1	Bag of Mixed Nuts Prod	1	General

Status	Operation ID	Description	Disp. Seq.	Type	Default Reject Rate %	Notes
	100-RST	Roasting	1		0	
	200-COA	Coating	2		0	
	300-BAG	Bagging	3		0	

Status	Check Out	Process Class ID	Process ID	Description	Version	Level
		BOX-MXN	BOX-MXN-1	Process for Box of Mixed	1	General

Entity: Attributes Steps Specs

Status	ID	Description	Sequence	Repeatability
	1	Setup	1	<input type="checkbox"/>
	1	Feed Area Inspection	1	<input type="checkbox"/>
	2	Roaster Temp	2	<input type="checkbox"/>
	2	Roast	2	<input type="checkbox"/>
	3	Start Roast	3	<input type="checkbox"/>
	4	Transfer	4	<input type="checkbox"/>
	3	Cleaning	3	<input type="checkbox"/>

An additional feature of the steps functionality is a sequence number for the steps and the **Step Groups**. You must specify an order by providing sequence number for the **Step Groups** and steps. This sequence number controls the order in which work must be performed. A step with a higher number cannot start until a step with a lower number within a **Step Group** is completed. This sequence also controls the ordering for **Step Groups**. In the case where **Step Groups** have

the same sequence number, steps in the groups can be performed in any order. The same applies to the case where steps have the same sequence number.

Executing Steps in Runtime

The **Steps** tab in the MES Operator Client is used as a procedure, broken down into discreet tasks, for the currently running job. The user is presented with a sequence of activities that must be performed to complete the operation. **Steps** can link to a document file, require data entry, require inspector sign-off, or require verification that the step was completed.

Individual steps can be bypassed if given permission to do so. Each step requires the operator to log on and then mark the step COMPLETED when done. Time stamps are recorded for login and completion of each step.

Step No	Step Desc	Form Name	Inspector	Start	Finish	State	Enter Data	Document	Comments
1	Clean and inspect all components			09:34:58 07/01/04	09:36:12 07/01/04	COMPLETE	<input type="checkbox"/>		
2	Pre-assemble test. Do not secure any parts.			09:36:27 07/01/04		RUNNING	<input type="checkbox"/>		
3	Review specs sheet					NEW	<input type="checkbox"/>		
4	Assemble base. tighten to					NEW	<input type="checkbox"/>		
5	Assemble Upper components					NEW	<input type="checkbox"/>		

Step Desc.
Clean and inspect all components

Data Edit

Status: COMPLETE Action: Normal Start: 09:34:58 07/01/04 Finish: 09:36:12 07/01/04 Inspector:

Required for Step Completion

Documents

Form Name

Steps can be logged into by multiple users and can be repeated over multiple lots. The drop down menus located at the top of the steps grid displays the **User**, **Serial number** (lot number) and **Step Group** that is currently active. The columns of the step grid can be repositioned or hidden in the grid by using the **Context** menu option **Arrange Columns**. The **Context** menu also has the **Show Detail Fields** option. This displays all the active fields for the running step. If the detailed fields are displayed the context window will display the **Hide Detail Fields** option.

The grid allows you to select documents, enter data (if required), and change the state of the step. The drop down menu for the state of a step contains **Running**, **Complete**, **Bypass**, and **Superseded**. The **Running** state automatically starts when a **Ready** state is logged into for the first time. A user does not have to be logged into a step for the step to be running. When a steps state is set to **Completed** the **Finish** time is populated and all users are logged off of the step.

To start a new step, highlight the step that you wish to start and select the login button. If the user has the correct permission, steps can be completed out of sequence. A step can require the user to add production, add consumption, **Operator Acknowledge** or enter form data.

Lab 16 – Tracking Operations Steps

Introduction

In this lab, you will add step information to guide the operator through the roasting operation of the flavored mixed nuts process.

In order to run the roasting operation, three groups of tasks need to be performed: setting up the roaster, running the roasting job, and cleaning the roaster, if it is required. You will create these groups and then add steps to each one of them.

Additionally, you will create and run a work order in Wonderware MES Client and run it in runtime to verify the operation of the steps that you created.

Objectives

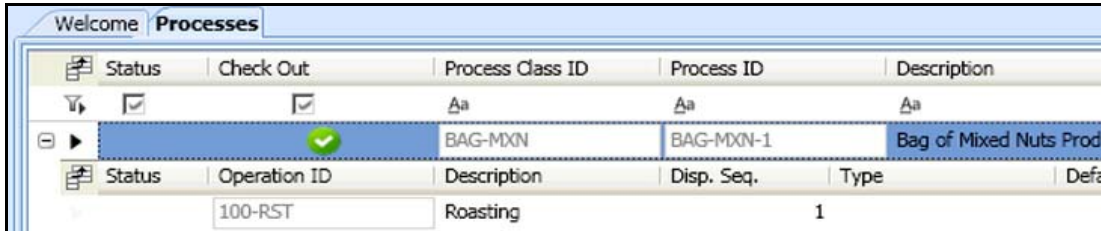
Upon completion of this lab, you will be able to:

- Define and add steps to a process
- Track the progress of steps for jobs in runtime

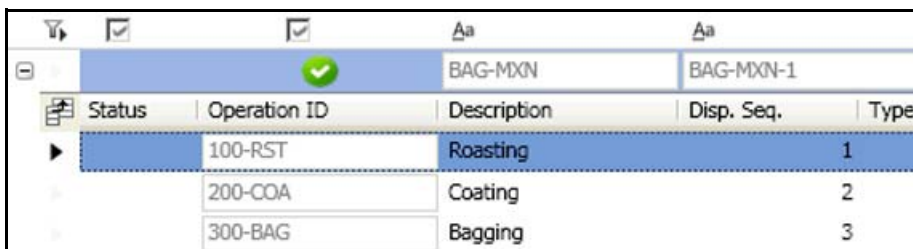
Add Steps to a Process

For this lab, you will modify the roasting operation of your flavored mixed nuts process. To do this, first you will check out the **BAG-MXN-1** process in Wonderware MES Client.

1. In the Wonderware MES Client, **Processes** tab, check out the **BAG-MXN-1** process.



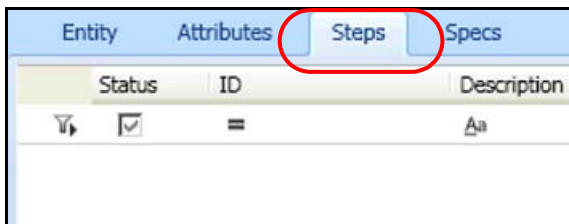
2. Click the **100-RST** operation.



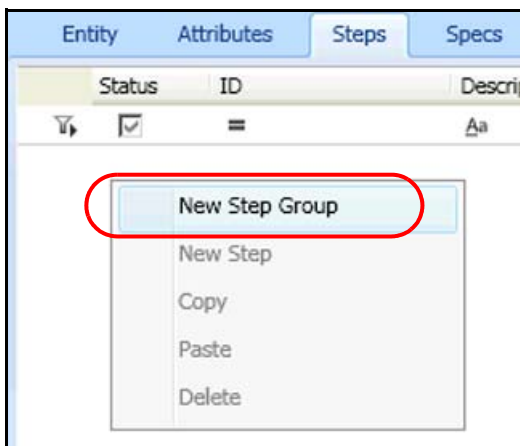
Steps are organized into groups. Therefore, before adding steps to the roasting operation, you will create step groups and then add steps to them.

Now, you will create the **Setup** step group.

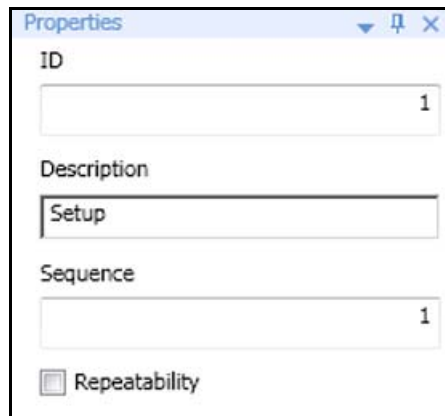
3. In the bottom of the tabbed workspace, click the **Steps** tab.



4. On the **Steps** tab, right-click the empty workspace and select **New Step Group**.



5. In the **Properties** pane, **Description** field, enter **Setup**.

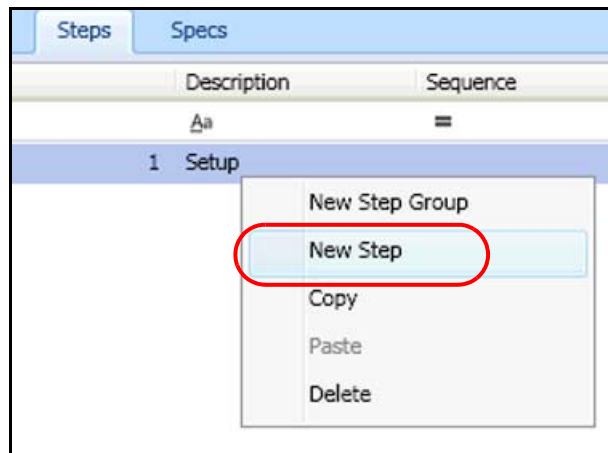


The screenshot shows a 'Properties' dialog box with the following fields and values:

- ID: 1
- Description: Setup
- Sequence: 1
- Repeatability: ☐

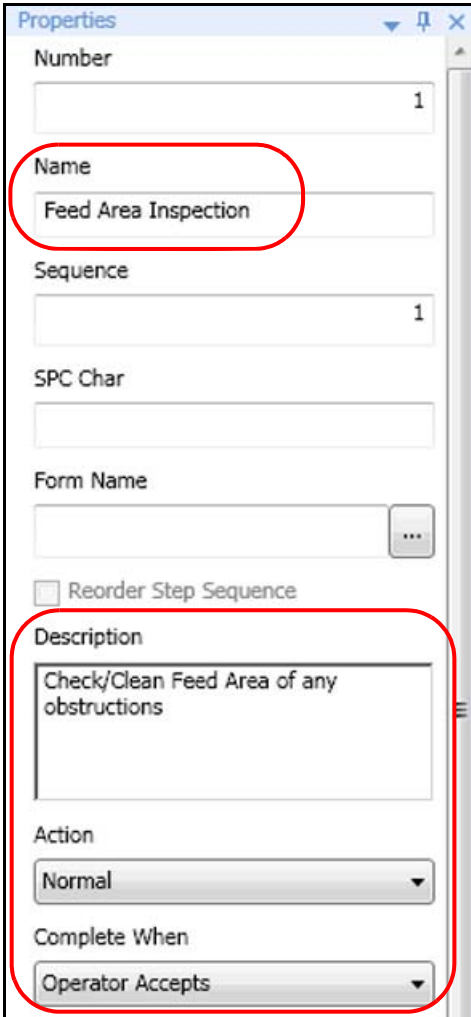
The first task will be to check for any obstructions in the feed area of the roaster. Therefore, you will now add a step within the **Setup** step group.

6. Right-click the **Setup** group and select **New Step**.



7. In the **Properties** pane, configure the new step as follows:

Name: Feed Area Inspection
Description: Check/Clean Feed Area of any obstructions
Action: Normal (*default*)
Complete When: Operator Accepts (*default*)



The screenshot shows a 'Properties' dialog box with the following fields and values:

- Number:** 1
- Name:** Feed Area Inspection (highlighted with a red oval)
- Sequence:** 1
- SPC Char:** (empty)
- Form Name:** (empty)
- ☐ Reorder Step Sequence
- Description:** Check/Clean Feed Area of any obstructions (highlighted with a red oval)
- Action:** Normal (dropdown menu)
- Complete When:** Operator Accepts (dropdown menu)

The next step is to set up the roasting temperature. Therefore, you will now add a step within the **Setup** group.

8. Create a step within the **Setup** step group and configure it as follows:

Name: Roaster Temp
Description: Enter Roasting Temp using MES interface
Action: Normal (*default*)
Complete When: Operator Accepts (*default*)

The screenshot shows a 'Properties' dialog box with the following fields and settings:

- Number:** 2
- Name:** Roaster Temp
- Sequence:** 2
- SPC Char:** (empty)
- Form Name:** (empty) with a button to select a form.
- ☐ Reorder Step Sequence
- Description:** Enter Roasting Temp using MES interface
- Action:** Normal (selected in a dropdown menu)
- Complete When:** Operator Accepts (selected in a dropdown menu)

6-10 Module 6 – Steps, Specifications, Spares, and MES Attributes

After setting up the roaster, you will run the roasting job. Therefore, you will now create the **Roast** step group.

9. On the **Steps** tab, right-click the empty workspace and select **New Step Group**.
10. In the Properties pane, **Description** field, enter **Roast**.

The **Steps** tab displays the new step group.

Entity Attributes Steps Specs					
Status	ID	Description	Sequence	Repeatability	
		1 Setup		1	
Status	Step No.	Step Name	Step Sequence	Description	
		1 Feed Area Inspection		1	Check/Clean Feed Area
		2 Roaster Temp		2	Enter Roasting Temp us
		2 Roast		2	

11. Create a step within the **Roast** step group and configure it as follows:

Name: Start Roast

Description: Once Roaster has reached RoastTemp setpoint, start Roaster

Action: Normal (*default*)

Complete When: Operator Accepts (*default*)

The screenshot shows a 'Properties' dialog box with the following fields and values:

- Number:** 3
- Name:** Start Roast
- Sequence:** 3
- SPC Char:** (empty)
- Form Name:** (empty) with a button to select a form
- Reorder Step Sequence:** ☐
- Description:** Once Roaster has reached RoastTemp setpoint, start Roaster
- Action:** Normal (dropdown menu)
- Complete When:** Operator Accepts (dropdown menu)

12. Create another step within the **Roast** step group and configure it as follows:

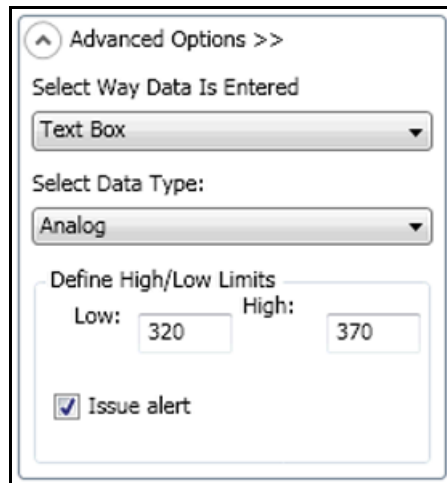
Name: Transfer
Description: Record nut temp after roasting process. Release roasted nuts to Coater.
Action: Normal (*default*)
Complete When: Operator Accepts (*default*)
Enter Data: *checked*

The screenshot shows a 'Properties' dialog box for a step. The fields are as follows:

- Number:** 4
- Name:** Transfer
- Sequence:** 4
- SPC Char:** (empty)
- Form Name:** (empty)
- ☐ Reorder Step Sequence
- Description:** Record nut temp after roasting process. Release roasted nuts to Coater.
- Action:** Normal (dropdown)
- Complete When:** Operator Accepts (dropdown)
- Standard Time (In hours):** 0
- Step Occurrence % (0=all):** 0
- Step Grp ID:** (2) Roast (dropdown)
- ☐ Allow Bypass
- ☒ Enter Data (highlighted with a red circle)

13. Towards the bottom of the Properties pane, expand the **Advanced Options** group and configure the options as follows:

Select Way Data Is Entered: Text Box (*default*)
Select Data Type: Analog
Low: 320
High: 370
Issue alert: *checked*

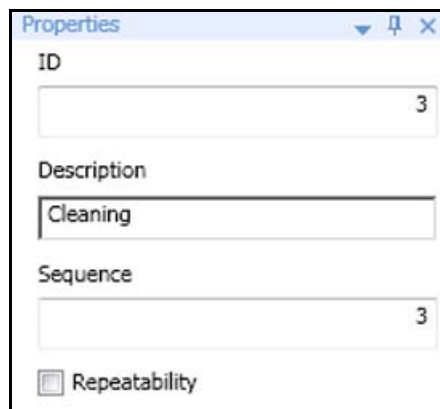


The screenshot shows the 'Advanced Options >>' dialog box. It contains the following settings: 'Select Way Data Is Entered' is set to 'Text Box'; 'Select Data Type' is set to 'Analog'; 'Define High/Low Limits' shows 'Low' as 320 and 'High' as 370; and the 'Issue alert' checkbox is checked.

For the purpose of this lab, you must register temperature while running the **Transfer** step and store the temperature information. Setting **Advanced Options** allows you to specify the kind of data that will be entered, and checking the **Issue alert** check box generates an alert if the temperature falls outside the defined limits.

Now, you will create the cleaning step for the roasting operation.

14. Create a step group with a **Description** of **Cleaning**.



The screenshot shows the 'Properties' dialog box for a step group. The 'ID' field contains the number 3. The 'Description' field contains the text 'Cleaning'. The 'Sequence' field contains the number 3. The 'Repeatability' checkbox is unchecked.

15. Create a step within the **Cleaning** step group and configure it as follows:

Name: Clean Unit
Description: If indicated by batch counter, clean Roaster
Action: Normal (*default*)
Complete When: Operator Accepts (*default*)
Allow Bypass: *checked*

The screenshot shows a 'Properties' dialog box with the following fields and values:

- Number: 5
- Name: Clean Unit
- Sequence: 5
- SPC Char: (empty)
- Form Name: (empty) with a button to select a form
- ☐ Reorder Step Sequence
- Description: If indicated by batch counter, clean Roaster
- Action: Normal (dropdown)
- Complete When: Operator Accepts (dropdown)
- Standard Time (In hours): 0
- Step Occurrence % (0=all): 0
- Step Grp ID: (3) Cleaning (dropdown)
- ☒ Allow Bypass (highlighted with a red circle)
- ☐ Enter Data

For the mixed nut factory, the cleaning task should not be mandatory. An operator should have an option to bypass it, in case it is needed. Checking the **Allow Bypass** check box ensures that an operator can bypass the **Clean Unit** step, if required.

16. Save all changes.
17. Verify and check in the **BAG-MXN-1** process.

Track the Running of Steps in Runtime

Before running a work order in runtime, you will create a work order in Wonderware MES Client.

18. Create a work order from **BAG-MXN-1** and configure it as follows:

Work Order ID: WO-100
Description: <enter a description>
Item: BMX-BBQ
Required Quantity: 400

Create Work Order from Process

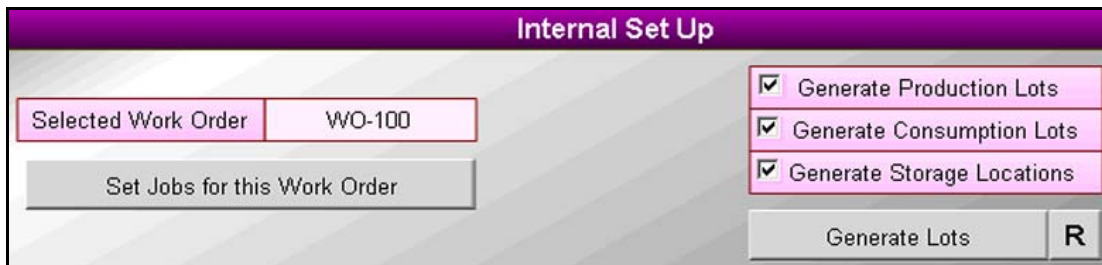
Process ID	BAG-MXN-1
Spec. Version	
Work Order ID	WO-100
Description	
Item	BMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	400 Pcs.
Release Date/Time	05/14/2013 12:00 AM
Due Date/Time	05/14/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

OK Cancel

6-16 Module 6 – Steps, Specifications, Spares, and MES Attributes

You will now track the progress of the jobs associated with **WO-100** in runtime. For this, you will use the InTouch application.

19. In the WindowViewer **Production** window, **Internal Set Up** panel, set jobs for **WO-100**.
20. Ensure that the **Generate Production Lots**, **Generate Consumption Lots**, and **Generate Storage Locations** check boxes are checked and click **Generate Lots**.

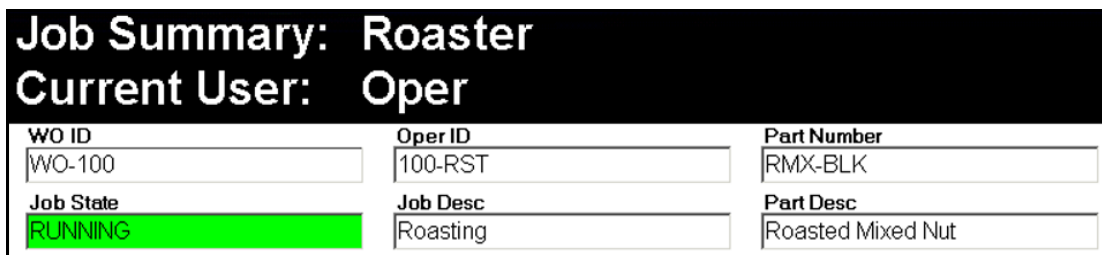


Now, you will run the roasting job.

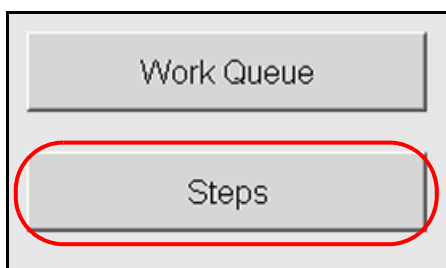
21. Start the roasting job.

The Operations Capability Object does not have the capability to display information about the steps that need to be run. Therefore, you will run the steps using Wonderware MES .NET Controls.

22. On the **Navigation Bar**, click **Manual**.
23. In the **Job Summary** panel, select the **Roaster** entity.



24. In the navigation area, click **Steps**.



You will now run the first step.

25. In the **Steps** grid, ensure **Step No 1** is selected, and then on the button bar, click the

Login to step button .

Note: You may have to click one of the other steps and then click **Step No 1** to enable the button bar buttons.

The **Status** of the step changes to **RUNNING**.

Operator		Serial Number	
Oper		-	

Step No	Step Desc	Grp Seq	Seq.
1		1	1
2		1	2
3		2	3
4		2	4
5		3	5

Step Desc.

Check/Clean Feed Area of any obstructions

Data Edit

Status: **RUNNING** (highlighted in green and circled in red)

Action: Normal


Start: 5/13/2013 1

Required for Step Completion: Operator accept

Finish:

Icons: [Checkmark] [X] [People] [Refresh] [Question] [Magnifying Glass] [Play]

The first step requires you to ensure that the roaster feeders are free of obstructions. Assume that you have performed this step and that there are no obstructions. You will now complete the first step.

26. Click the **Step accept/complete** button  to acknowledge the completion of step number 1.

The **Status** of the step now displays **COMPLETE**.

Step Desc.		
Check/Clean Feed Area of any obstructions		
Data Edit		
<input type="text"/>		
Status	Action	Start
COMPLETE	Normal	5/13/2013 1
Required for Step Completion		Finish
<input type="text"/>		5/13/2013 1

27. Click **Step No 2**.

The **Status** of the second step displays as **READY**.

Step No	Step Desc	Grp Seq	Seq.	
1		1	1	
2		1	2	
3		2	3	
4		2	4	
5		3	5	

Step Desc.		
Enter Roasting Temp using MES interface		
Data Edit		
<input type="text"/>		
Status	Action	Start
READY	Normal	<input type="text"/>
Required for Step Completion		Finish
<input type="text"/>		<input type="text"/>

Now, you will run the second step.



28. Click **Step No 2**, and then click the **Login to step** button.

The second step requires you to setup the temperature setpoint. However, the infrastructure for performing this task will be setup in the next lab. For now, assume that you have setup the temperature setpoint and complete the second step.



29. Click the **Step accept/complete** button to acknowledge the completion of step number 2.

You will now run the third step.

30. Click **Step No 3**, and then click the **Login to step** button.

The third step requires you to consume peanuts, cashews, and almonds. Therefore, you will consume the appropriate raw material in the **Production** window and complete the step.

31. On the **Navigation Bar**, click **Production**.

32. Consume peanuts, cashews, and almonds as follows:

	BOM Component 1	BOM Component 2	BOM Component 3
Quantity:	45.00	25.00	25.00
Lot:	PNT-100	CSW-100	AMD-100
Location:	Silo01	Silo02	Silo03

33. On the **Navigation Bar**, click **Manual**.

34. In the navigation area, click **Steps**.

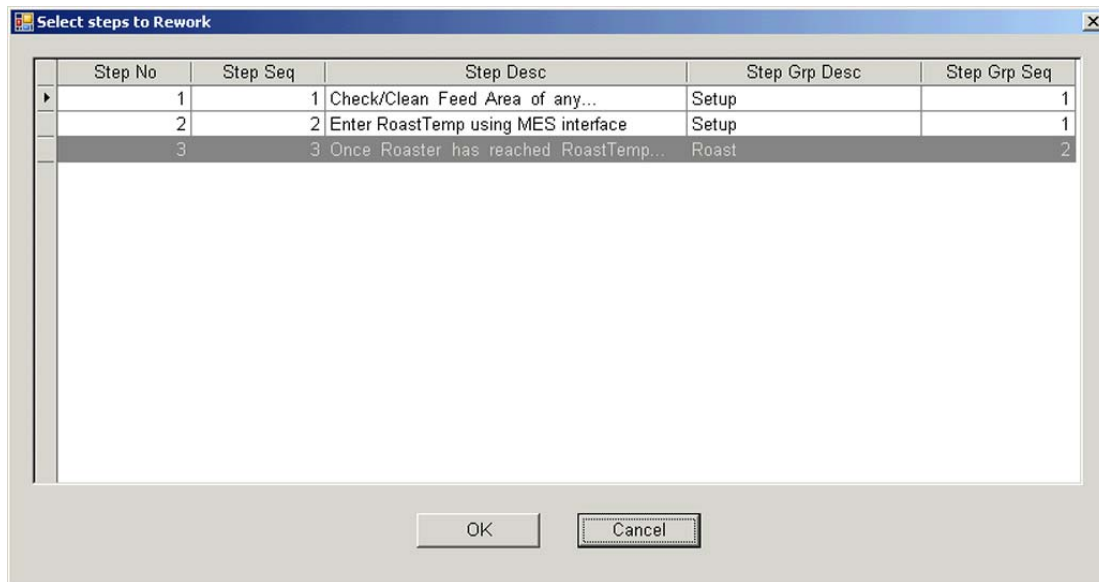
35. Click **Step No 3**, and then click the **Step accept/complete** button to acknowledge the completion of step number 3.

In the event a mistake is made, you can rework a step. You will now perform the appropriate actions to rework a completed step. In this case, you will rework **Step No 3**.



36. Click the **Step Rework** button

The **Select steps to Rework** dialog box appears.



37. Click **Step No 3**, and then click **OK**.

The third step now appears in the grid twice. The status of the first occurrence of this step displays **SUPERSEDED** and the second occurrence of this step displays **READY**. This allows you to run the third step again.

Grp Seq /	Seq. /	Document	View	Data	Start	Finish	State
1	1				5/15/2013 10:14:09 AM		COMPLETE
1	2				5/15/2013 10:15:41 AM		COMPLETE
2	3				5/15/2013 10:16:07 AM		SUPERSEDED
2	3						READY
2	4						NEW
3	5						NEW

38. Click **Step No 3** that displays state of **READY**, and then click the **Login to step** button.

The second occurrence of **Step No 3** now displays **RUNNING**.

Start	Finish	State
5/15/2013 10:14:09 AM		COMPLETE
5/15/2013 10:15:41 AM		COMPLETE
5/15/2013 10:16:07 AM		SUPERSEDED
5/15/2013 10:21:41 AM		RUNNING
		NEW
		NEW

39. Click the **Step accept/complete** button to acknowledge the completion of step number 3.

Now, you will run the fourth step.

40. Click **Step No 4**, and then click the **Login to step** button.

	Step No	Step Desc	Grp Seq	Seq.
	1		1	1
	2		1	2
	3		2	3
	3		2	3
▶	4		2	4
	5		3	5

The fourth step requires you to transfer the produced material to the next operation. For this, you will report production in the **Production** window.

41. On the **Navigation Bar**, click **Production**.

42. In the **GOOD Prod Counter** panel, report **95.00** pounds of good production.

GOOD Prod Counter

95.00

Cmd

Ready R

RMX-100

Roaster

2 ?

0

43. On the **Navigation Bar**, click **Manual**.

44. In the navigation area, click **Steps**.

You will now use the **Enter Data** button to enter temperature data associated with the fourth step.

45. Click **Step No 4**, and then click **Enter Data**.

Operator
Serial Number

Oper
-

	Step No ▲	Step Desc	Grp Seq ▲	Seq. ▲	Document
	1		1	1	
	2		1	2	
	3		2	3	
	3		2	3	
▶	4		2	4	
	5		3	5	

Step Desc.
Record nut temp after roasting process. Release roasted nuts to

Data Edit

Enter Data

Status
Action
Start

RUNNING
Normal
5/15/2013 1

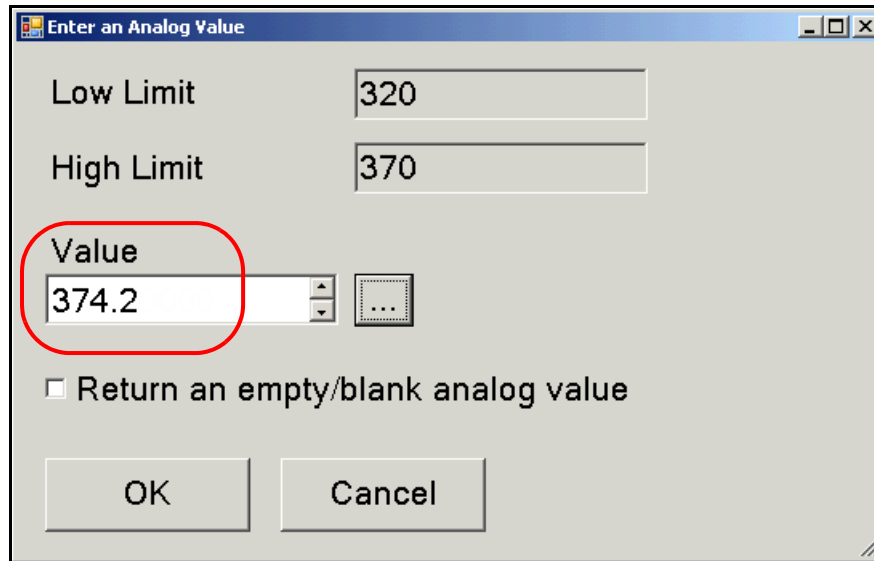
Cert N

Required for Step Completion
Finish

Data not entered

The **Enter an Analog Value** dialog box appears.

46. In the **Value** field, enter **374.2**.



The dialog box titled "Enter an Analog Value" has a title bar with standard window controls. It contains three input fields: "Low Limit" with the value 320, "High Limit" with the value 370, and "Value" with the value 374.2. The "Value" field is highlighted with a red circle. To the right of the "Value" field is a button with three dots "...". Below these fields is a checkbox labeled "Return an empty/blank analog value" which is currently unchecked. At the bottom are "OK" and "Cancel" buttons.

47. Click **OK**.

The value **374.2** is outside the low and high alarm limits. Therefore, the **Confirmation** dialog box appears. This alerts you that the value is outside the limit and asks whether you wish to accept this value or not.



The dialog box titled "Confirmation" has a title bar with a close button. The message inside reads: "The value entered is outside of the allowable range. Do you wish to accept the value?". At the bottom are two buttons: "Yes" and "No".

48. Click **Yes** to accept the value.

The **Data** column displays the value associated with the step.

Document	View	Data	Start
			5/15/2013 10:14:09 AM
			5/15/2013 10:15:41 AM
			5/15/2013 10:16:07 AM
			5/15/2013 10:21:41 AM
		374.2	5/15/2013 10:26:43 AM

49. Click the **Step accept/complete** button to acknowledge the completion of step number 4.

Now, you will bypass the cleaning step.

50. Click **Step No 5**, and then click the **Login to step** button.



51. Click the **Step Bypass** button.

The **Status** of the step now displays **BYPASSED**.

Step Desc.		
If indicated by batch counter, clean Roaster		
Data Edit		
<input type="text"/>		
Status BYPASSED	Action Normal	Start 5/15/2013 1
Required for Step Completion <input type="text"/>		Finish 5/15/2013 1

This completes all the steps associated with the roasting operation.

52. On the **Navigation Bar**, click **Production** and end the roasting job.

Run the Step Report for the Work Order

You will now view a report through the InTouch application that displays step information associated with the roasting operation.

53. On the **Navigation Bar**, click **DB Views**.

54. Click **Step Data**.



This displays all the steps related to **WO-100**.

Drag a column header here to group by that column.							
wo_id	oper_id	seq_no	ent_name	step_no	state_desc	step_data	start_user
WO-100	100-RST	0	Roaster	1	COMPLETE		Plant Operator
WO-100	100-RST	0	Roaster	2	COMPLETE		Plant Operator
WO-100	100-RST	0	Roaster	3	SUPERSEDED		Plant Operator
WO-100	100-RST	0	Roaster	3	COMPLETE		Plant Operator
WO-100	100-RST	0	Roaster	4	COMPLETE	374.2	Plant Operator
WO-100	100-RST	0	Roaster	5	BYPASSED		Plant Operator

55. In the Production window, run all of the remaining operations for **WO-100** as follows:

Operation	BOM 1	BOM 2	BOM 3	Production
200-COA	95	2	3	100
300-BAG	100	Set as Default		400

Section 2 – Specifications





This section discusses specifications, explains how to configure global specifications and browse and select them from the MES database, and describes specification capabilities in the Operations Capability Object.

Overview

You can assign specifications to operations within a process. Specifications can also be assigned at a global level and can be used as templates by different entities. You can also run specification command in runtime from the Operations Capability Object.

Specifications

Specifications represent a collection of values for settings that can be used during an operation for a process when producing an item for a work order. Specifications are used to set values with optional minimum and maximum values that are used in runtime. Specifications are similar to operating setpoints. For example, when running a job on an entity performing a mixing operation, the specifications for the operation can be used by the Operations Capability Object to load the setpoints in a PLC where the setpoints are different when different items are produced.

Entity	Attributes	Steps	Specs
Status	Version	Preferred Version	Description
	 Aa	 Aa	Aa
	Default		

You can assign multiple specification versions to an operation. However, you can define only one version as the preferred version. The preferred specification version is used when a work order is created from a process. All operations in a process use that same specification version.

Properties

Version

Default

☒ Preferred Version

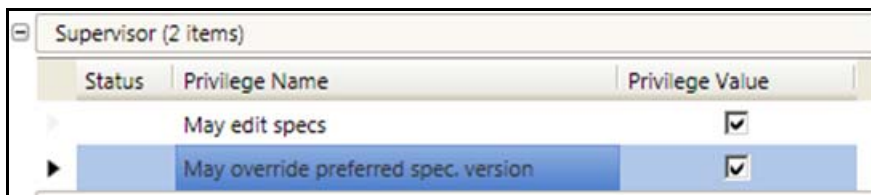
Description

▼ BOM Spec.

▼ Entity and Step Specification

▼ Item Class and Item Specification

A specification version can contain multiple specifications. When creating a work order from a process, the preferred version is chosen for the job or the user creating the work order can change the specification version for the job if their user group has the **May override preferred spec. version** privilege.

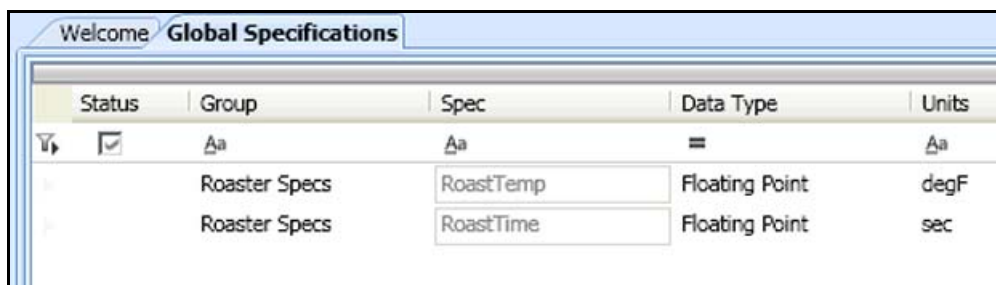


The screenshot shows a table titled "Supervisor (2 items)". It has three columns: "Status", "Privilege Name", and "Privilege Value". There are two rows of privileges, both with a checked status.

Status	Privilege Name	Privilege Value
<input checked="" type="checkbox"/>	May edit specs	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	May override preferred spec. version	<input checked="" type="checkbox"/>

Configuring Global Specifications

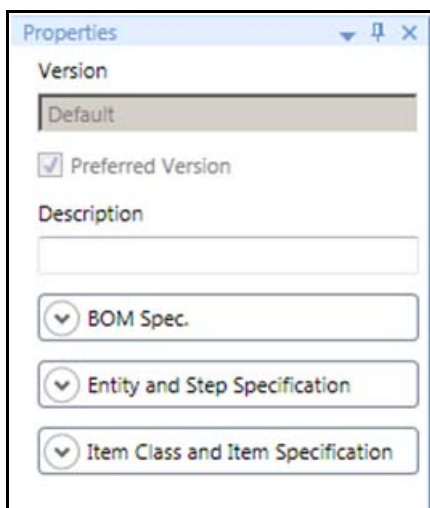
A typical Wonderware MES system contains definitions of many specifications some of which are considered to be "global" that can be used as a template for different items, processes, and entities. The definition of these global specifications is the starting point before they are assigned to operations within a process. These specifications are assigned to specification groups that are valuable when the specifications are used for a process or in the Operations Capability Object.



The screenshot shows a window titled "Global Specifications" with a "Welcome" tab. It contains a table with five columns: "Status", "Group", "Spec", "Data Type", and "Units". There are three rows of data, all with a checked status.

Status	Group	Spec	Data Type	Units
<input checked="" type="checkbox"/>	Aa	Aa	=	Aa
<input checked="" type="checkbox"/>	Roaster Specs	RoastTemp	Floating Point	degF
<input checked="" type="checkbox"/>	Roaster Specs	RoastTime	Floating Point	sec

When a specification is assigned to an operation's specification version, it is given the values relevant to that item-operation-entity-bill of material combination.



The screenshot shows a "Properties" dialog box for a specification version. It has a "Version" section with a "Default" dropdown menu. Below this is a "Preferred Version" checkbox which is checked. There is a "Description" text field. At the bottom, there are three expandable sections: "BOM Spec.", "Entity and Step Specification", and "Item Class and Item Specification".

Using Specifications

In the Operations Capability Object, you use the **Specifications** tab to browse and select the globally configured specifications from the MES database.

Specification Name: RoastTemp

Specifications:

Name
RoastTemp
RoastTime

Inherited Specifications:

Name

Global Spec Attributes

Spec Group Id: Roaster Specs

Spec Id: RoastTemp

Units: degF

Data Type: MxDouble

Extendable Spec Attributes

General Attributes

Attribute Name

Spec Id

Spec Group Id

In the Operations Capability Object, you can enable the **Specifications** tab in the object editor via the **Enable Specifications** check box on the **General** tab. This lets you map the specification properties such as **Value**, **Minimum Value**, and **Maximum Value** to object attributes.

Attribute Name	Use Input Output Source	Input Output Source
Units	<input type="checkbox"/>	
Spec Value	<input checked="" type="checkbox"/>	MyContainer.TimeSP
Min Value	<input checked="" type="checkbox"/>	MyContainer.TimeMinSP
Max Value	<input checked="" type="checkbox"/>	MyContainer.TimeMaxSP
Spare1	<input type="checkbox"/>	

When you execute the specifications commands in the Operations Capability Object, the specifications mapped as attributes in the Galaxy are made available for the Operations Capability Object in runtime. The mapped specification values are retrieved from the database for the Operations Capability Object's currently running job or a future job.

Attribute Name	Use Input Source	Value or Input Source
Work Order	<input checked="" type="checkbox"/>	MyContainer.Specs.WorkOrder
Operation	<input checked="" type="checkbox"/>	MyContainer.Specs.Operation
Sequence Number	<input checked="" type="checkbox"/>	MyContainer.Specs.SequenceNumber
Step Number	<input checked="" type="checkbox"/>	MyContainer.Specs.StepNumber
Job Position	<input checked="" type="checkbox"/>	MyContainer.Specs.JobPosition

For the **Load Running Job Specs Command** for the Operations Capability Object, the specifications for the currently running job on the parent entity of an Operations Capability Object are loaded. In case of the **Load Job Specs Command**, the Operations Capability Object uses the values of work order, operation and sequence number for the a Job that might be run in the future to set up the specifications for later use on that job.

Note that the step number is used to enable loading of the specifications for a single step if a number greater than 0 is in the attribute or the number -1 causes the Operations Capability Object to retrieve the specifications for all steps for an operation on a job.

Inside the Operations Capability Object are two sets of attributes created for every specification:

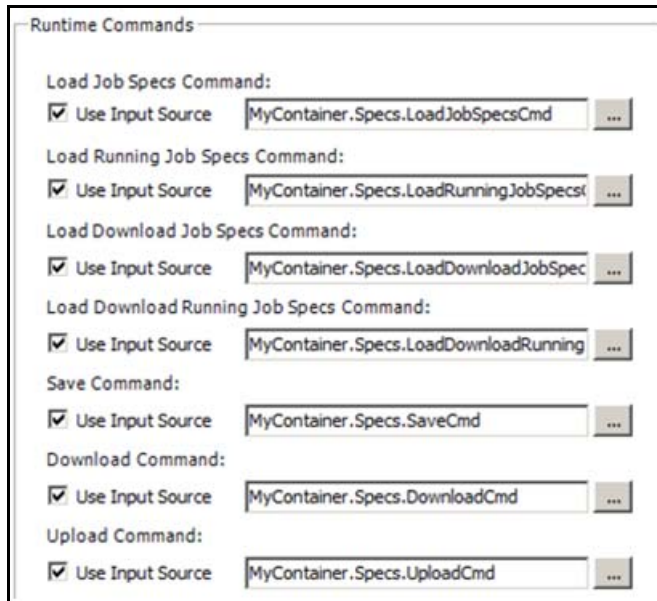
- Working attributes, which are used to let a shop floor user change the setpoints value within the maximum and minimum limit values specified
- Target attributes, which are used to represent the values currently loaded into a device, such as a PLC, on the shop floor

The shop floor user can change specification properties after loading them from the database and before uploading them to external input or output sources.

Extendable Attributes:		<input type="checkbox"/> Show extension attribute
Name		
Specs.RoastTemp.ScalingFactorDBToIO		
Specs.RoastTemp.ScalingFactorDBToIO.UseInputSource		
Specs.RoastTemp.ScalingFactorIOToDB		
Specs.RoastTemp.ScalingFactorIOToDB.UseInputSource		
Specs.RoastTemp.Target.MaxValue		
Specs.RoastTemp.Target.MaxValue.UseInputOutputSo...		
Specs.RoastTemp.Target.MinValue		
Specs.RoastTemp.Target.MinValue.UseInputOutputSource		
Specs.RoastTemp.Target.Spare1		
Specs.RoastTemp.Target.Spare1.UseInputOutputSource		
Specs.RoastTemp.Target.Spare2		
Specs.RoastTemp.Target.Spare2.UseInputOutputSource		
Specs.RoastTemp.Target.Spare3		
Specs.RoastTemp.Target.Spare3.UseInputOutputSource		
Specs.RoastTemp.Target.Spare4		
Specs.RoastTemp.Target.Spare4.UseInputOutputSource		
Specs.RoastTemp.Target.SpecGroupId		
Specs.RoastTemp.Target.SpecGroupId.UseInputOutput...		
Specs.RoastTemp.Target.SpecId		
Specs.RoastTemp.Target.SpecId.UseInputOutputSource		
Specs.RoastTemp.Target.SpecValue		
Specs.RoastTemp.Target.SpecValue.UseInputOutputSo...		
Specs.RoastTemp.Target.SpecValueActual		
Specs.RoastTemp.Target.SpecValueActual.UseInputSou...		
Specs.RoastTemp.Target.Units		
Specs.RoastTemp.Target.Units.UseInputOutputSource		
Specs.RoastTemp.Working.MaxValue		

Specification Capabilities

In the Operations Capability Object **Specifications** tab, you will see specification commands in runtime.



The screenshot shows a dialog box titled "Runtime Commands". It contains several sections, each with a label, a checked "Use Input Source" checkbox, a text field, and a button with three dots. The sections are:

- Load Job Specs Command: MyContainer.Specs.LoadJobSpecsCmd
- Load Running Job Specs Command: MyContainer.Specs.LoadRunningJobSpecsCmd
- Load Download Job Specs Command: MyContainer.Specs.LoadDownloadJobSpecsCmd
- Load Download Running Job Specs Command: MyContainer.Specs.LoadDownloadRunningJobSpecsCmd
- Save Command: MyContainer.Specs.SaveCmd
- Download Command: MyContainer.Specs.DownloadCmd
- Upload Command: MyContainer.Specs.UploadCmd

You can trigger specification commands in runtime to perform the following commands for specifications.

Load Job Specs Command

This command loads the specifications for a job, which is not necessarily running on the parent entity of an Operations Capability Object. For this command, the Operations Capability Object uses the values of work order, operation, and sequence number in the runtime job filter to load the specifications.

Load Running Job Specs Command

This command loads the specifications for the currently running job on the parent entity of an Operations Capability Object. You must specify the job position to retrieve the specifications. For this command, the Operations Capability Object uses the values of work order, operation, and sequence number for the job position instead of the values in the runtime job filter to load the specifications.

Download Command

This command is used to copy the values of the Working attributes to the Target attributes when applying the **Scaling Factor DB To IO** for each specification.

Save Command

This command is used to write the working value of each specification to the MES database.

Upload Command

This command is used to read the value configured for the **Actual Specification Value** attribute and update the target specification value in runtime. The target attribute value is written to the working attribute, Specs.<SpecAlias>.Working.SpecValueActual, while applying the scaling factor, Specs.<SpecAlias>.ScalingFactorIOToDB.

Load Download Job Specs Command

This command combines the action of executing **Load Job Specs Command** and **Download Command**.

Load Download Running Job Specs Command

This command combines the action of executing **Load Running Job Specs Command** and **Download Command**.

Lab 17 – Managing Specifications

Introduction

In this lab, you will define operational parameters, or setpoints, associated with the roasting operation in the flavored mixed nuts process. Then, you will configure the Operations Capability Object to automatically download these parameters to the plant floor during the roasting operation.

The roasting operation in the mixed nut factory requires you to specify the roasting temperature and roasting time setpoints. You will configure these setpoints and assign them to the appropriate operation in the process.

Objectives

Upon completion of this lab, you will be able to:

- Create global specifications in Wonderware MES Client
- Assign specifications to operations in a process
- Enable and configure specification capabilities in Operations Capability Object
- Track the use of specifications in runtime

Create Global Specifications for Roasting Temperature and Time

You will first create a global specification for roasting temperature in Wonderware MES Client.

1. In the Wonderware MES Client, **Master Data Config** group, click the **Global Specifications** module.

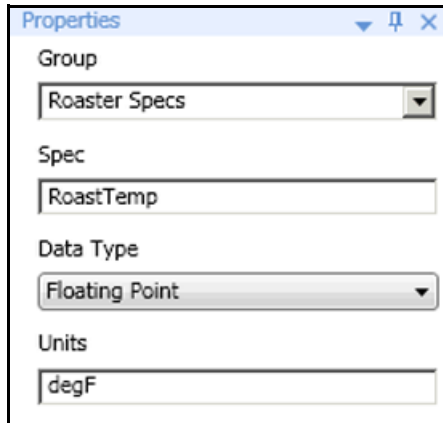


2. On the **Global Specifications** tab, right-click the empty workspace and click **New**.
This will create a new specification.

3. In the **Properties** pane, assign the following details for the new specification:

Group: Roaster Specs
Spec: RoastTemp
Data Type: Floating Point
Units: degF

Note: It is very important that you do not have a space in the name of the specification because the name needs to match the naming convention of the prebuilt InTouch application.



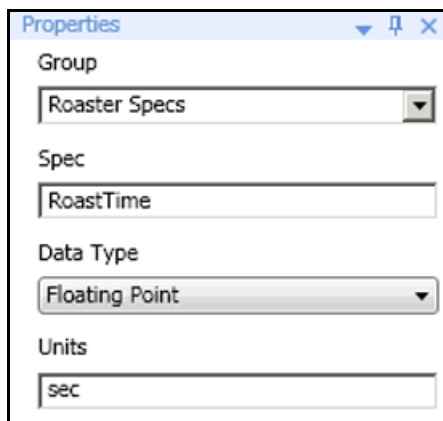
The screenshot shows a 'Properties' dialog box with the following fields:

- Group:** A dropdown menu with 'Roaster Specs' selected.
- Spec:** A text input field containing 'RoastTemp'.
- Data Type:** A dropdown menu with 'Floating Point' selected.
- Units:** A text input field containing 'degF'.

Now you will create a global specification for roasting time.

4. Create a second specification and configure it as follows:

Group: Roaster Specs
Spec: RoastTime
Data Type: Floating Point
Units: sec



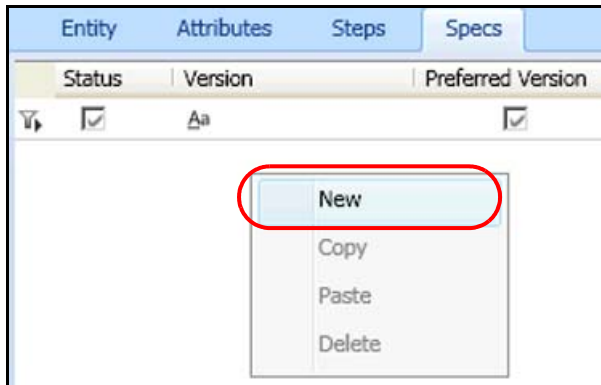
The screenshot shows a 'Properties' dialog box with the following fields:

- Group:** A dropdown menu with 'Roaster Specs' selected.
- Spec:** A text input field containing 'RoastTime'.
- Data Type:** A dropdown menu with 'Floating Point' selected.
- Units:** A text input field containing 'sec'.

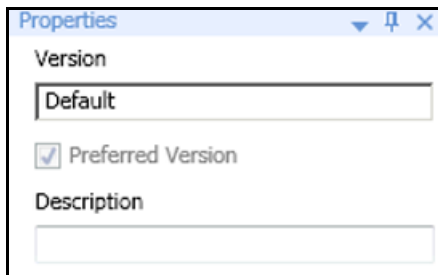
5. Save all changes and close the **Global Specifications** tab.

Now, you will assign the specifications to the **100-RST** operation.

6. On the **Processes** tab, check out the **BAG-MXN-1** process.
7. Click the **100-RST** operation.
8. In the bottom of the tabbed workspace, click the **Specs** tab.
9. On the **Specs** tab, right-click the empty workspace and select **New**.



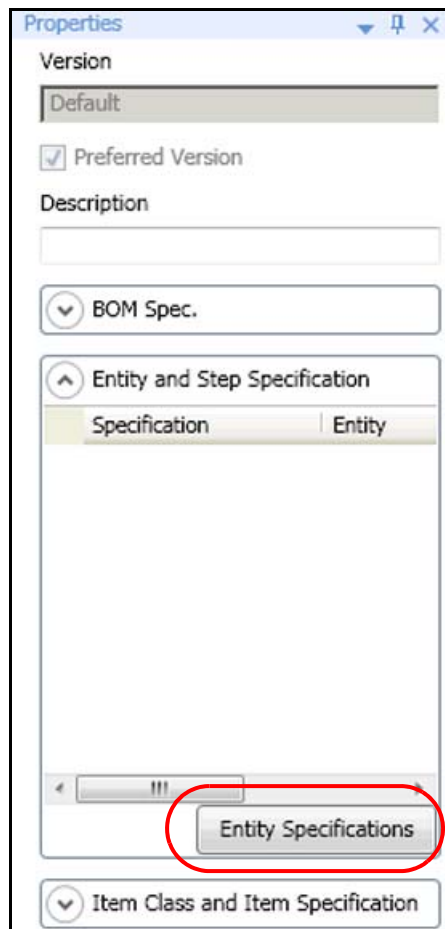
10. In the **Properties** pane, **Version** field, enter **Default**.



11. Save all changes.

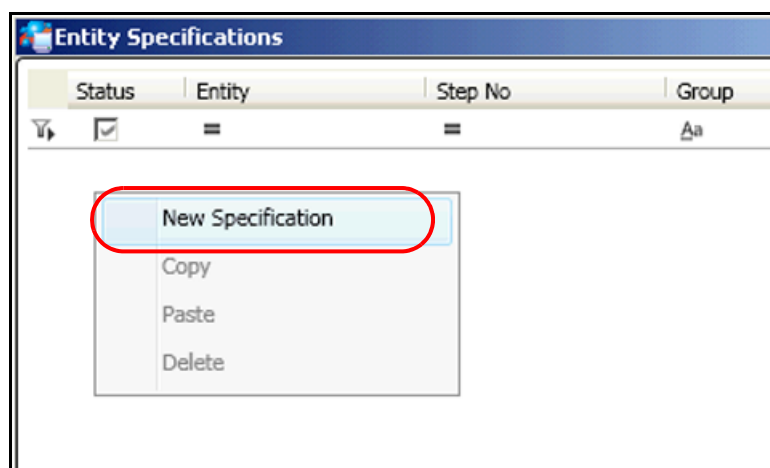
You will now add specification values to the **Default** specification version.

12. In the **Properties** pane, expand **Entity and Step Specification**, and then click **Entity Specifications**.



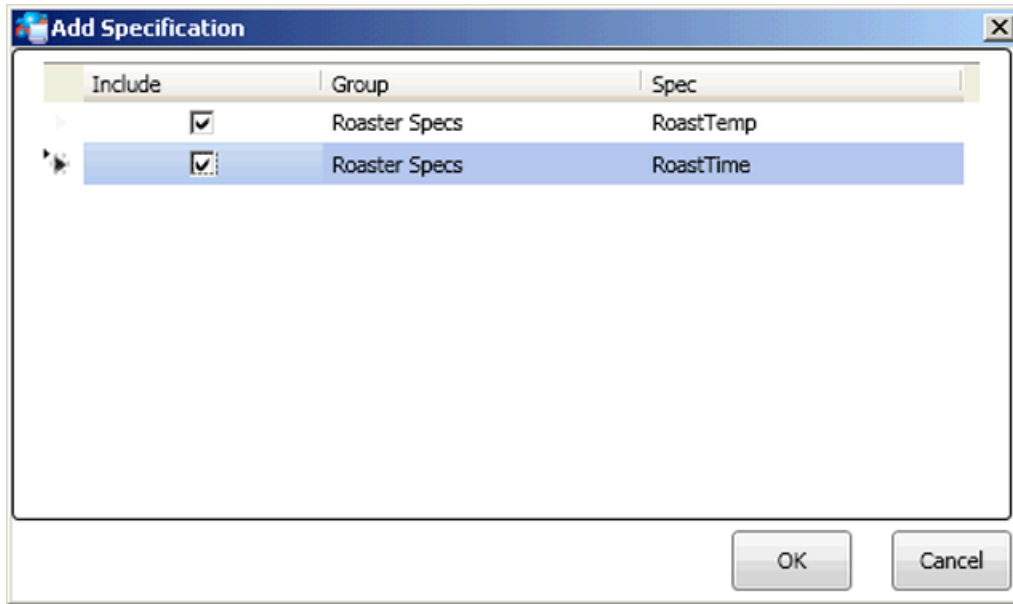
The **Entity Specifications** dialog box appears.

13. Right-click in the empty area and select **New Specification**.



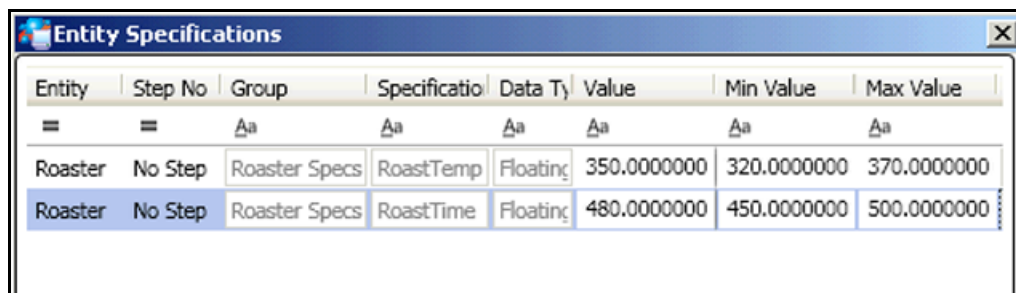
The **Add Specification** dialog box appears.

14. Check the check boxes to include the **RoastTemp** and **RoastTime** specifications.



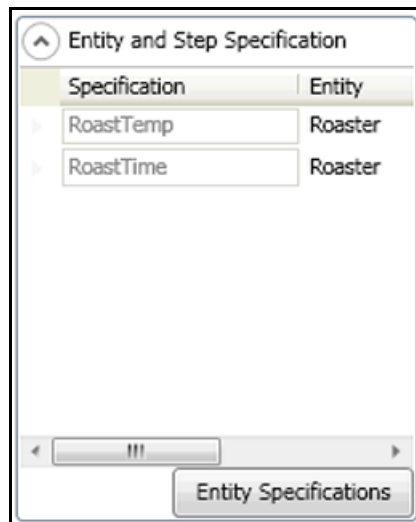
15. Click **OK**.
16. In the **Entity Specifications** dialog box, configure the specifications as follows:

Specification	Entity	Value	Min Value	Max value
RoastTemp	Roaster	350.00	320.00	370.00
RoastTime	Roaster	480.00	450.00	500.00



17. Click **OK** to close the **Entity Specifications** dialog box.

The specifications are now assigned to the operation.



18. Save all changes.
19. Verify and check in the **BAG-MXN-1** process.

Now, you will create a new work order in Wonderware MES Client.

20. Create a work order from **BAG-MXN-1** using the following values:

Work Order ID: WO-110
Description: <enter a description>
Item: BMX-BBQ
Required Quantity: 200

Create Work Order from Process

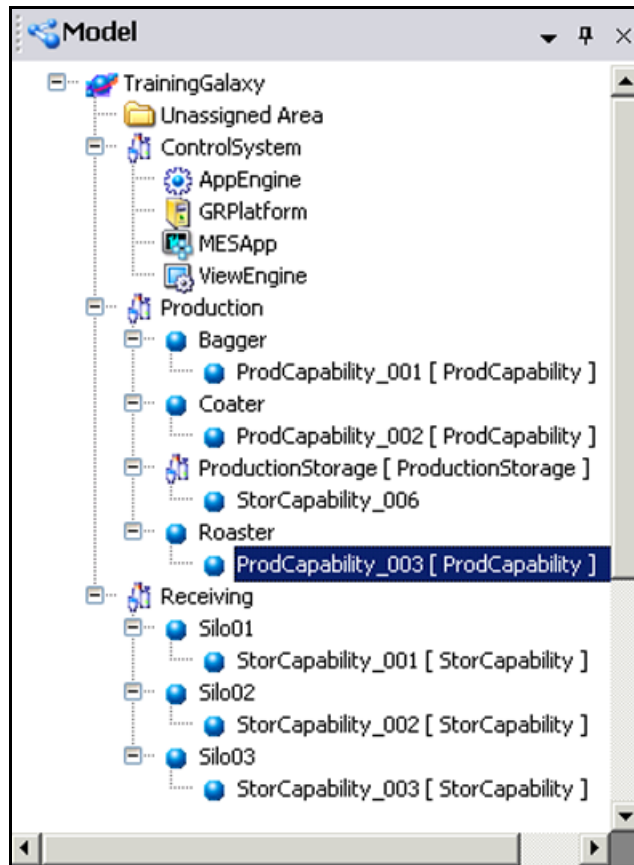
Process ID	BAG-MXN-1
Spec. Version	
Work Order ID	WO-110
Description	
Item	BMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	200 Pcs.
Release Date/Time	05/16/2013 12:00 AM
Due Date/Time	05/16/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

OK Cancel

Configure Specification Capabilities

Now, you will modify the Operations Capability Object to enable the attributes for manipulating the specifications. Specifications have been assigned only to the roasting operation. Therefore, you only need to modify the Operations Capability Object instance associated with the roasting entity.

21. In the ArchestrA IDE, **Model** view, **Production** area, double-click **Roaster.ProdCapability**.



22. On the **General** tab, **Miscellaneous** area, check the **Enable Specifications** check box.

The screenshot shows the 'ProdCapability_003' configuration window with the 'General' tab selected. The 'Miscellaneous' section is expanded, showing the following options:

- ☒ Entity Can Run Jobs
- ☐ Enable Create Job Attributes
- ☒ Enable Production Counters
- ☒ Enable Consumption Counters
- ☒ Entity Can Store Items
- ☒ Entity Can Schedule Jobs
- ☒ **Enable Specifications**
- ☐ Enable PEM Attributes

You will now add the **RoastTemp** specification to the Operations Capability Object.

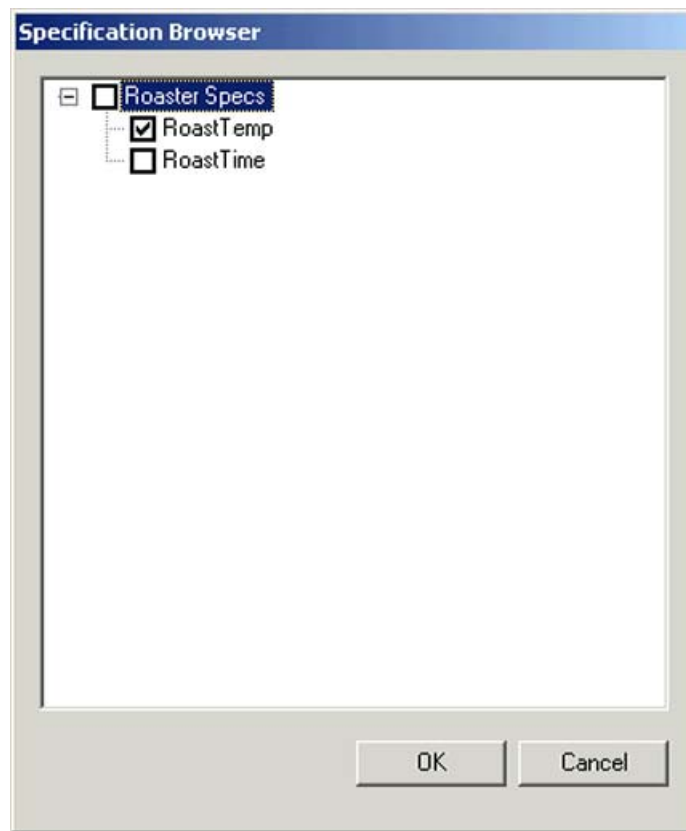
23. On the **Specifications** tab, click the **Add** button.

The screenshot shows the 'ProdCapability_003' configuration window with the 'Specifications' tab selected. The 'Add' button (a small square with a blue plus sign) is highlighted with a red circle. The 'Specification Name:' field is empty. Below the 'Specifications' list, the 'Global Spec Attributes' section is visible, containing the following fields:

- Spec Group Id:
- Spec Id:
- Units:
- DataType:

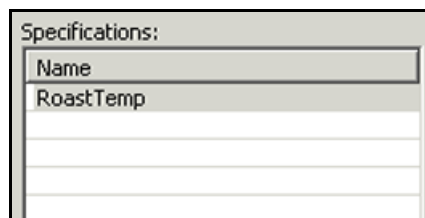
The **Specification Browser** dialog box appears, which shows the global specifications defined in the MES database.

24. Expand **Roaster Specs**, and then check the **RoastTemp** check box.



25. Click **OK**.

This creates a specification alias for **RoastTemp**.







26. In the **Extendable Spec Attributes** group, **Specification Properties** area, configure the attributes as follows:









Attribute Name	Use Input Output Source	Input Output Source
Spec Value	<i>checked</i>	MyContainer.TempSP
Min Value	<i>checked</i>	MyContainer.TempMinSP
Max Value	<i>checked</i>	MyContainer.TempMaxSP

Extendable Spec Attributes

General Attributes

Attribute Name	Use Input Output Source	Input Output Source
Spec Id	<input type="checkbox"/>  	<input type="text"/>
Spec Group Id	<input type="checkbox"/>  	<input type="text"/>

Specification Properties



Attribute Name	Use Input Output Source	Input Output Source
Units	<input type="checkbox"/>  	<input type="text"/>
Spec Value	<input checked="" type="checkbox"/>  	MyContainer.TempSP
Min Value	<input checked="" type="checkbox"/>  	MyContainer.TempMinSP
Max Value	<input checked="" type="checkbox"/>  	MyContainer.TempMaxSP

This step assigns the three attributes, **Spec Value**, **Min Value**, and **Max Value**, to their corresponding signals in the roaster.

27. In the **Specification Actual** area, configure **RoastTemp** as follows:

Attribute Name	Use Input Source	Input Source
Spec Value Actual	<i>checked</i>	MyContainer.CurrentTemp

Specification Actual

Attribute Name	Use Input Source	Input Source
Spec Value Actual	<input checked="" type="checkbox"/>  	MyContainer.CurrentTemp

Now, you will add the **RoastTime** specification to the Operations Capability Object.

28. Add the **RoastTime** specification to the Operations Capability Object.



29. Configure the **Specification Properties** area as follows:

Attribute Name	Use Input Output Source	Input Output Source
Spec Value	<i>checked</i>	MyContainer.TimeSP
Min Value	<i>checked</i>	MyContainer.TimeMinSP
Max Value	<i>checked</i>	MyContainer.TimeMaxSP

The image shows the 'Specification Properties' configuration window. It contains a table with the following data:

Attribute Name	Use Input Output Source	Input Output Source
Units	<input type="checkbox"/>	<input type="text"/>
Spec Value	<input checked="" type="checkbox"/>	MyContainer.TimeSP
Min Value	<input checked="" type="checkbox"/>	MyContainer.TimeMinSP
Max Value	<input checked="" type="checkbox"/>	MyContainer.TimeMaxSP
Spare1	<input type="checkbox"/>	<input type="text"/>

30. In the **Specification Actual** area, configure the Operations Capability Object as follows:

Attribute Name	Use Input Source	Input Source
Spec Value Actual	<i>checked</i>	MyContainer.CurrentTime

The image shows the 'Specification Actual' configuration window. It contains a table with the following data:

Attribute Name	Use Input Source	Input Source
Spec Value Actual	<input checked="" type="checkbox"/>	MyContainer.CurrentTime

31. Save and close, and then check in the object.

32. Redeploy the modified object.

Track the Job in Runtime

You will now use the InTouch application to track the roasting job associated with **WO-110**.

33. In the WindowViewer **Production** window, **Internal Set Up** panel, set jobs for **WO-110**.
34. Ensure that the **Generate Production Lots**, **Generate Consumption Lots**, and **Generate Storage Locations** check boxes are checked and click **Generate Lots**.
35. Start the roasting job.
36. On the **Navigation Bar**, click **Manual**.
37. In the **Job Summary** panel, ensure you are in the **Roaster** entity.
38. In the navigation area, click **Steps**.

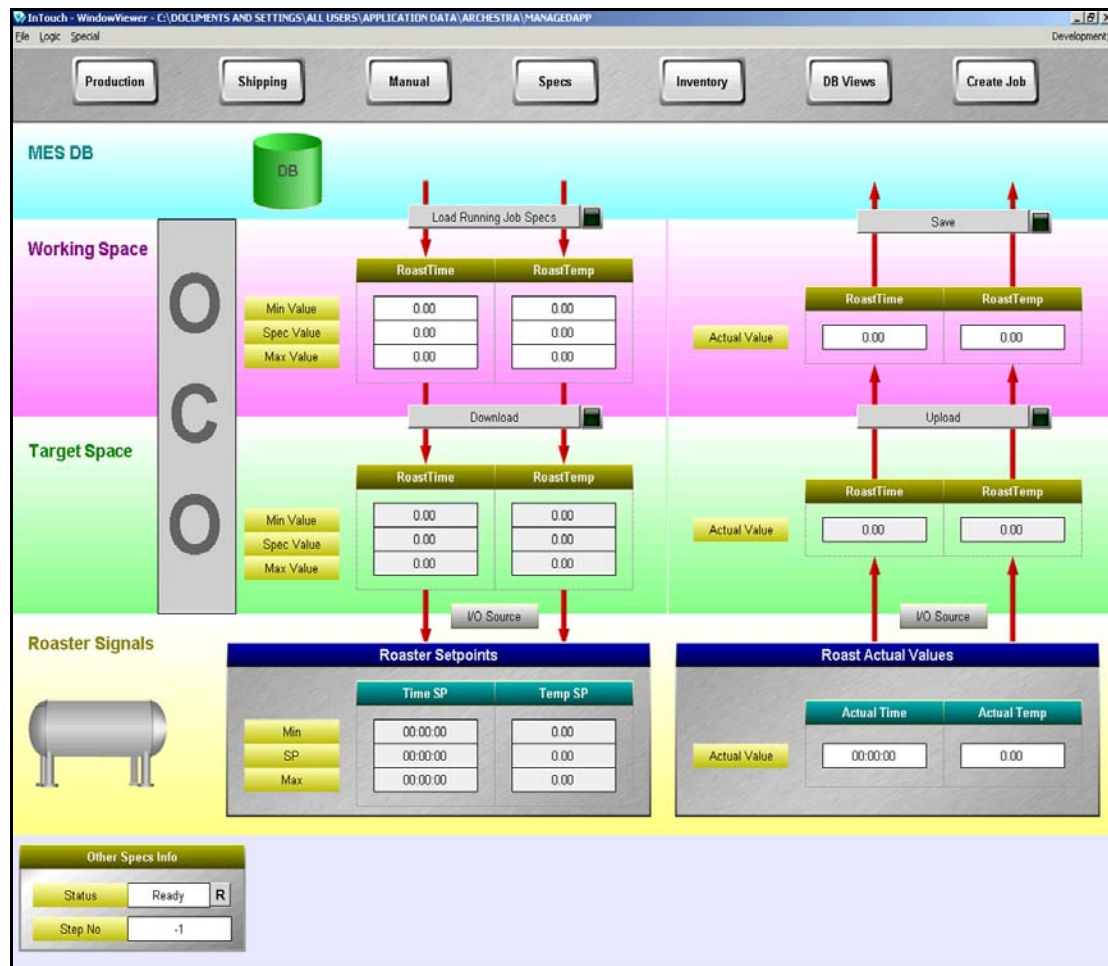
Now, you will run the steps to complete the operation.

39. Log on to **Step No 1**.
40. Complete **Step No 1**.
41. Log on to **Step No 2**.

Step number 2 requires you to set up the temperature setpoint using the MES interface. Therefore, you will set specifications.

42. On the **Navigation Bar**, click **Specs**.

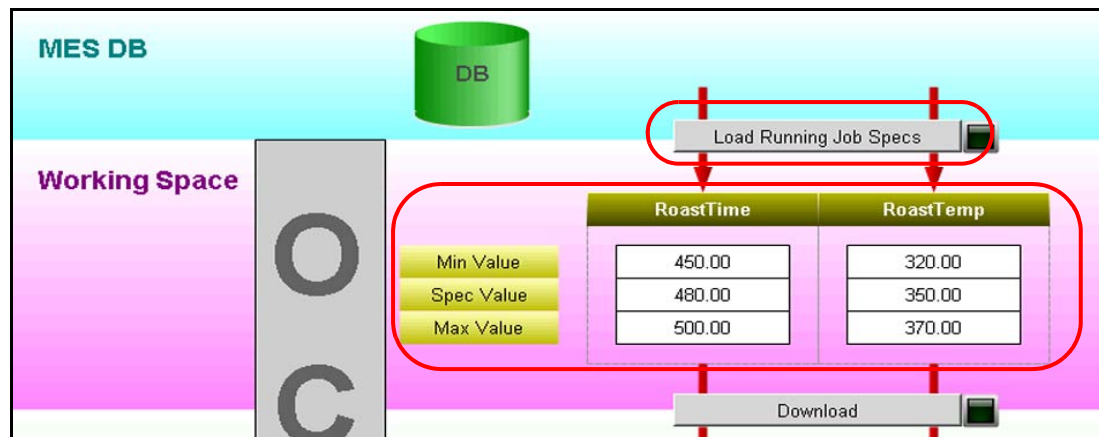
This window displays values for the **Working Space** and **Target Space** configuration versus actual.



You will now use the **Load Running Job Specs** command to retrieve the currently running job specifications in the working space.

43. Click **Load Running Job Specs**.

This loads the running job specifications in the working space.



Now, you will modify specifications in the work space.

44. In the **Working Space** pane, modify the running job specifications using the following values:

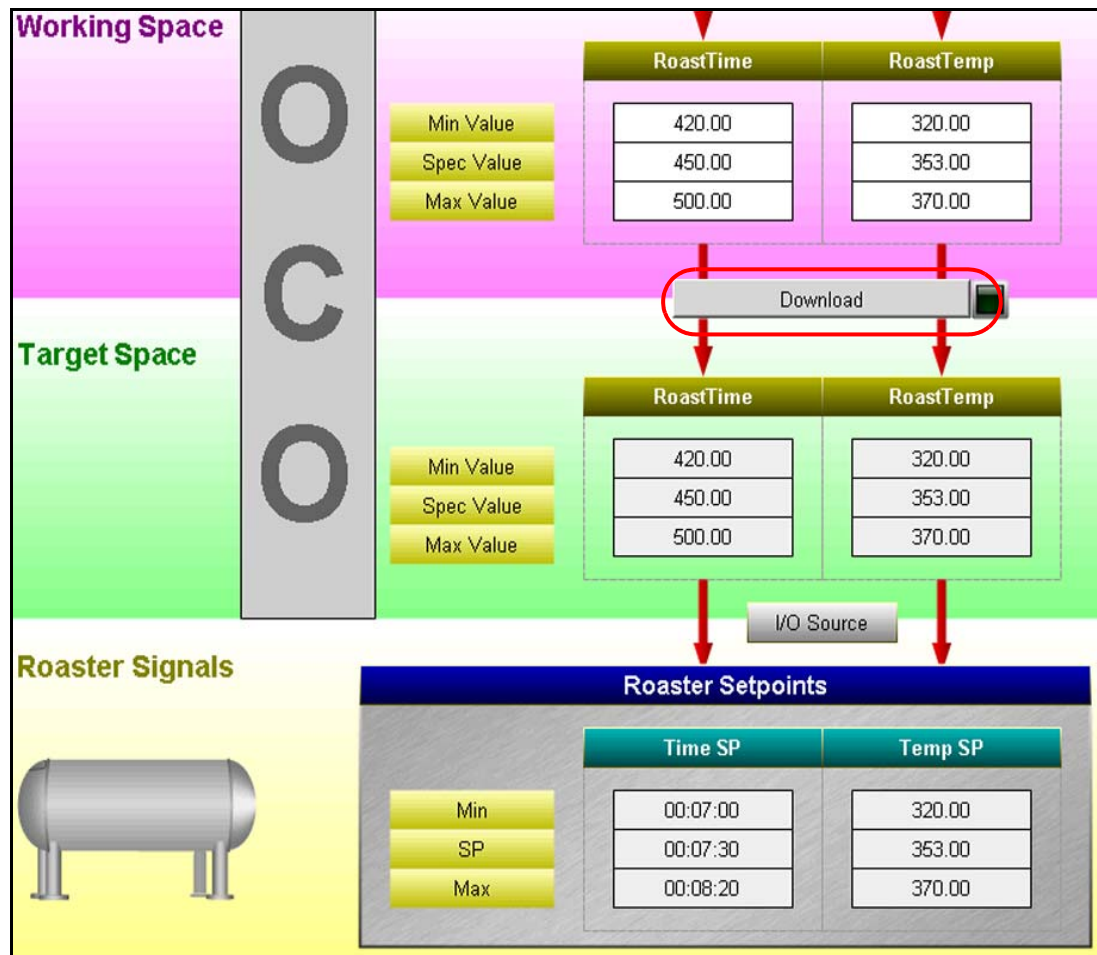
Working Space	RoastTime	RoastTemp
Min Value	420.00	320.00 (<i>default</i>)
Spec Value	450.00	353.00
Max Value	500.00 (<i>default</i>)	370.00 (<i>default</i>)

The screenshot shows the 'Working Space' interface. On the left is a vertical pane labeled 'Working Space' with a large 'O' and 'C' button. To the right of this pane are three yellow buttons: 'Min Value', 'Spec Value', and 'Max Value'. Further right is a table with two columns: 'RoastTime' and 'RoastTemp'. Red arrows point from the table headers to the corresponding columns in the table above. The table contains the following values:

RoastTime	RoastTemp
420.00	320.00
450.00	353.00
500.00	370.00

You will now use the **Download** command to download the running job specification to the plant floor.

45. Click **Download** to download the specifications into the target space.



This will also automatically send these values to the plant floor equipment based on the **I/O Source** configuration of the Operations Capability Object.

Note: The time setpoint is shown in terms of elapsed time.

This completes the process of setting up the time and temperature setpoints. Now, you will complete the step in the **Manual** window.

46. On the **Navigation Bar**, click **Manual**.
47. In the navigation area, click **Steps**.
48. Complete **Step No 2**.

49. Log on to **Step No 3**.

Step number 3 requires you to consume peanuts, cashews, and almonds. Therefore, you will consume the appropriate raw materials in the **Production** window. You will then start the roaster and ensure that the roasting procedure is completed.

50. On the **Navigation Bar**, click **Production**.

51. In the **BOM Component 1** panel, consume **22.50** pounds of peanuts.

52. In the **BOM Component 2** panel, consume **12.50** pounds of cashews.

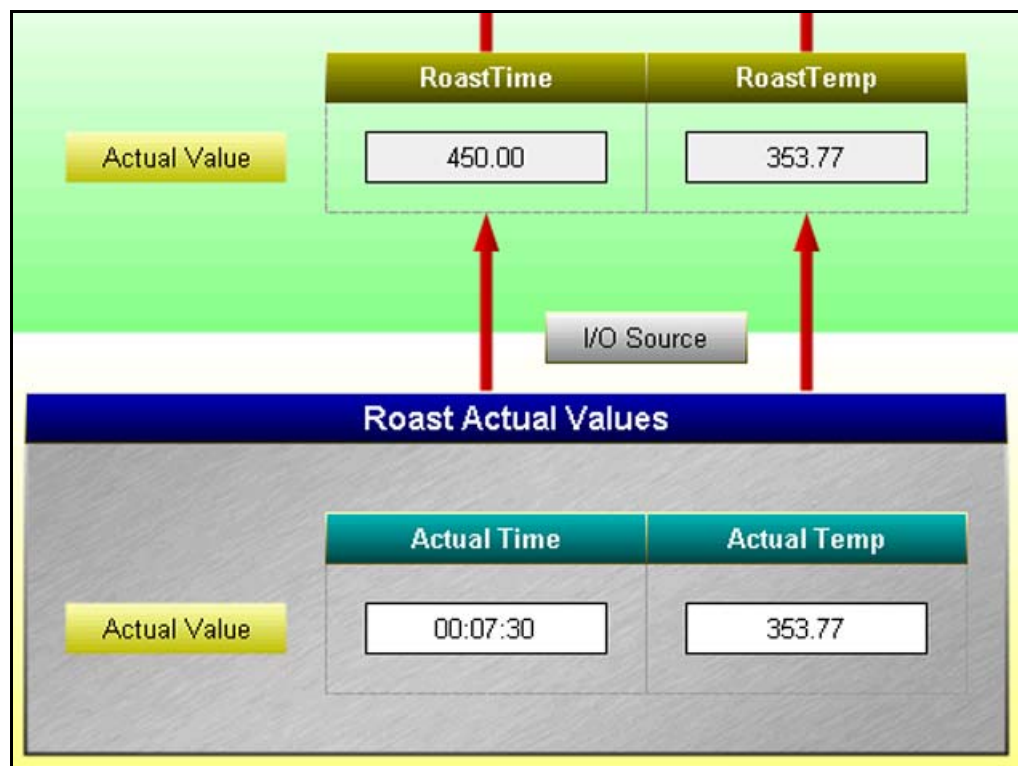
53. In the **BOM Component 3** panel, consume **12.50** pounds of almonds.

After the roasting procedure is finished, you will emulate data coming from the field to manually enter the actual readings for **Actual Time** and **Actual Temperature** in the **Specs** window and upload them in the MES database.

54. On the **Navigation Bar**, click **Specs**.

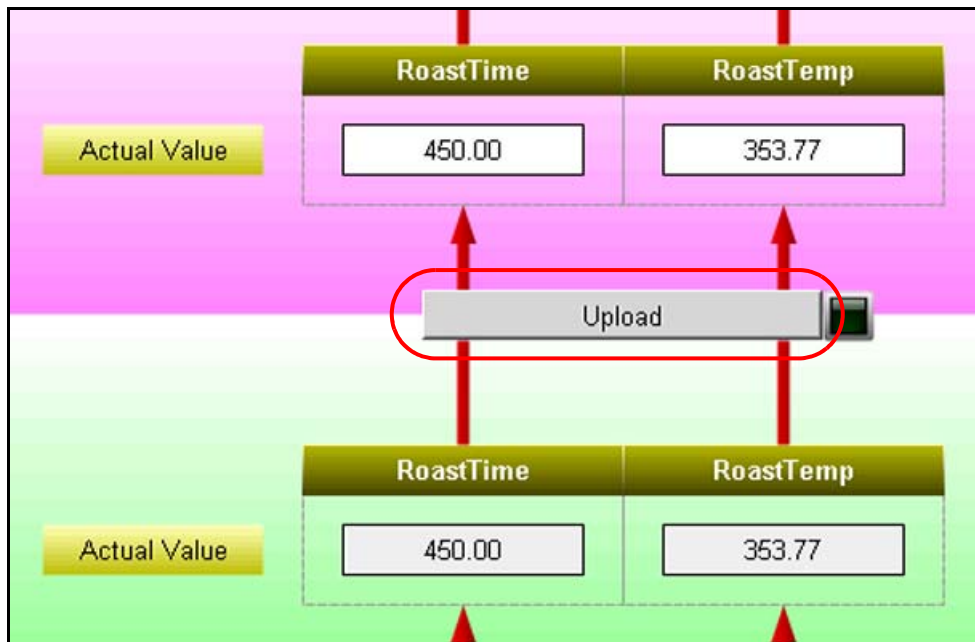
55. In the bottom-right of the **Specs** window, **Roast Actual Values** panel, specify the following:

	Actual Time	Actual Speed
Actual Value:	00:07:30	353.77



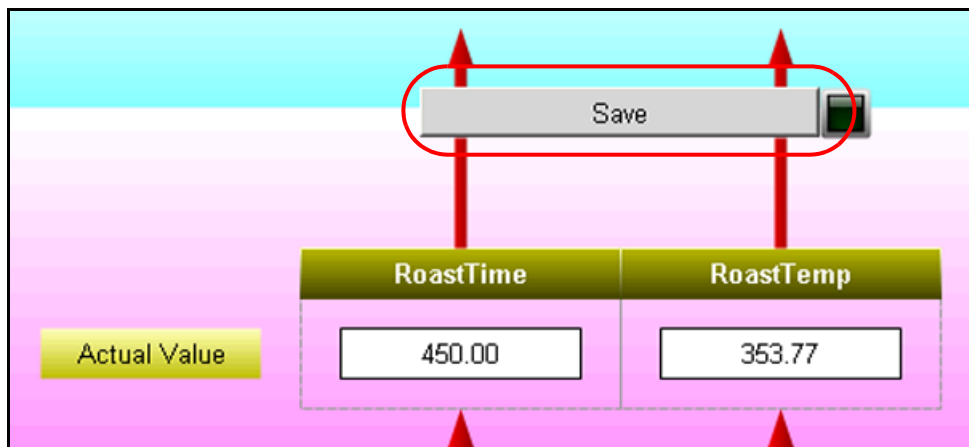
The **RoastTime** and **RoastTemp** values automatically get updated in the target space.

56. Click **Upload** to upload the information in the working space.



The working space allows you to enter data from the field, in case of lost connections or calibration errors.

57. Click **Save**.



Note: You can view the specification data in **DBViews** under **Specs Data**.

You will now complete the step in the **Manual** window.

58. On the **Navigation Bar**, click **Manual**.

59. In the navigation area, click **Steps**.

60. Complete **Step No 3**.

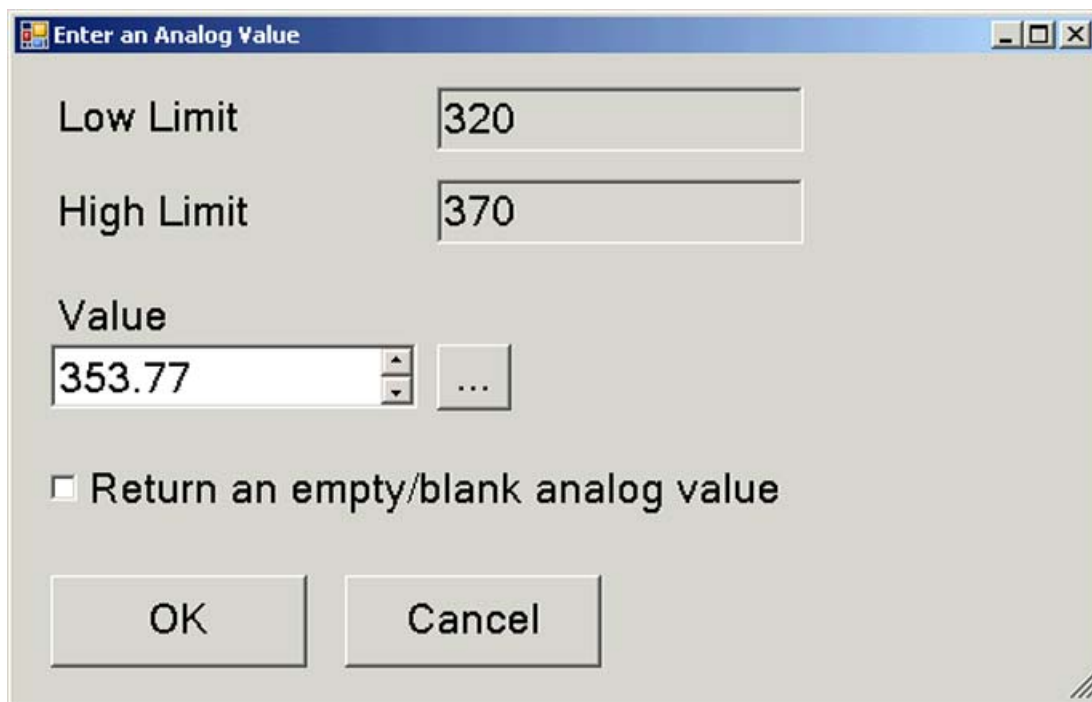
61. Log on to **Step No 4**.

Step number 4 requires you to register the temperature, report production, and transfer the roasted mixed nuts to the next operation.

62. Click **Enter Data**.

The **Enter an Analog Value** dialog box appears.

63. In the **Value** field, enter **353.77** to record the temperature.



64. Click **OK**.

Now, you will report production in the **Production** window for transferring the roasted mixed nuts to the next operation.

65. On the **Navigation Bar**, click **Production**.

66. In **Good Prod Counter**, report **47.50** pounds of production.

67. On the **Navigation Bar**, click **Manual**.

68. In the navigation area, click **Steps**.

69. Complete **Step No 4**.

You will now bypass the fifth step.

70. Log on to **Step No 5**.



71. Click the **Step Bypass** button.

All steps are now completed or bypassed.

72. In the **Production** window, end the roasting job.

73. Finish the remaining operations for **WO-110** as follows:

Operation	BOM 1	BOM 2	BOM 3	Production
200-COA	47.50	1	1.50	50
300-BAG	50	Set as Default		200

Section 3 – Spares and MES Attributes

This section discusses the use of Spare fields and the concept of custom MES Attributes and how to create and link them.

Overview

Spare fields and attributes are a way to assign additional information or properties to items, item classes, entities, lots, jobs, work orders, operations, and processes.









































Spares

Spare fields are used to create extra data columns in the MES database to store additional information. For example, for a particular item, the preferred vendor can be entered. They are string fields where the additional information can be manually entered. The fields are available in the **Properties** pane in many of the MES modules in the **Navigation Bar**.

The screenshot shows a 'Properties' window with the following fields:

- Category Name
- Category Description
- Category Spare1
- Category Spare2
- Category Spare3
- Category Spare4

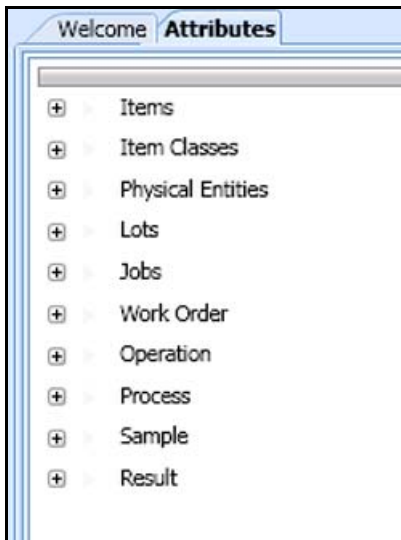
In Operations Capability objects, attributes can be assigned to the spare fields, so that any additional information from the field that you want to keep track of can be recorded in the MES database.

Attribute Name	Use Input Source	Value or Input Source
Segment Requirement	  	<input type="text"/>  
Segment Response	  	<input type="text"/>  
Operator	  	<input type="text"/>  
Comments	  	<input type="text"/>  
Spare 1	  	<input type="text"/>  
Spare 2	  	<input type="text"/>  
Spare 3	  	<input type="text"/>  
Spare 4	  	<input type="text"/>  

You can modify the spare field names in the **Languages** module by editing the language string.

Attributes

You use the **Attributes** module in the Wonderware MES Client to create and maintain the attributes that will be assigned to the each of these classifications below.



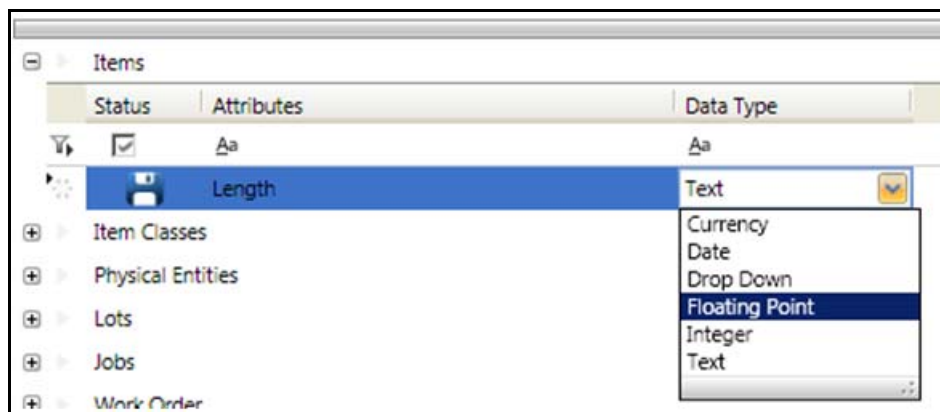
The definition of **Attributes** is available from each of the following modules in the **Navigation Bar**:

- **Master Data Configuration**
- **Product Definition**
- **Process Definition**
- **Order Management**
- **Quality Management**

Definition of Attribute

When configuring a new attribute, the following options are available in the **Properties** pane.

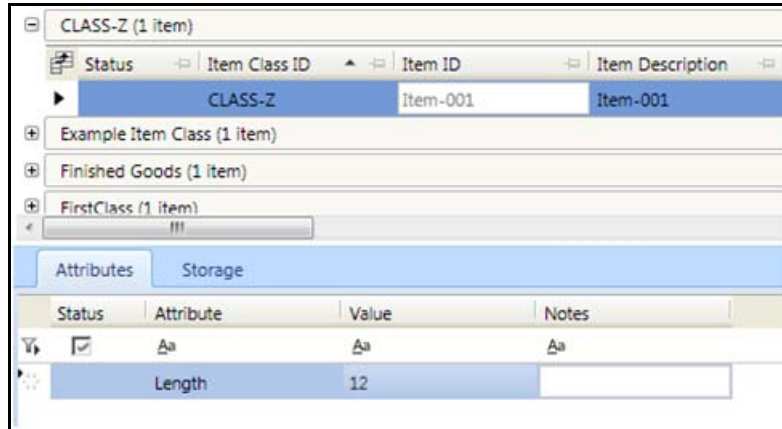
- **Attributes:** A name or description of the attribute. An attribute identifies the attribute in the data records, so an attribute must be unique within its group.
- **Data Type:** Indicates the type of data that is associated with this attribute.
 - **Currency:** A monetary value.
 - **Date:** A date and time value.
 - **Drop Down:** The value is selected from a drop-down list; the possible values are defined in the next field.
 - **Floating Point:** A decimal value.
 - **Integer:** A whole, numeric value.
 - **Text:** A user-defined string.



- **Entry Type:** Specifies whether the user defines a value for the attribute, notes about the attribute or both.
 - **Value only:** Contains the value assigned to the attribute for this item class. This field is not available if the attribute is defined as a **Notes Only** type
 - **Notes only:** Contains user-defined information about the attribute for this attribute. This field is no available if the attribute was defined as a **Value Only** type.
 - **Value/Notes:** Contains the value assigned to the attribute or the user-defined information about the attribute for this item class.
- **In Queue Grid:** When checked, allows the attribute to be shown as a column in the **Queue** module. Available only for items and jobs attributes.
- **In Inventory Grid:** When checked, allows the attribute to be shown as a column in the **Inventory** grid of the Supervisor module. Available only for items and lots attributes.

Linking Attributes

After creating an attribute, you can navigate to the items, item classes, entities, lots, jobs, work orders, operations, or processes you wish to link to the attribute and define values or notes about the attribute for that piece of data. The linked attributes are then available to display based on the definition of the attribute in the **Work Queue** or **Inventory** grids.



After creating an attribute, you can assign it in the following ways:

- Assigning Attributes to an Item
- Assigning Attributes to an Item Class
- Adding Attributes to an Operation
- Assigning Attributes to an Operation for a Process
- Assigning an Attribute to a Process
- Assigning Attributes to a Work Order
- Assigning Attributes to a Job for a Work Order
- Assigning Result Attributes to a Characteristic
- Assigning Sample Attributes to a QM Specification

The linked attributes are then available based on the definition of the attribute in the In Queue or In Inventory grids.

Lab 18 – Using Spares and MES Attributes

Introduction

In this lab, you will access the additional information available in MES by adding custom attributes to the MES Client and one of the Operations Capability objects.

Factory executives have been upset lately about the amount of bad production. Therefore, you will add the supervisor's name to the data, when bad items are produced. A **Spare** field associated with the bad production counter will record this information.

For the mixed nut factory, you will modify the process configuration by adding an author field to it. To do this, you will then add custom MES attributes to the mixed nut factory and assign them to the processes in the MES database. Then, you will create a work order and assign attributes to it in runtime.

In addition, you will track the jobs after the Clean Spray Heads task during the roasting operation. This is important because the spray heads need cleaning after every five job cycles.

Objectives

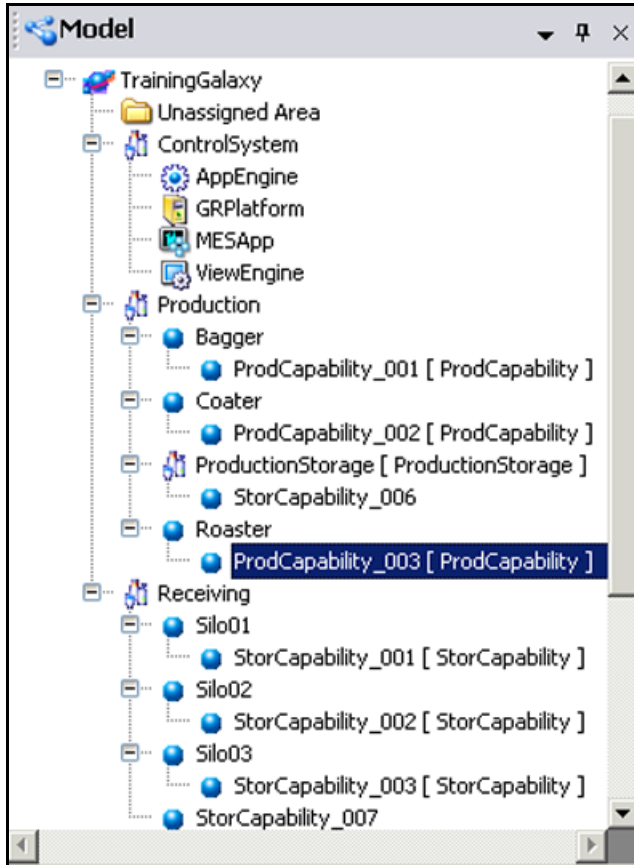
Upon completion of this lab, you will be able to:

- Enable and utilize the Spare fields using the Operations Capability Object
- Create and define attributes in Wonderware MES Client
- Assign attributes to processes
- Assign attributes to jobs

Enable and Configure the Spare Field

First, you will enable a spare field as an extension attribute in production counter of the roaster. This allows the operator to choose which supervisor is currently on duty.



1. In the ArchestrA IDE, **Model** view, **Production** area, double-click **Roaster.ProdCapability**.



2. On the **Production Counters** tab, in the **Inherited Production Counters** list, click **Bad Production**.

ProdCapability_003

General | Job Defaults | Job Execution | **Production Counters** | Consumption Counters | Storage

  **Production Counter Name :** BadProduction


Production Counters:

Name

Job Position

Job Position

General Counter Attributes

Counter Attributes 

Attribute Name

BOM Position

Item

Production Reason

To Location

To Lot

To Sublot

Inherited Production Counters:

Name
GoodProduction [\$ProductionUnit.Pr...
BadProduction [\$ProductionUnit.Pro...

Event Data

Event DateTime:

☐ Use Input Source

A User Defined Attribute has already been created in the area objects to record the **Sup** variable.

3. Scroll to the bottom of the configuration editor, and then in the **Counter Extension Attributes** group, check **Extension Attributes**.
4. Configure the **Spare 1** attribute as follows:

Use Input Source: *checked*

Value or Input Source: *MyArea.AreaSup*

The screenshot shows the 'Counter Extension Attributes' configuration window. At the top, the 'Extension Attributes' checkbox is checked. Below this is a table with the following columns: 'Attribute Name', 'Use Input Source', and 'Value or Input Source'. The table contains several rows, including 'Spare 1', 'Spare 2', 'Spare 3', and 'Spare 4'. The 'Spare 1' row is highlighted with a red circle, and its 'Use Input Source' checkbox is checked, and its 'Value or Input Source' field contains the text 'MyArea.AreaSup'.

Attribute Name	Use Input Source	Value or Input Source
Segment Requirement	<input type="checkbox"/>	
Segment Response	<input type="checkbox"/>	
Operator	<input type="checkbox"/>	
Comments	<input type="checkbox"/>	
Spare 1	<input checked="" type="checkbox"/>	MyArea.AreaSup
Spare 2	<input type="checkbox"/>	
Spare 3	<input type="checkbox"/>	
Spare 4	<input type="checkbox"/>	

5. Save and close, check in, and redeploy the modified object.

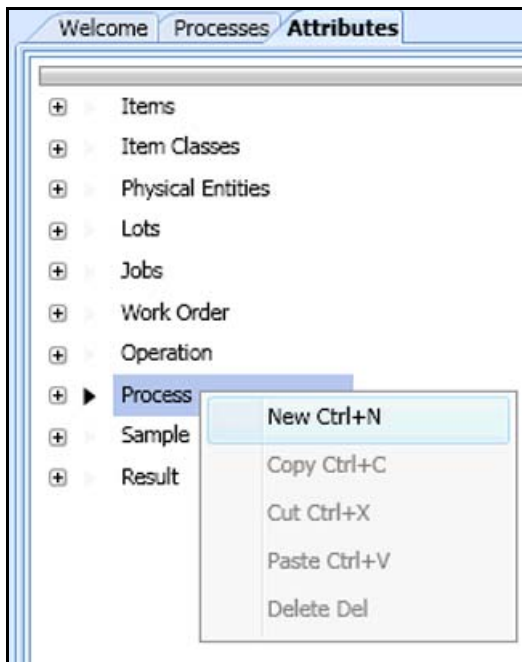
Create and Define Attributes

You will now create and define the MES attributes in Wonderware MES Client.

6. In the Wonderware MES Client, **Master Data Config** group, click the **Attributes** module.

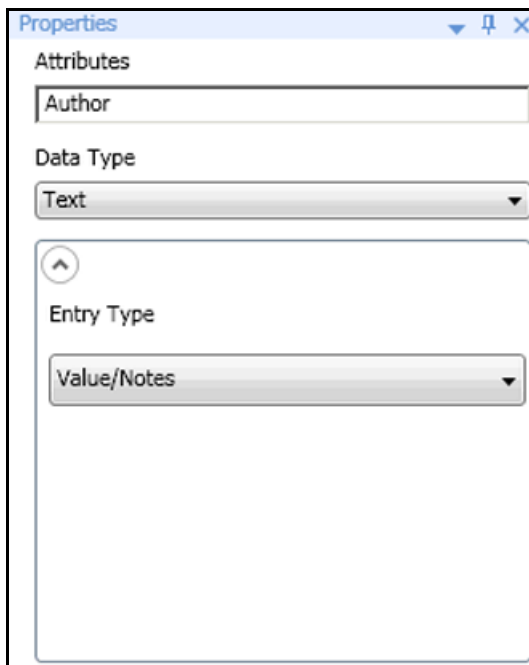


7. On the **Attributes** tab, right-click **Process** and select **New**.

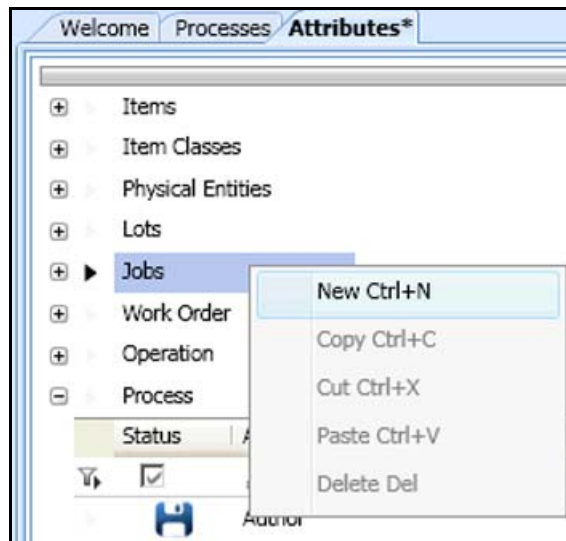


8. In the **Properties** pane, configure the new process attribute as follows:

Attributes: Author
Data Type: Text (*default*)
Entry Type: Value/Notes

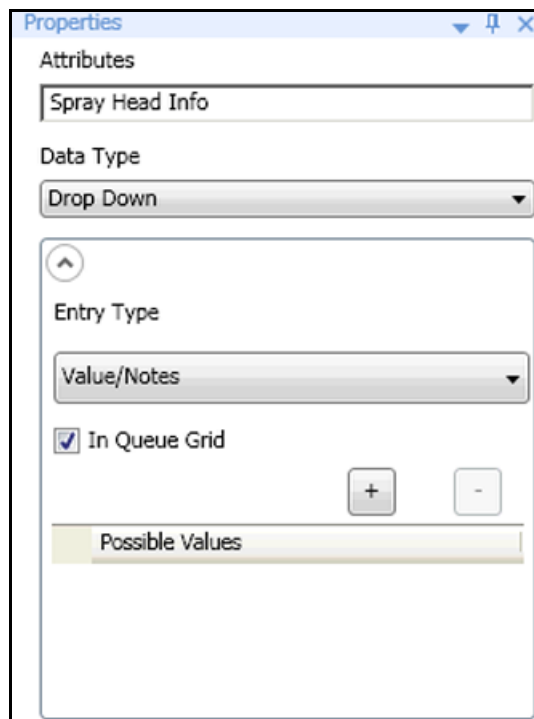


9. On the **Attributes** tab, right-click **Jobs** and select **New**.



10. In the **Properties** pane, configure the new job attribute as follows:

Attributes:	Spray Head Info
Data Type:	Drop Down
Entry Type:	Value/Notes
In Queue Grid:	<i>checked</i>



11. Click the plus button, and then configure one of the **Possible Values** as **Clean Spray Heads**.

The screenshot shows the 'Properties' dialog box with the 'Attributes' tab selected. The 'Attributes' field contains 'Spray Head Info'. The 'Data Type' is set to 'Drop Down'. The 'Entry Type' is set to 'Value/Notes'. The 'In Queue Grid' checkbox is checked. A red oval highlights the 'Possible Values' list, which contains the entry 'Clean Spray Heads'. A '+' button is visible next to the list.

12. Save all changes and close the **Attributes** tab.

Assign Process Attributes

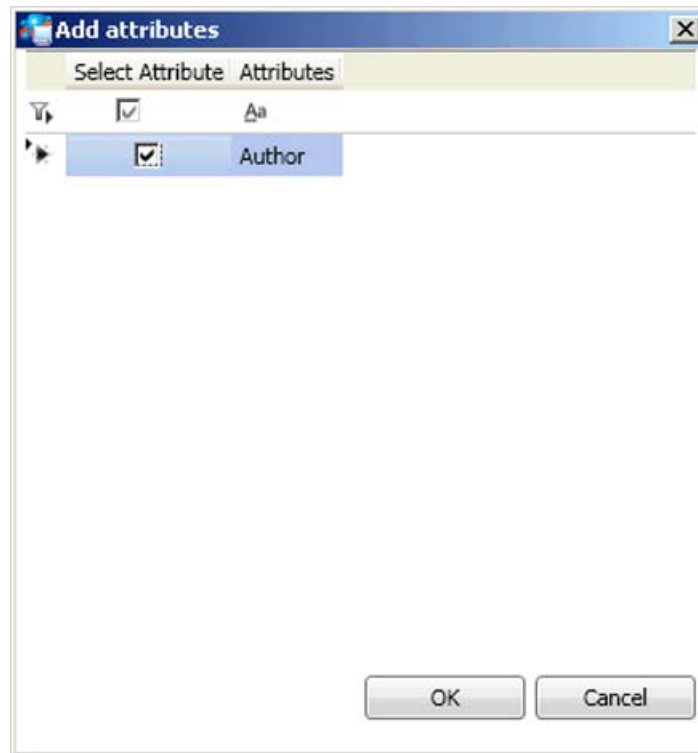
Now, you will add attributes to the elements that you want to customize. For the purpose of this lab, you will customize the flavored mixed nuts process and jobs that come after the Clean Spray Heads operation.

13. On the **Processes** tab, check out the **BAG-MXN-1** process.
14. In the bottom of the tabbed workspace, on the **Attributes** tab, right-click the empty workspace and select **Add**.

The screenshot shows the 'Attributes' tab in the workspace. The 'Status' and 'Attribute' columns are visible. The 'Add' button is highlighted in a light blue box.

This displays the **Add attributes** dialog box, which lists the attributes that can be added to this process.

15. Check the **Author** check box.



16. Click **OK**.

17. In the **Properties** pane, configure the **Author** attribute as follows:

Value: J. Smith

Notes: MES Coordinator (Last updated on Jan 2013)



The screenshot shows a 'Properties' window with three sections: 'Attribute', 'Value', and 'Notes'. The 'Attribute' section has a text box containing 'Author'. The 'Value' section has a text box containing 'J. Smith'. The 'Notes' section has a text box containing 'MES Coordinator (Last updated on Jan 2013)'.

18. Check out the **BOX-MXN-1** process.
19. Add the **Author** attribute to this process and configure it as follows:

Value: C. Johnson

Notes: Automation Engineer (Last updated on May 2013)



The screenshot shows a 'Properties' dialog box with three sections: 'Attribute', 'Value', and 'Notes'. The 'Attribute' section contains a text box with the word 'Author'. The 'Value' section contains a text box with 'C. Johnson'. The 'Notes' section contains a text box with the text 'Automation Engineer (Last updated on May 2013)'.

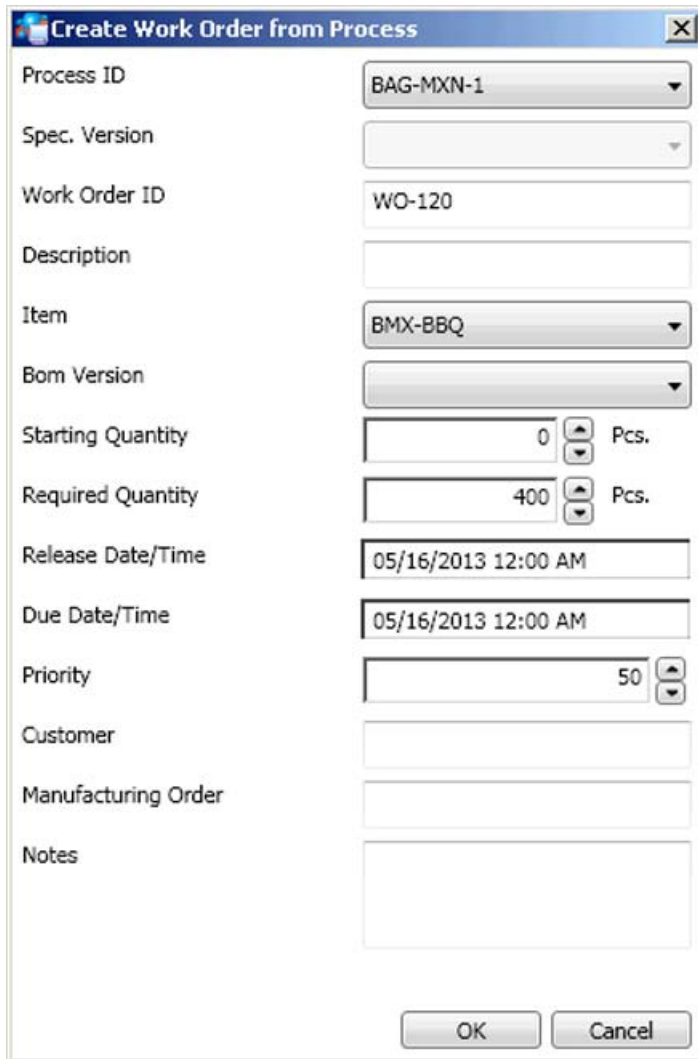
20. Save all changes.
21. Verify and check in the **BAG-MXN-1** process.
22. Verify and check in the **BOX-MXN-1** process.

Assign Job Attributes

Now, you will add and modify job attributes.

23. Create a work order from **BAG-MXN-1** and configure it as follows:

Work Order ID: WO-120
Description: <enter a description>
Item: BMX-BBQ
Required Quantity: 400



The screenshot shows a software dialog box titled "Create Work Order from Process". It contains several input fields and dropdown menus for configuring a work order. The fields are as follows:

Field	Value
Process ID	BAG-MXN-1
Spec. Version	
Work Order ID	WO-120
Description	
Item	BMX-BBQ
Bom Version	
Starting Quantity	0 Pcs.
Required Quantity	400 Pcs.
Release Date/Time	05/16/2013 12:00 AM
Due Date/Time	05/16/2013 12:00 AM
Priority	50
Customer	
Manufacturing Order	
Notes	

At the bottom of the dialog box are two buttons: "OK" and "Cancel".

You will now assign attributes to these jobs in runtime.

24. On the WindowViewer **Navigation Bar**, click **Manual**.

25. In the **Job Summary** panel, ensure you are in the **Roaster** entity.

For the purpose of this lab, assume that the running of the roasting job started right after the Clean Spray Heads operation. You will now assign the **Spray Head Info** attribute to this job.

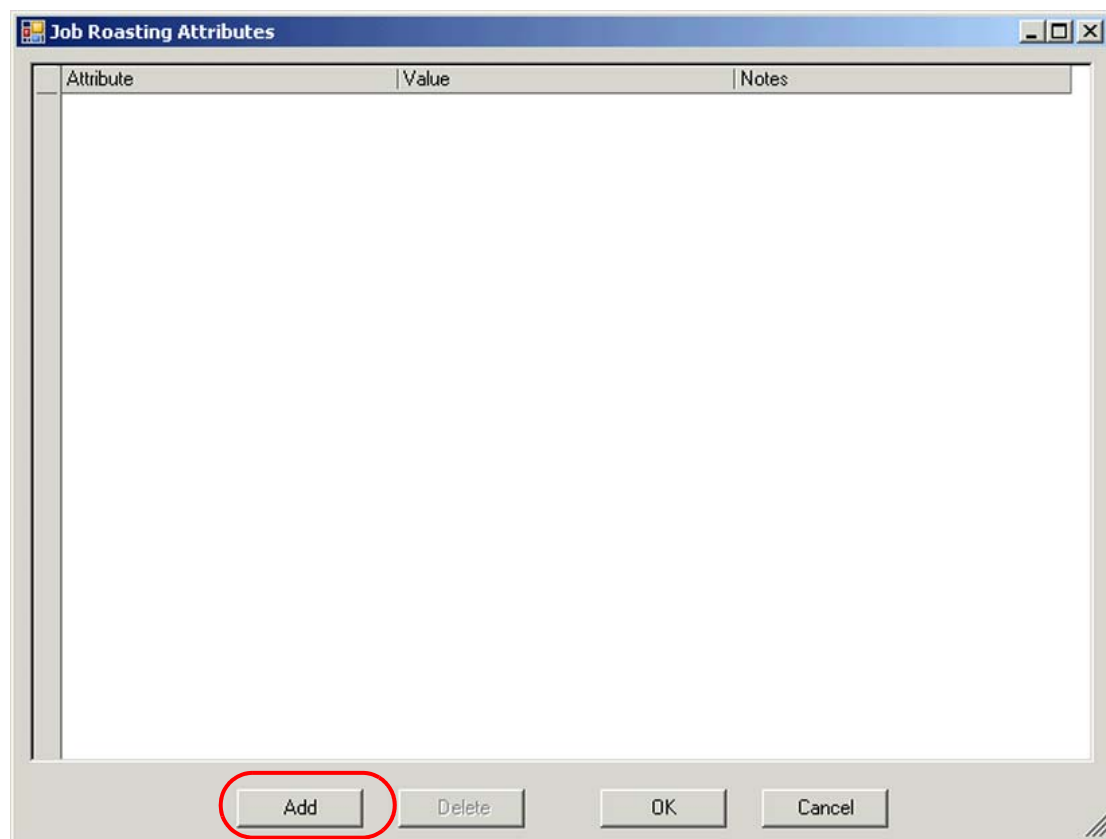
26. In the **Work Queue** grid, ensure the roasting job for **WO-120** is selected, and then click the



View Attributes button

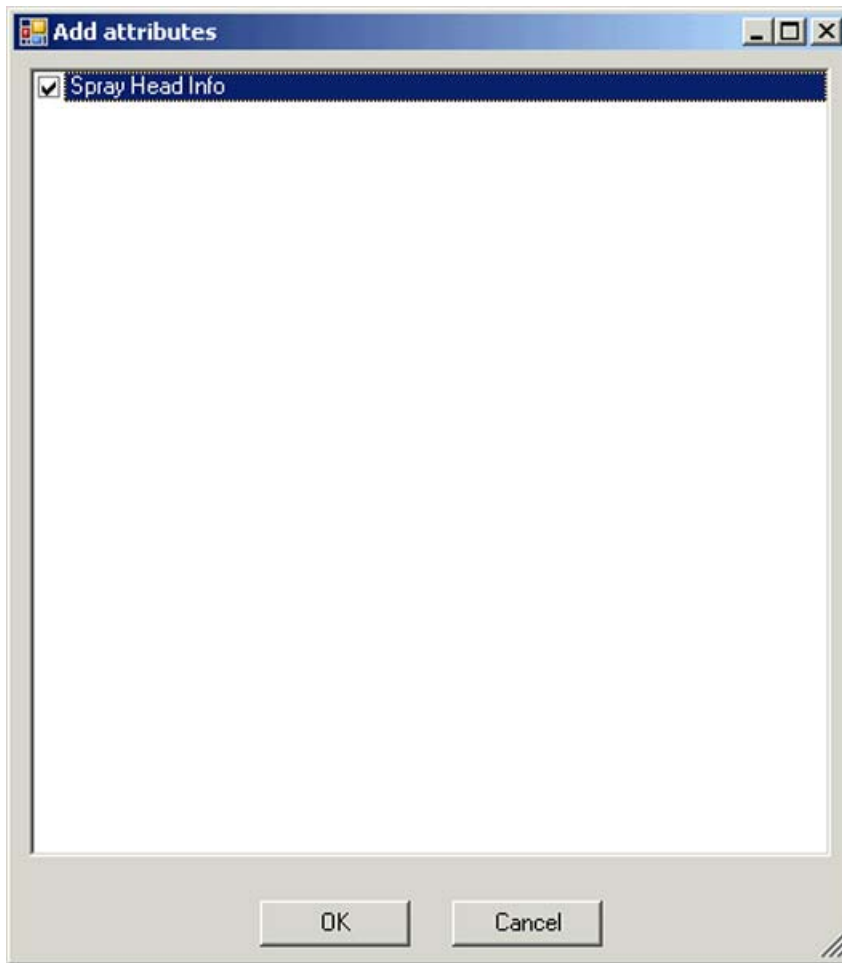
The **Job Roasting Attributes** dialog box appears.

27. Click **Add**.



The **Add attributes** dialog box appears.

28. Check the **Spray Head Info** check box.



29. Click **OK**.

30. In the **Job Roasting Attributes** dialog box, **Value** drop-down list, click **Clean Spray Heads**.

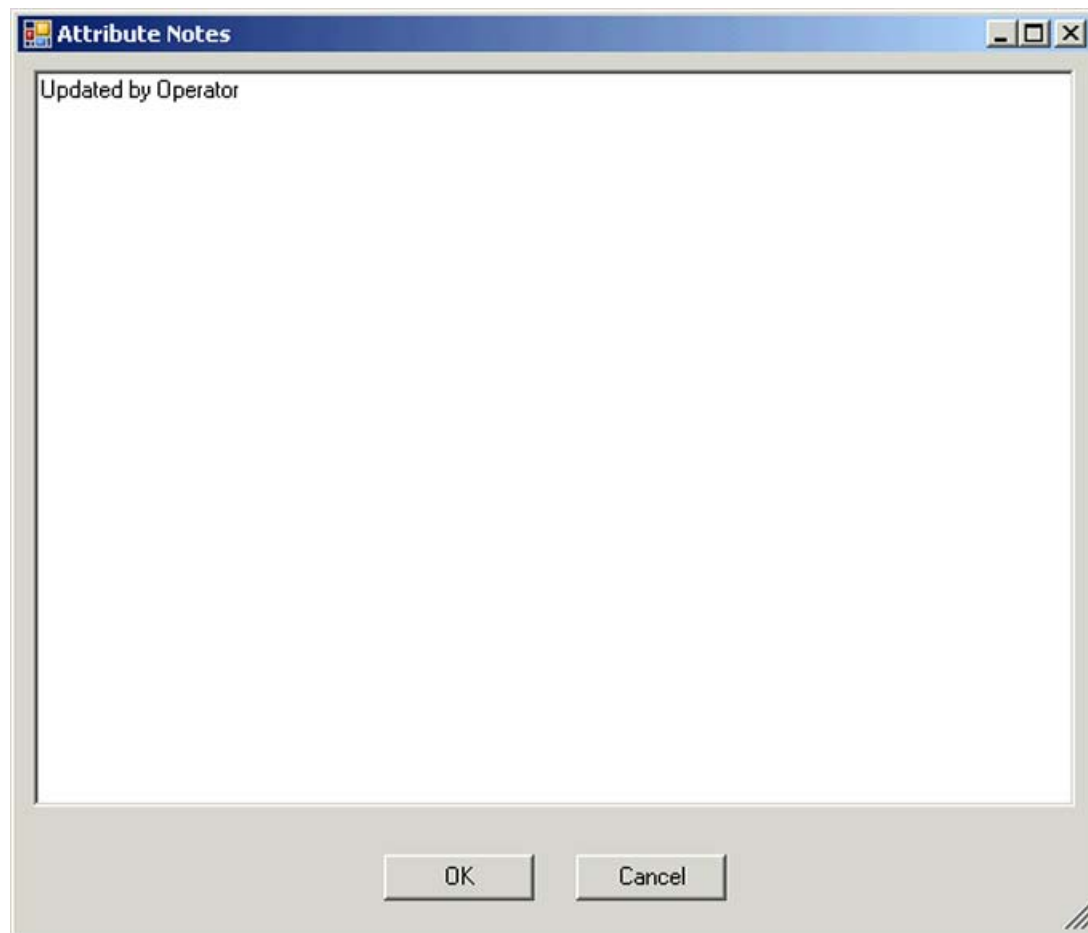


31. In the **Notes** column, click the ellipsis button.



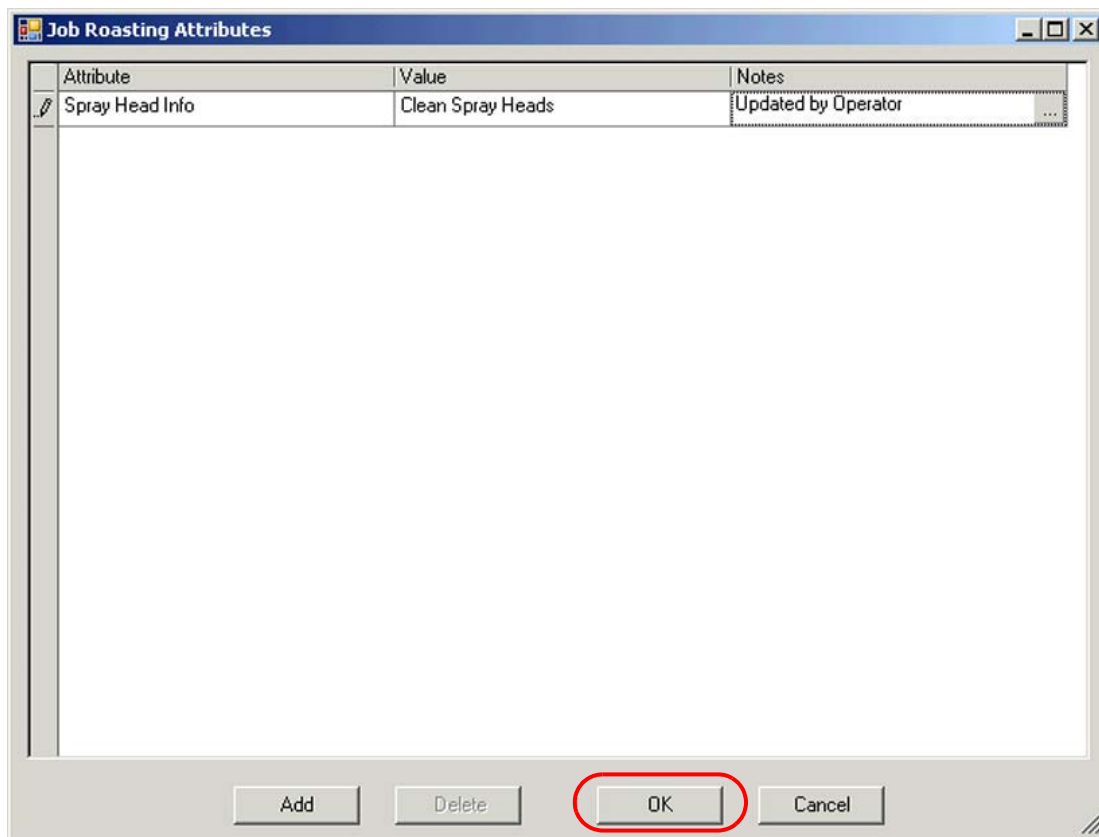
The **Attribute Notes** dialog box appears.

32. Enter **Updated by Operator**.



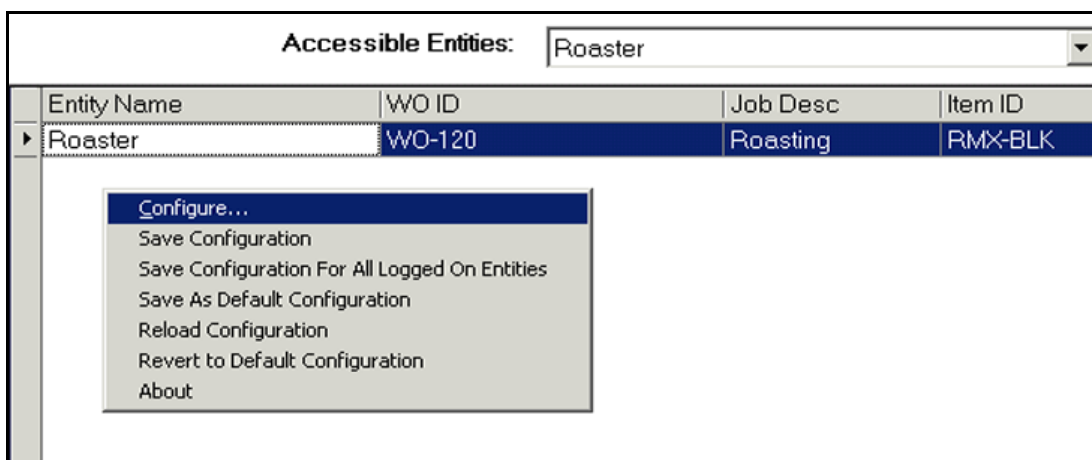
33. Click **OK**.

34. In the **Job Roasting Attributes** dialog box, click **OK**.



Now, you will make the **Spray Head Info** attribute visible in the grid.

35. In the **Work Queue** grid, right-click the empty area and select **Configure**.



This displays the **Column Configuration for Grid** dialog box. Here, you will find the column that corresponds to the **Spray Head Info** attribute.

36. Scroll to the bottom of the list and locate the row with **Spray Head Info** in the **Column Heading**.
37. In the **Visible** column, check the check box.

Column Configuration for Grid

☐ Include Title row Factelligence Grid

☐ Include Group By row

☒ Include Filter row

Column Name	Column Heading	Visible	Filterable	Back Color
ent_name	Entity Name<750>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
run_ent_name	Run Entity Name<2045>	<input type="checkbox"/>	<input type="checkbox"/>	
item_spare1	Item spare 1<521>	<input type="checkbox"/>	<input type="checkbox"/>	
item_spare2	Item spare 2<522>	<input type="checkbox"/>	<input type="checkbox"/>	
item_spare3	Item spare 3<523>	<input type="checkbox"/>	<input type="checkbox"/>	
item_spare4	Item spare 4<524>	<input type="checkbox"/>	<input type="checkbox"/>	
lifetime	Lifetime<999>	<input type="checkbox"/>	<input type="checkbox"/>	
description	Description<88>	<input type="checkbox"/>	<input type="checkbox"/>	
abbreviation	Abbreviation<4408>	<input type="checkbox"/>	<input type="checkbox"/>	
def_lot_no	Default Lot<629>	<input type="checkbox"/>	<input type="checkbox"/>	
process_id	Process Id<715>	<input type="checkbox"/>	<input type="checkbox"/>	
attr0	Spray Head Info	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

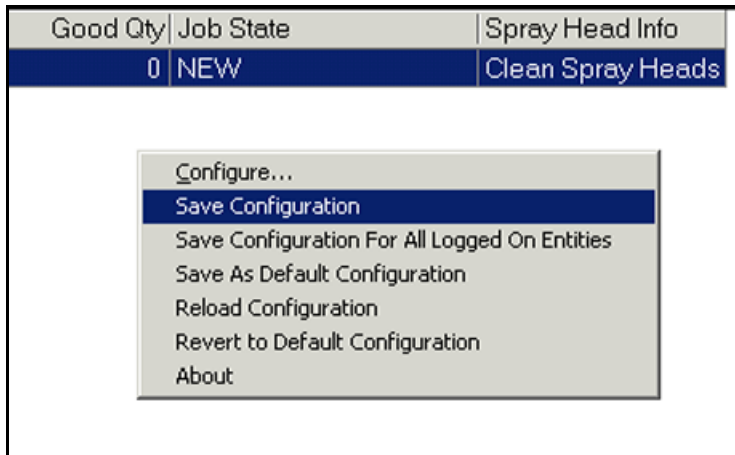
OK Cancel

38. Click **OK**.
39. In the **Work Queue** grid, scroll right.
- The **Spray Head Info** attribute is now visible in the grid.

Reqd Qty	Good Qty	Job State	Spray Head Info
95	0	NEW	Clean Spray Heads

You will now save this configuration to ensure that the **Spray Head Info** attribute column is always visible in the **Roaster** entity grid.

40. In the **Work Queue** grid, right-click the empty area and select **Save Configuration**.

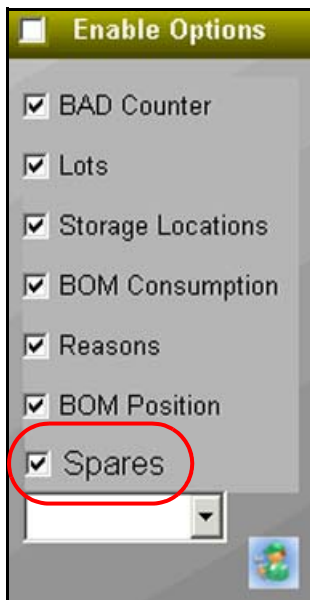


Track the Jobs in Runtime

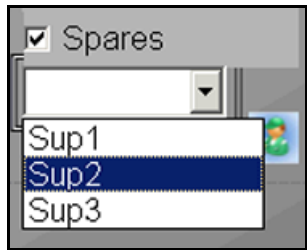
You will now identify the supervisor on duty and report bad production. Finally, you will finish all operations associated with the work order.

41. In the WindowViewer **Production** window, **Enable Options** panel, check **Spares**.

The **Spares** drop-down list appears.



42. In the drop-down list, click **Sup2**.



43. Set the jobs for **WO-120**, generate the lots, and start the roasting job.
44. In the **BAD Prod Counter** panel, **Prod. Reason** field, enter **8** to report contaminated production.
45. In the **Quantity** field, report **3.00** pounds of bad production.

Now, you will view that bad production also displays which Supervisor was on duty at that time.

46. On the **Navigation Bar**, click **DB Views** and organize the production data by **wo_id** and **oper_id**.
47. Expand **WO-120** and **100-RST**, and then scroll right to view the **spare1** column.

reas_desc	item_grade_desc	item_status_desc	byproduct	job_start_act_local	job_finish_act_local	spare1
Contaminated...	Scraps	Production Scraps	<input type="checkbox"/>	06/06/2013 01:00 PM		Sup2

48. In the **Production** and **Manual** windows, run the operations, including Steps, for **WO-120** as follows:

Operation	BOM 1	BOM 2	BOM 3	Production
100-RST	45	25	25	95
200-COA	95	2	3	100
300-BAG	100	Set as Default		400



inventorys
Learning Services



Module 7 – Inventory Management

Section 1 – Inventory	7-3
Lab 19 – Managing Inventory Lots	7-7
Lab 20 – Tracking Job Inventory Updates	7-25

Module Objectives

- Discuss the inventory management features of Wonderware MES Software/Operations and the Operations Capability Object attributes in runtime

Section 1 – Inventory

This section discusses the inventory management features of Wonderware MES Software/Operations and the Operations Capability Object attributes in runtime.

Overview

The Inventory grid displays the current item inventory in the Wonderware MES system. Items can be stored in storage entities and in specified lots. The Wonderware MES inventory system will allow you to track an item's remaining quantity, grade, status, and expiration date. The current work order may be associated with produced items, to allow tracking of WIP (work in progress) items. Internal movements may be tracked, as well as recording shipments in and out of your system.

Inventory Capabilities of the Operations Capability Object

In the Operations Capability Object, you can use the **Inventory Transfer** tab to receive a new inventory item quantity or transfer an inventory item quantity from a source storage entity to a destination storage entity. The source storage entity is the entity from where you want to move inventory items and the destination storage entity is the entity to which you want to move inventory items.

Attributes that begin with the word **To** and **Transfer** are used when specifying a new inventory item received. All the attributes are used to transfer inventory items.

To view the **Inventory Transfer** tab in the object editor, select the **Entity Can Store Items** check box in the **General** tab.

You can reclassify an inventory item to a new grade, state, or expiry date by triggering the Move Inventory command. To reclassify the grade, state, or expiry for an existing inventory item, values of the following attributes must be same:

- To Location and From Location
- To Item and From Item
- To Lot and From Lot
- To Sublot and From Sublot

If an inventory is maintained according to a job, the following additional attributes must also be the same:

- To Work Order and From Work Order
- To Operation and From Operation
- To Sequence Number and From Sequence Number

You must specify the source information such as location, item name and quantity, lot and sublot numbers, and sequence number to move an inventory item.

Managing Inventory in Runtime

You can manage your inventory in runtime, by using the **Inventory Transfer Attributes** available in the Operations Capability Object. The **Inventory Transfer** attributes that are available at runtime are described in the following table. You must select the **Entity Can Store Items** check box on the **General** tab to view the following attributes in the .

Attribute name	Description	Configuration
StorageExec.ToLocation	Specifies the entity where the inventory will be transferred.	Yes
StorageExec.ToItem	Specifies the item that is stored at the destination location.	Yes
StorageExec.ToLot	Specifies the lot where the item is being stored.	Yes
StorageExec.ToSublot	Specifies the subplot where the item is being stored.	Yes
StorageExec.ToGrade	Specifies the grade of the item being stored.	Yes
StorageExec.ToState	Specifies the state of the item being stored.	Yes
StorageExec.ToUOM	Specifies the Unit of Measure for the item being stored.	Yes
StorageExec.ToExpiryDate	Specifies the expiry date for the item being stored.	Yes
StorageExec.ToWorkOrder	Specifies the work order of a destination.	Yes
StorageExec.ToOperation	Specifies the operation of a destination.	Yes
StorageExec.ToSequenceNumber	Specifies the job sequence of a destination.	Yes
StorageExec.TransferQuantity	Specifies the quantity to be transferred.	Yes
StorageExec.TransferOption	Specifies the options to transfer an inventory item.	Yes
StorageExec.FromLocation	Specifies the entity where the item is being transferred from.	Yes
StorageExec.FromItem	Specifies the item that is being removed from the source location.	Yes
StorageExec.FromLot	Specifies the lot from where the item is being removed.	Yes
StorageExec.FromSublot	Specifies the Sublot from where the item is being removed.	Yes
StorageExec.FromWorkOrder	Specifies the work order of a source.	Yes
StorageExec.FromOperation	Specifies the operation of a source.	Yes
StorageExec.FromSequenceNumber	Specifies the job sequence of a source.	Yes
StorageExec.MoveInventoryCmd	Specifies the command to move an inventory item from a source location to a destination location.	No
StorageExec.ReceiveCmd	Specifies the command to receive an inventory item to a destination location.	No
StorageExec.ResetCmd	Resets the commands and errors that occur while executing the commands.	No

Managing Inventory in Wonderware MES Operator

The **Inventory Tab** in Wonderware MES Operator displays the current inventory status of the selected entity. This tab allows the user to transfer in, transfer out and reclassify inventory in the selected location only. It also provides filtering and the ability to view and modify lot attributes for the selected row in the tab. Each of the buttons on this tab will be described at greater length.

Transfer Item Button – Transfer Item In button launches the inventory transfer screen that pulls inventory from another entity to the currently selected entity.

Transfer Item Out Button – Transfer Item Out button launches the inventory transfer screen that sends inventory to another entity from the currently selected entity.

Scrap Button – The **Scrap** button allows for all or partial items to be taken out of inventory.

Reclassify Button – Reclassify button launches the **Reclassify Item Window**. This window allows the user to change the grade and status of the lot selected in the inventory tab.

Hide/Show Numeric Keypad – The **Hide/Show Numeric Keypad** button toggles the view of the numeric keypad display.

Lot Attributes Button – Lot Attributes button launches the lot attributes window which allows the user to add, remove and change the values of the lot attributes of the lot selected in the inventory tab.

Filter Button – Filter button launches the filter window allowing the user to enter filter parameters to limit the view of the inventory tab. Selecting the check box next to a grade or status will add that to the filter and remove all uncheck odes. The text boxes for item id and lot number are filled in with whole or partial items or lots to be added to the filter. A wild card character of “%” can be used at any point in either field.

Switch User Button – The **Switch User** button changes the active user in Operator. Usually, computers on the shop floor are shared by multiple users. The **Switch User** serves two purposes. The first is to login or to make a user active. A user that has already logged into Operator and is not currently the active user selects the **Switch User** that brings up the **Switch User** screen. The user would then highlight their user name, enter their password, and then select the **Login** button. The second purpose that the **Switch User** button is used for is to lock a user’s session. If multiple users are utilizing one PC, a user can select the **Switch User** button that will then display the **Switch User** screen. By doing this no other users can alter another users information in Operator.

Refresh Button –The **Refresh** button updates **Inventory Grid**.

Help Button – The **Help** button opens the **Help** window.

Launch External Program Button – The **Launch External Program** button runs a predefined external file. The button can be set to pass arguments. Setting the parameters for this button is done in the “configure button” window for each tab.

Launch Internet Browser Button – The **Launch Internet Browser** button launches a defined browser and a predefined page. The parameters are configured in the **Configure Buttons** tab of the **Inventory** screen.

Open Forms Button – The **Open Forms** button opens a form that has been predefined. The forms that are available are configured in the **Forms** window of Supervisor are selected by setting the default parameter for the drop down menu in the **Configure** buttons screen of the **Inventory** tab.

Enabling Updates in the BOM

You can automatically update inventory items by using the BOM version features within the Wonderware MES Client.

A Bill of Material (BOM) contains the basic information and production details for the selected BOM version. A BOM item represents any component or by-product of the production of parent item. These components and by-products must be defined as an item and assigned to an item to be a part of the BOM.

A BOM version specifies the components that are consumed to produce the parent item, any by-products of that production, and default values for several production settings. BOM item adds production-specific details for usage of the item in the current BOM version.

An item can contain multiple BOM versions, but you can define only one version as the preferred version. The preferred BOM version is used automatically whenever a process is defined to produce the parent item.

Lab 19 – Managing Inventory Lots

Introduction

In this lab, you will manage inventory lots in runtime. You will configure the inventory options for the storage locations that were defined in a previous lab. Then, you will use the Operations Capability Object to manage inventory transfers, such as receiving lots, transferring lots, and reclassifying lots in runtime.

Objectives

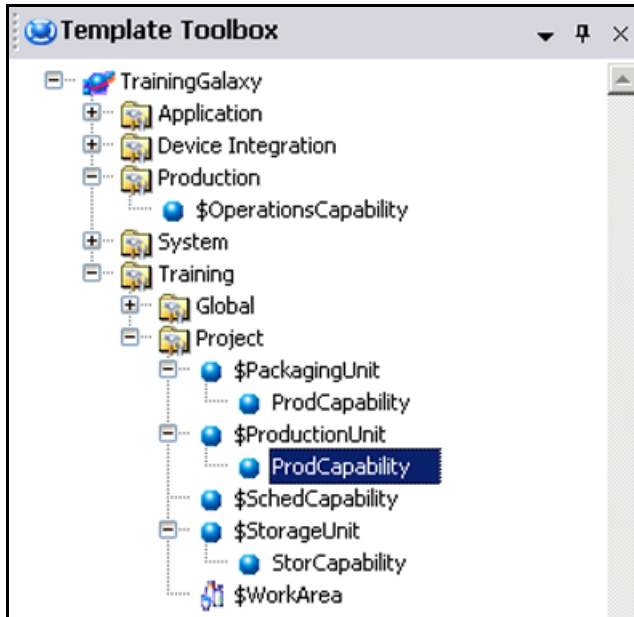
Upon completion of this lab, you will be able to:

- Configure storage options in the Operations Capability Object
- Manage inventory lots

Configure Inventory Lots

Although the **\$ProductionUnit.ProdCapability** and **\$StorageUnit.StorCapability** templates are already configured with the **Entity Can Store Items** attribute, you will use the **Storage Execution** tab to further define storage location inventory options.

1. In the ArchestrA IDE, **Template Toolbox**, double-click **\$ProductionUnit.ProdCapability**.



2. On the **Storage Execution** tab, check the **Auto Delete Zero Inventory** and the **Allow Multiple Lots** check boxes, and then lock them.

The screenshot shows the configuration window for **\$ProductionUnit.ProdCapability ***. The **Storage Execution** tab is selected. The following options are visible:

- ☒ **Auto Delete Zero Inventory** (locked)
- ☐ **Allow Negative Quantity** (locked)
- ☐ **Allow Multiple Items** (locked)
- ☒ **Allow Multiple Lots** (locked)
- ☐ **Allow Dirty State** (locked)
- ☐ **Indistinguishable Lots** (locked)
- ☐ **Movable** (locked)

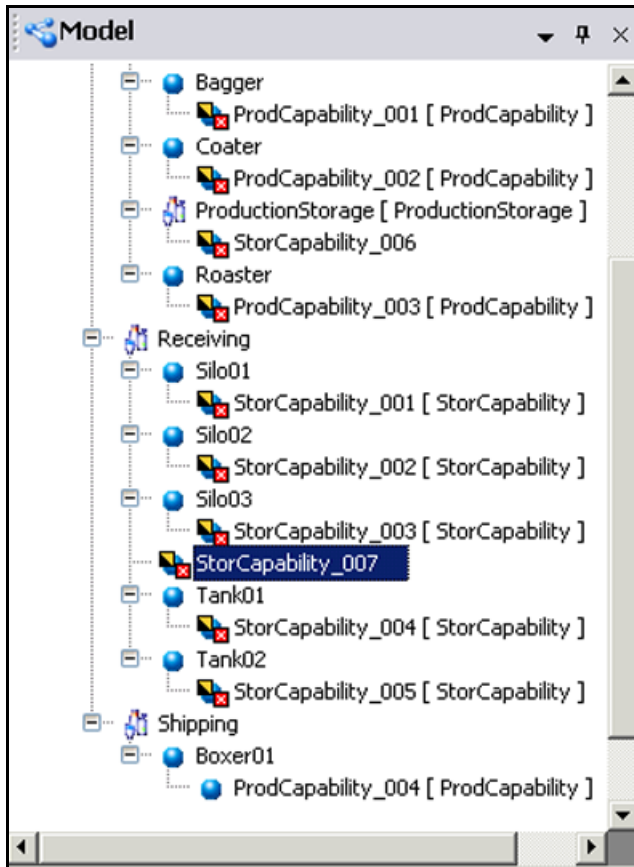
Below the checkboxes, there are three fields:

- Location:** [Empty text box] (locked)
- Maximum Capacity:** [0.0] (locked)
- Initial Entity Status:** [Available] (locked)

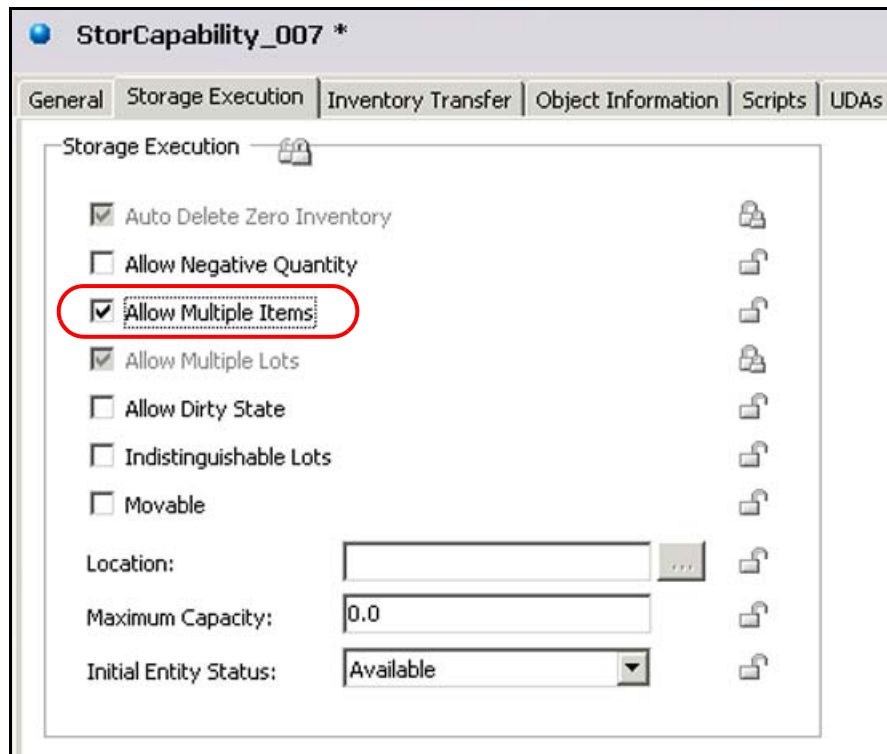
3. Save and close, and then check in the object.
4. Repeat Steps 1 through 3 to configure the **\$StorageUnit.StorCapability** template.

Because multiple materials are stored in the **Receiving**, we need to enable the options to allow for multiple items. To do this, you will configure the **StorCapability** instance in the **Receiving** area.

5. In the **Model** view, double-click the **StorCapability** object in the **Receiving** area.

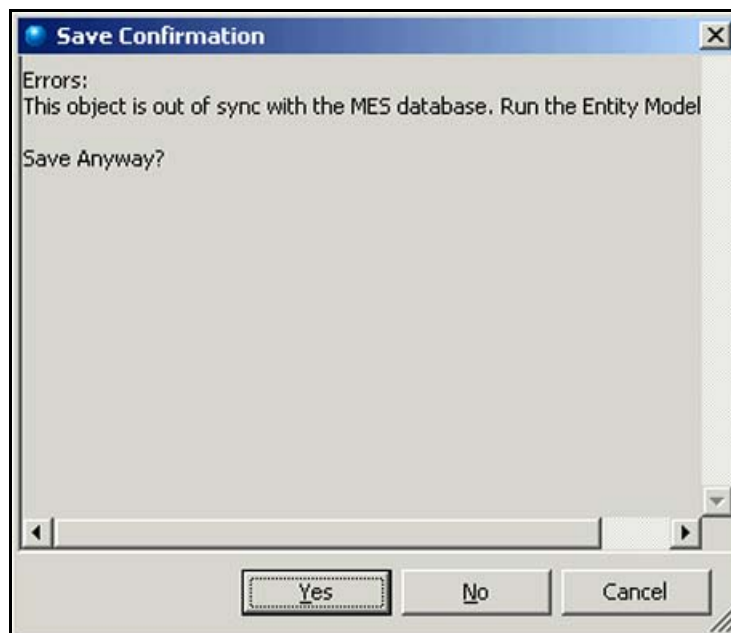


6. On the **Storage Execution** tab, check **Allow Multiple Items**.



7. Save and close the configuration editor.

The **Save Confirmation** dialog box appears. This is because you are making further changes to the instance, when there are already changes that have not yet been synchronized with the MES database.



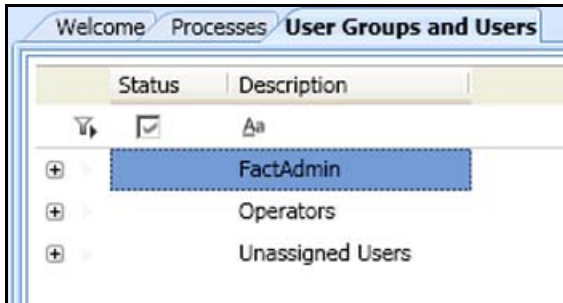
8. Click **Yes**, and then check in the object.

7-12 Module 7 – Inventory Management

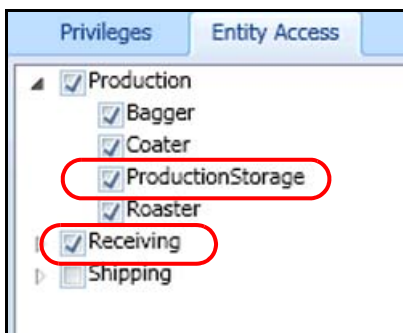
9. Run the Entity Model Builder for both the **Production** and **Receiving** areas.
10. Redeploy the modified objects.

You will now check Wonderware MES Client to ensure that you have access to the entities you just configured.

11. In the Wonderware MES Client, **Master Data Config** group, click **User Groups and Users**, and then on the **User Groups and Users** tab, click **FactAdmin**.



12. On the **Entity Access** tab, expand **Production**, and then check **ProductionStorage** and **Receiving**.



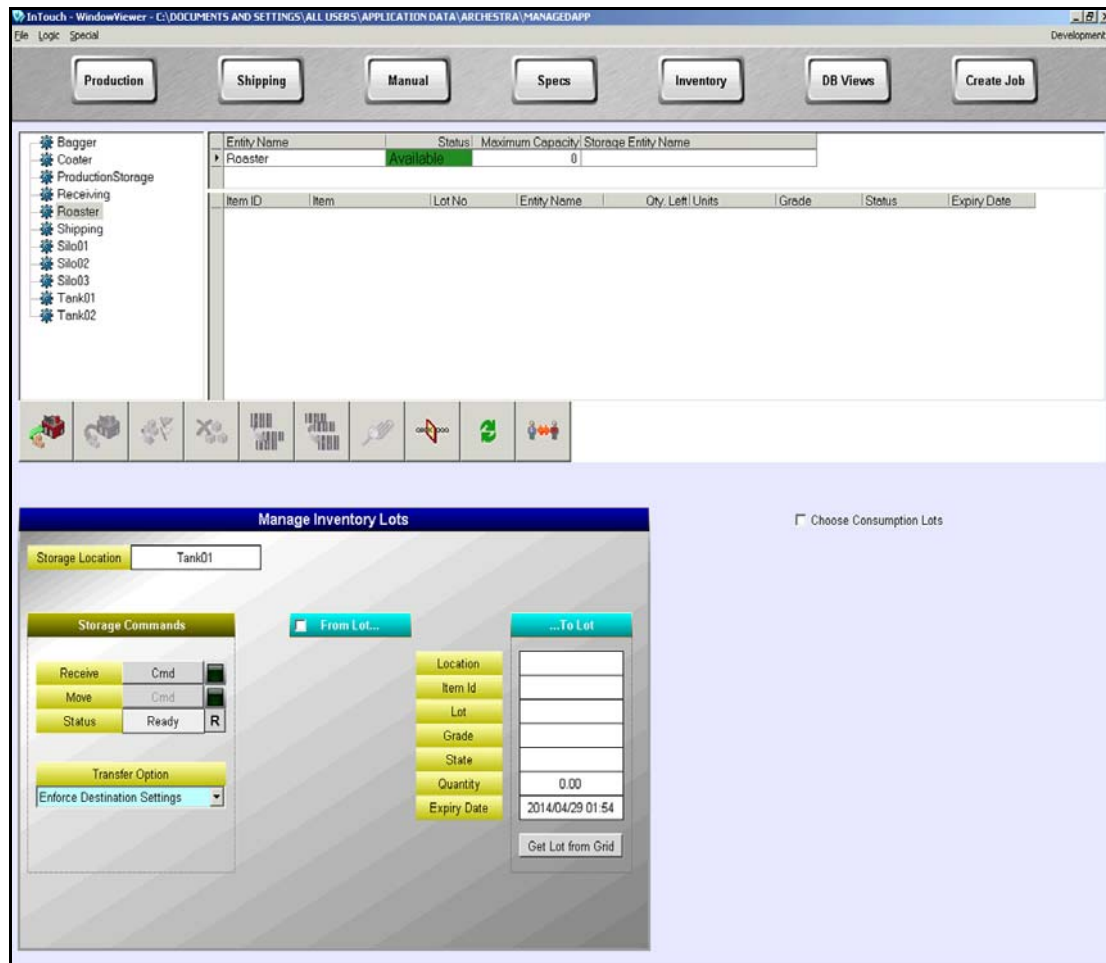
13. Repeat Steps 11 and 12 to configure the same entity access for the **Operators** group.
14. Save all changes and close the **User Groups and Users** tab.

Receive Inventory Lots in Runtime

Now, you will receive inventory lots in runtime. To manage your inventory lots, you will modify the inventory-related attributes for **Tank01**.

15. On the WindowViewer **Navigation Bar**, click **Inventory**.

The **Inventory** window appears.



7-14 Module 7 – Inventory Management

16. In the **Manage Inventory Lots** panel, **To Lot** panel, configure the inventory for **Tank01** as follows:

Location: Tank01
Item Id: OIL-LQD
Lot: OIL-300
Grade: Normal
State: Raw Materials
Quantity: 1000.00

The screenshot shows the 'Manage Inventory Lots' panel. At the top, 'Storage Location' is set to 'Tank01'. Below this, the 'Storage Commands' panel is visible. To the right, the 'From Lot...' and '...To Lot' panels are shown. The '...To Lot' panel is highlighted with a red box and contains the following configuration:

Field	Value
Location	Tank01
Item Id	OIL-LQD
Lot	OIL-300
Grade	Normal
State	Raw Materials
Quantity	1000.00
Expiry Date	2014/04/29 01:54

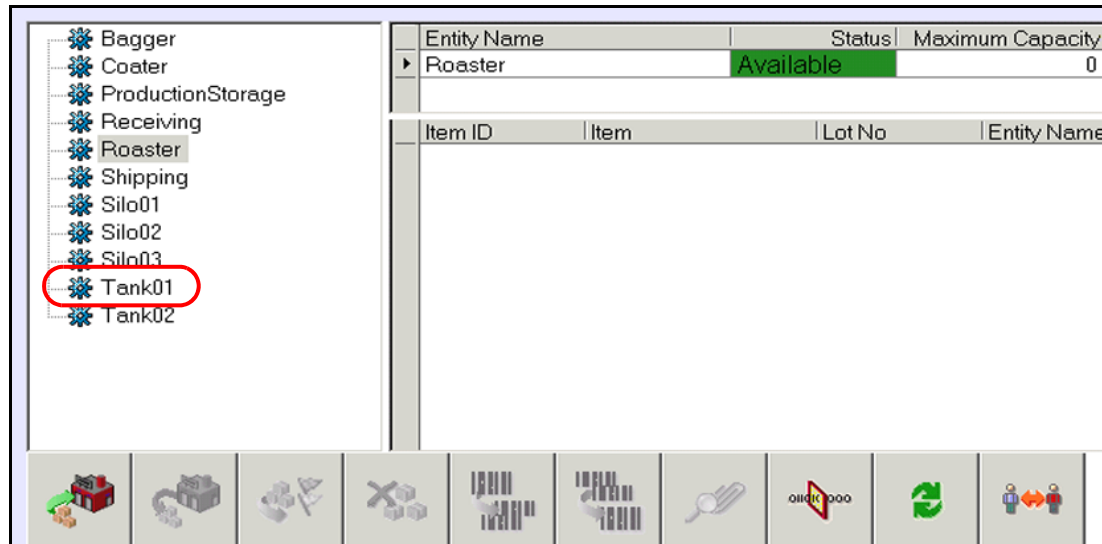
Below the '...To Lot' panel is a 'Get Lot from Grid' button.

17. In the **Storage Commands** panel, **Receive** field, click the **Cmd** button.

The screenshot shows the 'Storage Commands' panel. The 'Receive' field is highlighted with a red box, and the 'Cmd' button next to it is also highlighted with a red box. Below the 'Receive' field are the 'Move' and 'Status' fields. The 'Status' field has a 'Ready' value and a 'R' button. Below these fields is the 'Transfer Option' panel, which has a dropdown menu set to 'Enforce Destination Settings'.

You will now view the coating oil lot.

18. In the entity list, click **Tank01**.



The **Inventory** grid displays coating oil in the **Tank01** entity successfully received.

Note: You may need to refresh the control to view the received lot.

Entity Name	Status	Maximum Capacity	Storage Entity Name
Tank01	Used	0	

Item ID	Item	Lot No	Entity Name	Qty. Left	Units	Grade	Status
OIL-LQD	Coating Oil	OIL-300	Tank01	1000	Gallons	Normal	Raw Materials

7-16 Module 7 – Inventory Management

19. In the **Manage Inventory Lots** panel, **To Lot** panel, configure the inventory for **Tank02** as follows:

Location: Tank02
Item Id: OIL-LQD (*default*)
Lot: OIL-301
Grade: Normal (*default*)
State: Raw Materials (*default*)
Quantity: 700.00



20. In the **Storage Commands** panel, **Receive** field, click the **Cmd** button.
21. In the entity list, click **Tank02**.

Notice that you have successfully received coating oil in the **Tank02** entity.

Entity Name	Status	Maximum Capacity	Storage Entity Name
Tank02	Used	0	

Item ID	Item	Lot No	Entity Name	Qty. Left	Units	Grade	Status
OIL-LQD	Coating Oil	OIL-301	Tank02	700	Gallons	Normal	Raw Materials

Now, you will receive an additional **500** gallons of coating oil in the **Tank02** entity.

22. In the **Manage Inventory Lots** panel, **To Lot** panel, **Quantity** field, enter **500**.

...To Lot	
Location	Tank02
Item Id	OIL-LQD
Lot	OIL-301
Grade	Normal
State	Raw Materials
Quantity	500.00
Expiry Date	2014/04/29 01:54
Get Lot from Grid	

23. In the **Storage Commands** panel, **Receive** field, click the **Cmd** button.

24. On the button bar, click the **Refresh** button.



Notice there is now **1200** gallons of coating oil in **Tank02** entity.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶ OIL-LQD	Coating Oil	OIL-301	Tank02	1200	Gallons

Moving Inventory Lots

You will now move **300** gallons of coating oil from **Tank01** to **Tank02**. Therefore, you will use both the **From Lot** and **To Lot** panels.

25. In the entity list, click **Tank01**.

26. In the **Manage Inventory Lots** panel, check the **From Lot** panel check box.

Manage Inventory Lots

Storage Location: Tank01

Storage Commands

Receive	Cmd	<input type="checkbox"/>
Move	Cmd	<input type="checkbox"/>
Status	Ready	R

Transfer Option: Enforce Destination Settings

From Lot...

...To Lot

Location	Tank02
Item Id	OIL-LQD
Lot	OIL-301
Grade	Normal
State	Raw Materials
Quantity	500.00
Expiry Date	2014/04/29 01:54

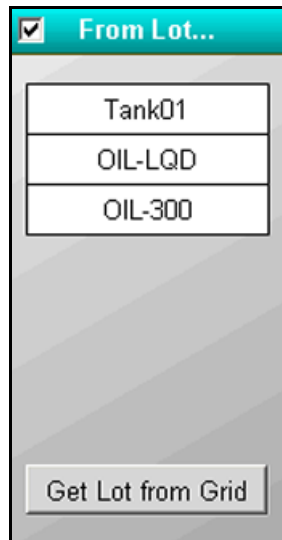
Get Lot from Grid

27. Click **Get Lot from Grid**.

☒ **From Lot...**

Get Lot from Grid

This takes the information from the **Tank01** lot and populates the **From Lot** attributes in the **Tank01** object with the information of the **Tank01** lot.



From Lot...	
Tank01	
OIL-LQD	
OIL-300	

Get Lot from Grid

28. In the **Manage Inventory Lots** panel, **To Lot** panel, configure the inventory for **Tank02** as follows:

Location:	Tank02 (<i>default</i>)
Item Id:	OIL-LQD (<i>default</i>)
Lot:	OIL-300
Grade:	Normal (<i>default</i>)
State:	Raw Materials (<i>default</i>)
Quantity:	300.00



...To Lot	
Location	Tank02
Item Id	OIL-LQD
Lot	OIL-300
Grade	Normal
State	Raw Materials
Quantity	300.00
Expiry Date	2014/04/29 01:54

Get Lot from Grid

29. In the **Storage Commands** panel, **Move** field, click the **Cmd** button.

30. On the button bar, click the **Refresh** button.

Notice that the value in the **Qty. Left** column decreases to **700** gallons for **Tank01**.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶ OIL-LQD	Coating Oil	OIL-300	Tank01	700	Gallons

31. In the entity list, click **Tank02**.

There are two lots, **OIL-300** and **OIL-301**, with **300** and **1200** gallons of coating oil, respectively.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶ OIL-LQD	Coating Oil	OIL-300	Tank02	300	Gallons
OIL-LQD	Coating Oil	OIL-301	Tank02	1200	Gallons

Splitting Lots

You will now receive peanuts into **Silo01**. You will receive a single lot of peanuts and then split the lot into two.

32. In the **Manage Inventory Lots** panel, **From Lot** panel, uncheck the check box.
33. In the **To Lot** panel, configure the inventory as follows:

Location: Silo01
Item Id: PNT-BLK
Lot: PNT-500
Grade: Normal (*default*)
State: Raw Materials (*default*)
Quantity: 1200.00

From Lot...	...To Lot
Location	Silo01
Item Id	PNT-BLK
Lot	PNT-500
Grade	Normal
State	Raw Materials
Quantity	1200.00
Expiry Date	2014/04/29 01:54
Get Lot from Grid	

34. In the **Storage Commands** panel, **Receive** field, click the **Cmd** button.
35. In the **Inventory** grid, click **Silo01** to view the new lot.

7-22 Module 7 – Inventory Management

Assume that you made a mistake and received just one lot when actually you had two lots of peanuts, lot **PNT-500** with **800** pounds and lot **PNT-510** with **400** pounds. To correct this mistake, you will now split this lot into two lots.

36. In the **Manage Inventory Lots** panel, **From Lot** panel, check the check box.

37. To the right of the **From Lot** panel, click the double-left arrow button.

The screenshot shows the 'Manage Inventory Lots' window. At the top, there's a title bar. Below it, a 'Storage Location' field contains 'Tank01'. A 'Storage Commands' button is on the left. In the center, the 'From Lot...' checkbox is checked. To its right is a double-left arrow button (two '<' symbols) which is circled in red. Further right is a '...To Lot' button.

This copies lot information from the **To Lot** panel to the **From Lot** panel.

This screenshot shows a detailed view of the 'From Lot...' and '...To Lot' panels. The 'From Lot...' panel on the left has a checked checkbox and a list containing 'Silo01', 'PNT-BLK', and 'PNT-500'. Below this list is a 'Get Lot from Grid' button. The '...To Lot' panel on the right has a list containing 'Silo01', 'PNT-BLK', 'PNT-500', 'Normal', 'Raw Materials', '1200.00', and '2014/04/29 01:54'. It also has a 'Get Lot from Grid' button. Between the two panels is a central column with yellow buttons for 'Location', 'Item Id', 'Lot', 'Grade', 'State', 'Quantity', and 'Expiry Date'. At the top of this central column is a double-left arrow button (<<), and at the bottom is a double-right arrow button (>>).

38. In the **To Lot** panel, configure the inventory as follows:

Location: Silo01 (*default*)
Item Id: PNT-BLK (*default*)
Lot: PNT-510
Grade: Normal (*default*)
State: Raw Materials (*default*)
Quantity: 400.00

The screenshot shows a panel titled "...To Lot" with a teal header. Below the header are several input fields, each with a label and a value: "Silo01", "PNT-BLK", "PNT-510", "Normal", "Raw Materials", "400.00", and "2014/04/29 01:54". At the bottom of the panel is a button labeled "Get Lot from Grid".

39. In the **Storage Commands** panel, **Move** field, click the **Cmd** button.

The screenshot shows a panel titled "Storage Commands" with a green header. Below the header are three rows of buttons. The first row has "Receive", "Cmd", and a green status indicator. The second row has "Move", "Cmd", and a green status indicator. The third row has "Status", "Ready", and a button labeled "R". Below these rows is a yellow button labeled "Transfer Option" and a blue button labeled "Enforce Destination Settings" with a dropdown arrow.

40. On the button bar, click the **Refresh** button.

There are now two lots of peanuts, **PNT-500** and **PNT-510**, with **800** and **400** pounds of peanuts, respectively.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
PNT-BLK	Peanuts Bulk	PNT-500	Silo01	800	Pounds
PNT-BLK	Peanuts Bulk	PNT-510	Silo01	400	Pounds

Now, you will receive cashews to prepare for the next lab.

41. In the **Manage Inventory Lots** panel, **From Lot** panel, uncheck the check box.

42. In the **To Lot** panel, configure the inventory as follows:

Location: Silo02
Item Id: CSW-BLK
Lot: CSW-500
Grade: Normal (*default*)
State: Raw Materials (*default*)
Quantity: 1000.00

43. In the **Storage Commands** panel, **Receive** field, click the **Cmd** button.

44. In the entity list, click **Silo02**.

The details of the lot in **Silo02** are displayed.

	Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶	CSW-BLK	Cashews Bulk	CSW-500	Silo02	1000	Pounds

You will now input the remainder of the inventory lots for the **Receiving** area.

45. Repeat Steps 42 and 43 three more times for the following items:

Location:	Silo03	Receiving	Receiving (<i>default</i>)
Item Id:	AMD-BLK	BBQ-FLA	BAG-BBQ
Lot:	AMD-500	FLA-500	BAG-500
Grade:	Normal (<i>default</i>)	Normal (<i>default</i>)	Normal (<i>default</i>)
State:	Raw Materials (<i>default</i>)	Raw Materials (<i>default</i>)	Raw Materials (<i>default</i>)
Quantity:	1000.00 (<i>default</i>)	1000.00 (<i>default</i>)	4000.00

46. In the entity list, view the details of the lots in **Silo03** and **Receiving**.

Lab 20 – Tracking Job Inventory Updates

Introduction

In the previous lab, you managed inventory using the Operations Capability Object.

In this lab, you will modify the Bill of Materials (BOM) to enable real-time inventory updates in the MES database. This will instruct Wonderware MES Client to update inventory levels when consumption and production are reported.

Finally, you will track inventory updates as the result of running jobs.

Objectives

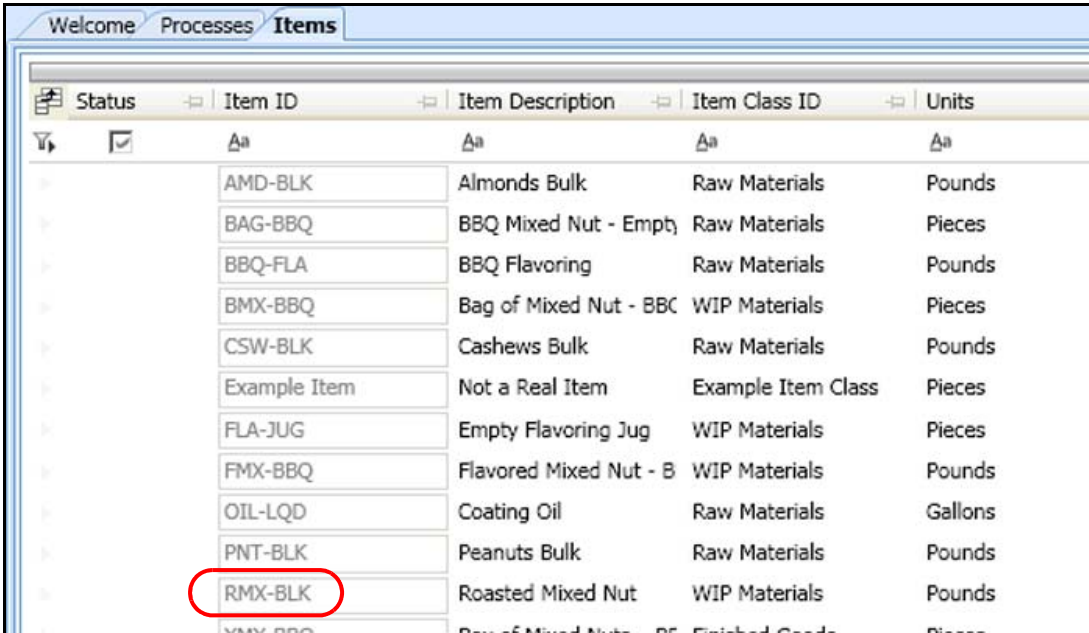
Upon completion of this lab, you will be able to:

- Configure a BOM to update inventory
- Track inventory updates in runtime

Enable BOM to Update Inventory in Runtime

First, you will configure the BOM to update the inventory for production and consumption in real-time.

1. In the Wonderware MES Client, **Product Definition** group, **Items** module, click **Apply filters**.
2. On the **Items** tab, click **RMX-BLK**.



The screenshot shows the 'Items' module in the Wonderware MES Client. The interface includes a tabbed menu at the top with 'Welcome', 'Processes', and 'Items'. Below the menu is a table with columns: Status, Item ID, Item Description, Item Class ID, and Units. The 'RMX-BLK' item is highlighted with a red circle.

Status	Item ID	Item Description	Item Class ID	Units
	AMD-BLK	Almonds Bulk	Raw Materials	Pounds
	BAG-BBQ	BBQ Mixed Nut - Empty	Raw Materials	Pieces
	BBQ-FLA	BBQ Flavoring	Raw Materials	Pounds
	BMX-BBQ	Bag of Mixed Nut - BBC	WIP Materials	Pieces
	CSW-BLK	Cashews Bulk	Raw Materials	Pounds
	Example Item	Not a Real Item	Example Item Class	Pieces
	FLA-JUG	Empty Flavoring Jug	WIP Materials	Pieces
	FMX-BBQ	Flavored Mixed Nut - B	WIP Materials	Pounds
	OIL-LQD	Coating Oil	Raw Materials	Gallons
	PNT-BLK	Peanuts Bulk	Raw Materials	Pounds
	RMX-BLK	Roasted Mixed Nut	WIP Materials	Pounds
	RMX-BBQ	Bag of Mixed Nut - BBC	WIP Materials	Pieces

3. In the **Properties** pane, expand the **BOM** section, and then click **Configure BOMs**.

The screenshot shows the 'Properties' pane with the following fields:

- Item ID: RMX-BLK
- Item Class ID: WIP Materials
- Item Description: Roasted Mixed Nut
- Units: Pounds
- Num Decimals: 3

The BOM section is expanded, showing a table with the following data:

Version ID	Description	Preferr
Original	BOM for Roas	

The 'Configure BOMs' button is highlighted with a red circle.

4. On the **RMX-BLK-BOM** tab, click **Original**.

The screenshot shows the 'RMX-BLK-BOM' tab with the following table:

Status	Version ID	Description	Preferred Version
<input checked="" type="checkbox"/>	Original	BOM for Roasted Mixec	<input checked="" type="checkbox"/>

The 'Original' cell in the 'Version ID' column is highlighted with a red circle.

5. In the **Properties** pane, expand the **Production Details** section, and then check the **Update Inventory** check box.




The screenshot shows a 'Properties' window with a 'Production Details' section expanded. The 'Update Inventory' checkbox is checked and circled in red. Other fields include Version ID (Original), Date (5/2/2013 12:12:19 PM), Preferred Version (checked), Description (BOM for Roasted Mixed Nuts), Default Prod Code, Default Lot, Required Grade, To Storage Location (Roaster), Scaling Factor (1), Backflush, May create new lots, May choose alternate inventory location, Must Consume from Inventory, and Must Consume from WIP.

Version ID	Original
Date	5/2/2013 12:12:19 PM
Preferred Version	<input checked="" type="checkbox"/>
Description	BOM for Roasted Mixed Nuts
Production Details	
Default Prod Code	
Default Lot	
Required Grade	
To Storage Location	Roaster
Scaling Factor	1
Backflush	<input type="checkbox"/>
May create new lots	<input checked="" type="checkbox"/>
May choose alternate inventory location	<input checked="" type="checkbox"/>
Update Inventory	<input checked="" type="checkbox"/>
Must Consume from Inventory	<input type="checkbox"/>
Must Consume from WIP	<input type="checkbox"/>

This ensures that whenever the system reports production using this BOM, the production lot is updated in the inventory.

Now, you will configure the consumption settings.

6. On the **Components** tab, click **Peanuts Bulk**.

Components						
Status	BOM Position	Item Description	Quantity	Min Quantity	Max Quantity	
	<input checked="" type="checkbox"/>	Aa	=	=	=	
▶		1 Peanuts Bulk	0.474	0.4	0.5	
▶		2 Cashews Bulk	0.263	0.2	0.3	
▶		3 Almonds Bulk	0.263	0.2	0.3	

7. In the **Properties** pane, update the inventory for **Peanuts Bulk** as follows:

Update Inventory: *checked*

Must Consume from Inventory: *checked*

The screenshot shows the 'Properties' window for an inventory item named 'Peanuts Bulk'. The window contains several fields and checkboxes. The 'Quantity' field is set to 0.474, 'Min Quantity' is 0.4, and 'Max Quantity' is 0.5. The 'Storage Location' is 'Silo01'. The 'Update Inventory' and 'Must Consume from Inventory' checkboxes are checked and circled in red. Other checkboxes include 'Backflush Consumption', 'Must Consume Before Production Allowed', 'May create new lots', 'May choose alternate inventory location', 'Must Consume from WIP', and 'Constant Quantity'.

Field	Value
BOM Position	1
Item	Peanuts Bulk
Required Grade	
Default Reason	
Quantity	0.474
Storage Location	Silo01
Min Quantity	0.4
Max Quantity	0.5

- ☐ Backflush Consumption
- ☐ Must Consume Before Production Allowed
- ☒ May create new lots
- ☒ May choose alternate inventory location
- ☒ Update Inventory
- ☒ Must Consume from Inventory
- ☐ Must Consume from WIP
- ☐ Constant Quantity

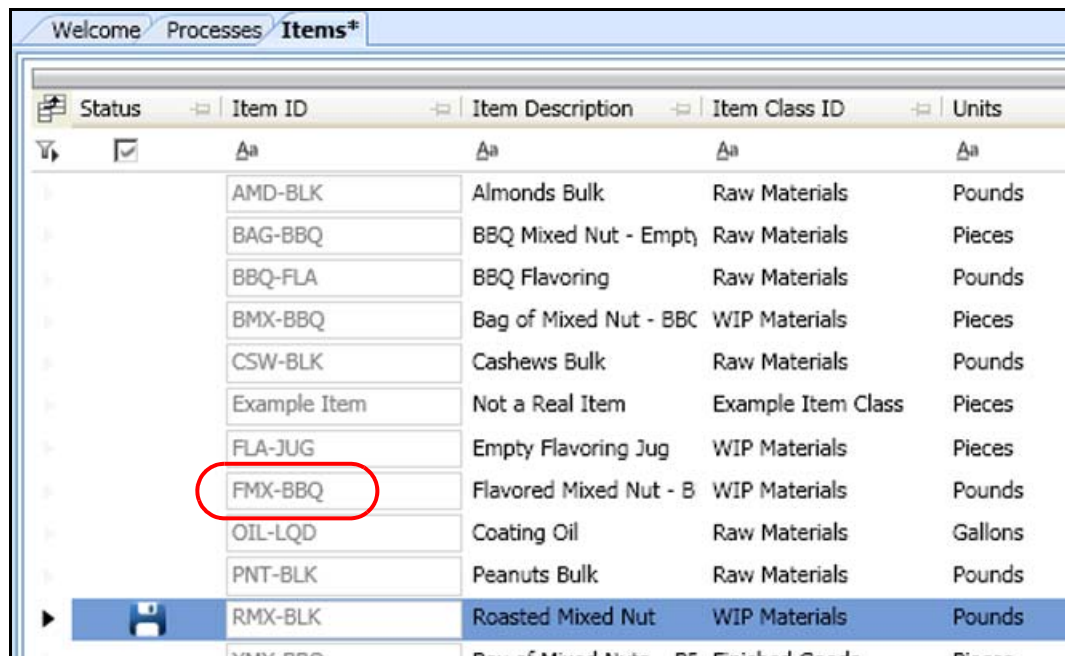
This will ensure that the quantities consumed are actually subtracted and enforced in the inventory status of the database.

8. On the **Components** tab, click **Cashews Bulk**.
9. In the **Properties** pane, update the inventory for **Cashews Bulk** as follows:

Update Inventory: ☒ *checked*

Must Consume from Inventory: ☒ *checked*

10. Repeat Steps 8 and 9 to update the inventory for the almonds.
 11. Save all changes and close the **RMX-BLK-BOM** tab.
- You will now modify the **Flavored Mixed Nut - BBQ** item and configure its BOM.
12. On the **Items** tab, click **FMX-BBQ**.



Status	Item ID	Item Description	Item Class ID	Units
<input checked="" type="checkbox"/>	AMD-BLK	Almonds Bulk	Raw Materials	Pounds
<input checked="" type="checkbox"/>	BAG-BBQ	BBQ Mixed Nut - Empty	Raw Materials	Pieces
<input checked="" type="checkbox"/>	BBQ-FLA	BBQ Flavoring	Raw Materials	Pounds
<input checked="" type="checkbox"/>	BMX-BBQ	Bag of Mixed Nut - BBC	WIP Materials	Pieces
<input checked="" type="checkbox"/>	CSW-BLK	Cashews Bulk	Raw Materials	Pounds
<input checked="" type="checkbox"/>	Example Item	Not a Real Item	Example Item Class	Pieces
<input checked="" type="checkbox"/>	FLA-JUG	Empty Flavoring Jug	WIP Materials	Pieces
<input checked="" type="checkbox"/>	FMX-BBQ	Flavored Mixed Nut - B	WIP Materials	Pounds
<input checked="" type="checkbox"/>	OIL-LQD	Coating Oil	Raw Materials	Gallons
<input checked="" type="checkbox"/>	PNT-BLK	Peanuts Bulk	Raw Materials	Pounds
<input checked="" type="checkbox"/>	RMX-BLK	Roasted Mixed Nut	WIP Materials	Pounds

13. In the **Properties** pane, **BOM** section, click **Configure BOMs**.
14. On the **FMX-BBQ-BOM** tab, click **Original**.

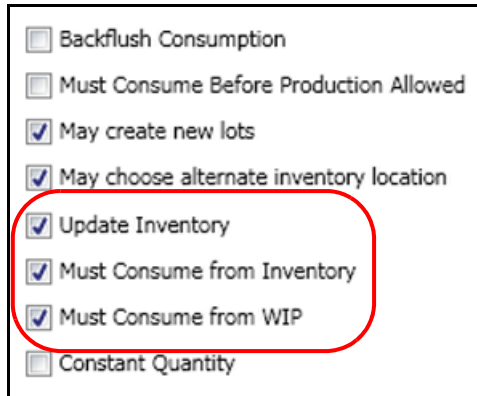
15. In the **Properties** pane, expand the **Production Details** section, and then check the **Update Inventory** check box.

The screenshot shows a 'Properties' window with the following fields and options:

- Version ID: Original
- Date: 5/7/2013 12:41:20 PM
- ☒ Preferred Version
- Description: BOM for Flavored Mixed Nuts – BBQ
- Production Details** (expanded section):
 - Default Prod Code: [dropdown menu]
 - Default Lot: [text field]
 - Required Grade: [dropdown menu]
 - To Storage Location: Coater [button ...]
 - Scaling Factor: 1
 - ☐ Backflush
 - ☒ May create new lots
 - ☒ May choose alternate inventory location
 - ☒ **Update Inventory** (circled in red)
 - ☐ Must Consume from Inventory
 - ☐ Must Consume from WIP

16. On the **Components** tab, click **Roasted Mixed Nut**.
17. In the **Properties** pane, update the inventory for **Roasted Mixed Nut** as follows:

Update Inventory: *checked*
Must Consume from Inventory: *checked*
Must Consume from WIP: *checked*



☐ Backflush Consumption
☐ Must Consume Before Production Allowed
☒ May create new lots
☒ May choose alternate inventory location
☒ Update Inventory
☒ Must Consume from Inventory
☒ Must Consume from WIP
☐ Constant Quantity

When the **Must Consume from WIP** check box is checked, it forces the system to consume an inventory lot coming from a previous job within the same work order.

18. On the **Components** tab, click **Coating Oil**.
19. In the **Properties** pane, update the inventory for **Coating Oil** as follows:

Update Inventory: *checked*
Must Consume from Inventory: *checked*

20. Repeat Steps 18 and 19 to update the inventory for **BBQ Flavoring**.

You will not configure the BOM for **Empty Flavoring Jug** because it only has to be recorded and tracked for compliance purposes.

21. Save all changes and close the **FMX-BBQ-BOM** tab.

Now, you will modify the **BMX-BBQ** item and configure its BOM.

22. On the **Items** tab, click **BMX-BBQ**, and then in the **Properties** pane, **BOM** section, click **Configure BOMs**.
23. On the **BMX-BBQ-BOM** tab, click **Original**.
24. In the **Properties** pane, expand the **Production Details** section, and then check the **Update Inventory** check box.
25. On the **Components** tab, click **Flavored Mixed Nut - BBQ**.
26. In the **Properties** pane, update the inventory for **Flavored Mixed Nut - BBQ** as follows:

Update Inventory: *checked*
Must Consume from Inventory: *checked*
Must Consume from WIP: *checked*

27. On the **Components** tab, click **BBQ Mixed Nut - Empty**.
28. In the Properties pane, update the inventory for **BBQ Mixed Nut - Empty** as follows:

Update Inventory: *checked*
Must Consume from Inventory: *checked*

29. Save all changes and close the **BMX-BBQ-BOM** tab.
30. Save all changes and close the **Items** tab.

You have now enabled the BOMs to update the inventory in runtime as consumption and production are reported.

Track Inventory Updates in Runtime

Now, you will track the work order and inventory updates in runtime. First, you will create a work order in Wonderware MES Client.

31. On the **Processes** tab, create a work order from **BAG-MXN-1** as follows:

Work Order ID: WO-130
Description: *<enter a description>*
Item: BMX-BBQ
Required Quantity: 400

You will now use the InTouch application to track the running of the work order.

32. In the WindowViewer **Production** window, **Internal Setup** panel, set jobs for **WO-130**.



33. Uncheck the **Generate Consumption Lots** check box, and then click **Generate Lots**.



Now the system will automatically generate lots for production and will not generate lots for consumption. Instead, you will select those from the inventory.

34. Start the roasting job.

35. On the **Navigation Bar**, click **Manual**.
 36. If needed, use the **Job Summary** panel to switch to the **Roaster** entity.
 37. In the navigation area, click **Steps**.
- Now, you will complete all of the steps.
38. Complete steps 1, 2, and 3
 39. Log on to **Step No 4**, and then click the **Enter Data** button.
 40. Leave the default value and click **OK**.
 41. Complete **Step No 4**.
 42. Bypass **Step No 5**.

Operator		Serial Number		Step Group	
Oper		-		- All -	

Step No	Step Desc	Grp Seq	Seq	Document	View	Data	Start
1		1	1				5/16/2013 2:24:28 PM
2		1	2				5/16/2013 2:24:36 PM
3		2	3				5/16/2013 2:24:47 PM
4		2	4			320	5/16/2013 2:25:02 PM
5		3	5				5/16/2013 2:25:57 PM

Step Desc.	Documents
If indicated by batch counter, clean Roaster	

Data Edit	Form Name

Status	Action	Start	Cert Name
BYPASSED	Normal	5/16/2013 2	

Required for Step Completion	Finish
	5/16/2013 2

You will now use the **Inventory** grid to consume and select the lots from where you want to consume.

43. On the **Navigation Bar**, click **Inventory**.
44. Check the **Choose Consumption Lots** check box.

The three operation panels appear.

☒ Choose Consumption Lots

Roasting Job

BOM Pos 1 (PNT-BLK)		S
BOM Pos 2 (CSW-BLK)		S
BOM Pos 3 (AMD-BLK)		S

Coating Job

BOM Pos 1 (RMX-BLK)		S
BOM Pos 2 (OIL-LQD)		S
BOM Pos 3 (BBQ-FLA)		S

Bagging Job

BOM Pos 1 (FMX-BBQ)		S
BOM Pos 2 (BAG-BBQ)		S

You will use these panels to choose the lots that you want to consume from. The set button next to the controls allows you to select a lot from the grid.

You will now select a lot for the **Peanuts Bulk**.

45. In the entity list, click **Silo01**.

Two lots for the **Peanuts Bulk** appear.

46. In the entity list, ensure the **PNT-500** lot is selected.

	Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶	PNT-BLK	Peanuts Bulk	PNT-500	Silo01	800	Pounds
	PNT-BLK	Peanuts Bulk	PNT-510	Silo01	400	Pounds

47. In the **Roasting Job** panel for **BOM Pos 1 (PNT-BLK)**, click the **Set** button to select the **PNT-500** lot.

The screenshot shows the 'Roasting Job' panel. It contains three rows for BOM positions. The first row, 'BOM Pos 1 (PNT-BLK)', has an empty text field and a 'Set' button circled in red. The second row, 'BOM Pos 2 (CSW-BLK)', has an empty text field and a 'Set' button. The third row, 'BOM Pos 3 (AMD-BLK)', has an empty text field and a 'Set' button.

The lot number appears.

The screenshot shows the 'Roasting Job' panel after the lot selection. The first row, 'BOM Pos 1 (PNT-BLK)', now has 'PNT-500' entered in the text field. The second and third rows remain unchanged with empty text fields and 'Set' buttons.

Now, you will set consumption of cashews from **Silo02**.

48. In the entity list, click **Silo02** and ensure the **CSW-500** lot is selected.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
CSW-BLK	Cashews Bulk	CSW-500	Silo02	1000	Pounds

49. In the **Roasting Job** panel for **BOM Pos 2 (CSW-BLK)**, click the **Set** button to select the **CSW-500** lot.

The screenshot shows the 'Roasting Job' panel after the second lot selection. The first row, 'BOM Pos 1 (PNT-BLK)', still has 'PNT-500' in its text field. The second row, 'BOM Pos 2 (CSW-BLK)', now has 'CSW-500' entered in its text field. The third row remains unchanged with an empty text field and a 'Set' button.

50. In the entity list, click **Silo03** and ensure the **AMD-500** lot is selected.
51. In the **Roasting Job** panel for **BOM Pos 3 (AMD-BLK)**, click the **Set** button to select the **AMD-500** lot.

Roasting Job		
BOM Pos 1 (PNT-BLK)	PNT-500	S
BOM Pos 2 (CSW-BLK)	CSW-500	S
BOM Pos 3 (AMD-BLK)	AMD-500	S

Now you will report consumption enough to produce roasted mixed nuts.

52. On the **Navigation Bar**, click **Production**.

BOM component now shows the peanut lot, **PNT-500**, from **Silo01**, the cashew lot, **CSW-500**, from **Silo02**, and the almond lot, **AMD-500**, from **Silo03**.

BOM Component 1	BOM Component 2	BOM Component 3
0.00 ?	0.00 ?	0.00 ?
Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Ready R	Ready R	Ready R
PNT-500	CSW-500	AMD-500
RMX-130	RMX-130	RMX-130
Silo01	Silo02	Silo03
1 ?	1 ?	1 ?
Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

53. In the **BOM Component 1** panel, consume **45** pounds of peanuts.
54. In the **BOM Component 2** panel, consume **25** pounds of cashews.
55. In the **BOM Component 3** panel, consume **25** pounds of almonds.

You will now verify that the consumption was successful. This can be done through the **Consumption Data** report.

56. On the **Navigation Bar**, click **DB Views**.

57. Click **Consumption Data** and organize the data by **wo_id** and **oper_id**.

58. Expand **WO-130** and **100-RST**.

Notice the data displays consumptions from the inventory lots.

oper_id: 100-RST (3 items)									
seq_no	ent_name	qty_cons	item_id	item_desc	units	item_class_desc	lot_no	from_ent_name	fg_lot_no
0	Roaster	45	PNT-BLK	Peanuts Bulk	lbs	Raw Materials	PNT-500	Silo01	RMX-130
0	Roaster	25	CSW-BLK	Cashews Bulk	lbs	Raw Materials	CSW-500	Silo02	RMX-130
0	Roaster	25	AMD-BLK	Almonds Bulk	lbs	Raw Materials	AMD-500	Silo03	RMX-130

Now, you will access the **Inventory** grid to verify the status of the inventory.

59. On the **Navigation Bar**, click **Inventory**.

60. In the entity list, click **Silo01**.

Notice the **Inventory** grid shows the **PNT-500** lot with **755** pounds and not **800** pounds. This is because you just consumed **45** pounds of peanuts from the lot.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
PNT-BLK	Peanuts Bulk	PNT-500	Silo01	755	Pounds
PNT-BLK	Peanuts Bulk	PNT-510	Silo01	400	Pounds

61. In the entity list, click **Silo02**.

Notice the **Inventory** grid shows the **CSW-500** lot with **975** pounds and not **1000** pounds. This is because you just consumed **25** pounds of cashews.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
CSW-BLK	Cashews Bulk	CSW-500	Silo02	975	Pounds

62. In the entity list, click **Silo03**, and then verify that **25** pounds has been consumed.

You will now report production of **95** pounds of roasted mixed nuts.

63. On the **Navigation Bar**, click **Production**.

64. In the **Production** window, report **95** pounds of good WIP production.

You have reported all the necessary consumption and production. Therefore, you are ready to complete the job.

65. End the roasting job.

The roasting job is now complete. You have reported the production of **95** pounds for the roasted mixed nut lot, **RMX-130**, in the **Roaster** entity.

Now, you will access the inventory to see the new lot.

66. On the **Navigation Bar**, click **Inventory**.

67. In the entity list, ensure **Roaster** is selected.

The **Inventory** grid shows the new **RMX-130** lot as a result of the WIP production.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶ RMX-BLK	Roasted Mixed Nut	RMX-130	Roaster	95	Pounds

You will now make the work order number visible in the grid.

68. In the **Inventory** grid, right-click the empty area and select **Configure**.

Item ID	Item	Lot No
▶ RMX-BLK	Roasted Mixed Nut	RMX-130

Configure...

Save Configuration

Save Configuration For All Logged On Entities

Save As Default Configuration

Reload Configuration

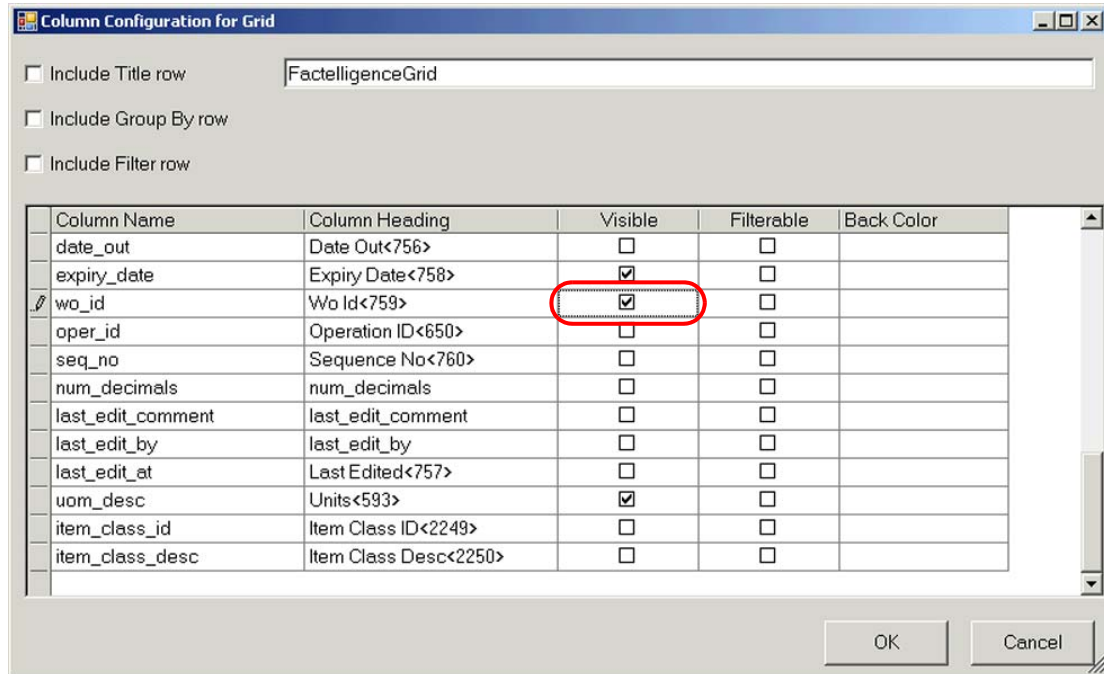
Revert to Default Configuration

About

The **Column Configuration for Grid** dialog box appears.

Now, you will set the visibility for the **WO ID** column.

69. Scroll down and in **Column Name**, locate **wo_id**, and then in the **Visible** column, check the check box .



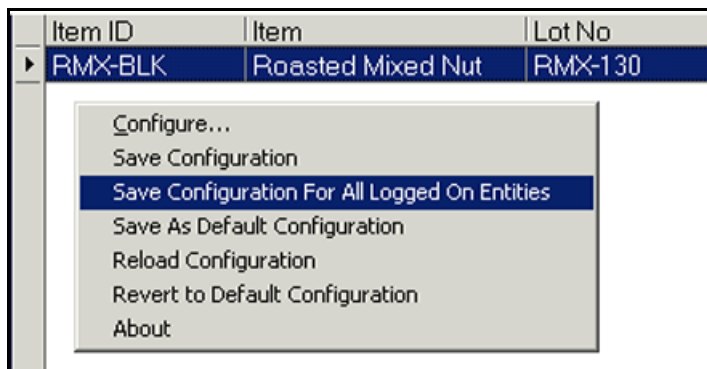
70. Click **OK**.

The **Inventory** grid now includes the **WO ID** column. This shows that the **RMX-130** lot is associated with **WO-130**.

Item ID	Item	Lot No	Entity Name	Qty. Left / Units	Grade	Status	Expiry Date	WO ID
▶ RMX-BLK	Roasted Mixed Nut	RMX-130	Roaster	95 Pounds	Normal	WIP Materials		WO-130

You will now save the configuration for the **Roaster**, **Coater**, and **Bagger** entities.

71. In the **Inventory** grid, right-click the empty area and select **Save Configuration For All Logged On Entities**.



Now, you will start the coating operation.

72. In the **Production** window, start the coating job.

73. On the **Navigation Bar**, click **Inventory** and ensure that the **Choose Consumption Lots** check box is checked.

You will now select lots for roasted mixed nuts.

74. In the entity list, ensure **Roaster** is selected, and then in the **Inventory** grid, ensure the **RMX-130** lot is selected.

75. In the **Coating Job** panel for **BOM Pos 1 (RMX-BLK)**, click the **Set** button to select the **RMX-130** lot.

Roasting Job

BOM Pos 1 (PNT-BLK)	PNT-500	S
BOM Pos 2 (CSW-BLK)	CSW-500	S
BOM Pos 3 (AMD-BLK)	AMD-500	S


Coating Job

BOM Pos 1 (RMX-BLK)		S
BOM Pos 2 (OIL-LQD)		S
BOM Pos 3 (BBQ-FLA)		S

The lot information appears.

Coating Job

BOM Pos 1 (RMX-BLK)	RMX-130	S
BOM Pos 2 (OIL-LQD)		S
BOM Pos 3 (BBQ-FLA)		S

76. In the entity list, click **Tank01**, and then in the **Inventory** grid, ensure the **OIL-300** lot is selected.
77. In the **Coating Job** panel for **BOM Pos 2 (OIL-LQD)**, click the **Set** button  to select the **OIL-300** lot.



Coating Job		
BOM Pos 1 (RMX-BLK)	RMX-130	
BOM Pos 2 (OIL-LQD)	OIL-300	
BOM Pos 3 (BBQ-FLA)		

78. In the entity list, click **Receiving**, and then in the **Inventory** grid, ensure only the **FLA-500** lot is selected.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
BBQ-FLA	BBQ Flavoring	FLA-500	Receiving	1000	Pounds
BAG-BBQ	BBQ Mixed Nut -...	BAG-500	Receiving	4000	Pieces

79. In the **Coating Job** panel for **BOM Pos 3 (BBQ-FLA)**, click the **Set** button  to select the **FLA-500** lot.



Coating Job		
BOM Pos 1 (RMX-BLK)	RMX-130	
BOM Pos 2 (OIL-LQD)	OIL-300	
BOM Pos 3 (BBQ-FLA)	FLA-500	

80. On the **Navigation Bar**, click **Production**.
81. Click the **Coater** entity.

Now, you are ready to produce and consume. You will be producing **100** pounds of flavored mixed nuts. Therefore, you need to consume **95** pounds of **RMX-130**, **2** gallons of **OIL-300**, and **3** pounds of **FLA-500**.

82. In the **Production** window, report consumption as follows:

	BOM Component 1	BOM Component 2	BOM Component 3
Quantity	95	2	3
Lot No	RMX-130	OIL-300	FLA-500

BOM Component 1	BOM Component 2	BOM Component 3
95.00 ?	2.00 ?	3.00 ?
Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>	Cmd <input type="checkbox"/>
Ready R	Ready R	Ready R
RMX-130	OIL-300	FLA-500
FMX-130	FMX-130	FMX-130
Roaster	Tank01	Receiving
6 ?	1 ?	1 ?
Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>	Set as Default <input type="checkbox"/>

83. Report **100** pounds of good WIP production.

All production and consumption has now been reported.

84. End the coating job.

You will now check the **Inventory** grid to make sure that the consumptions and productions were successful.

85. On the **Navigation Bar**, click **Inventory**.

86. In the entity list, ensure **Roaster** is selected.

The **Inventory** grid is blank. This is because you just consumed all of your roasted mixed nuts.

87. In the entity list, click **Tank01**.

The **Inventory** grid shows the **OIL-300** lot with **698** gallons and not **700** gallons. This is because you just consumed **2** gallons of coating oil.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶ OIL-LQD	Coating Oil	OIL-300	Tank01	698	Gallons

88. In the entity list, click **Receiving**.

The **Inventory** grid shows the **FLA-500** lot with **997** pounds and not **1000** pounds. This is because you just consumed **3** pounds of flavoring.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶ BBQ-FLA	BBQ Flavoring	FLA-500	Receiving	997	Pounds
BAG-BBQ	BBQ Mixed Nut -...	BAG-500	Receiving	4000	Pieces

Now, you will verify the production.

89. In the entity list, click **Coater**.

The **Inventory** grid shows the **FMX-130** lot of **100** pounds associated with **WO-130**.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶ FMX-BBQ	Flavored Mixed Nut -...	FMX-130	Coater	100	Pounds

90. In the **Production** window, start the bagging job.

In order to report consumption, you are required to select lots for the bagging job.

91. On the **Navigation Bar**, click **Inventory** and ensure that the **Choose Consumption Lots** check box is checked.
92. In the entity list, click **Coater**.
93. In the **Bagging Job** panel, **BOM Pos 1 (FMX-BBQ)**, click the **Set** button to select the **FMX-130** lot.
94. In the entity list, click **Receiving**.
95. Unselect the **FLA-500** lot and select the **BAG-500** lot.

Item ID	Item	Lot No	Entity Name	Qty. Left	Units
BBQ-FLA	BBQ Flavoring	FLA-500	Receiving	997	Pounds
▶ BAG-BBQ	BBQ Mixed Nut -...	BAG-500	Receiving	4000	Pieces

96. For **BOM Pos 2 (BAG-BBQ)**, click the **Set** button.

The screenshot shows a window titled "Bagging Job". Inside, there are two rows representing BOM positions. The first row is "BOM Pos 1 (FMX-BBQ)" with a selected lot of "FMX-130" and a button labeled "S". The second row is "BOM Pos 2 (BAG-BBQ)" with a selected lot of "BAG-500" and a button labeled "S".

Bagging Job		
BOM Pos 1 (FMX-BBQ)	FMX-130	S
BOM Pos 2 (BAG-BBQ)	BAG-500	S

97. On the **Navigation Bar**, click **Production**.
98. Click the **Bagger** entity.
99. In the **BOM Component 1** panel, report **100** pounds of flavored mixed nuts.

BOM Component 1

100.00 ?

Cmd

Ready R

FMX-130

BMX-130

Coater

6 ?

Set as Default

Instead of reporting consumption explicitly, you will set lot information for the backflush consumption of the empty bags.

100. In the **BOM Component 2** panel, click **Set as Default**.

Now, you will report production.

101. In the **Good Prod Counter** panel, report **400** bags of flavored mixed nuts.

102. End the bagging job.

You will now verify the inventory lots in the **Inventory** grid.

103. On the **Navigation Bar**, click **Inventory**.

104. In the entity list, click **Coater**.

The **Inventory** grid is blank. This means that the WIP lot has been consumed.

105. In the entity list, click **Receiving**.

The **Inventory** grid shows the **BAG-500** lot with **3600** pieces. This is because you just consumed **400** bags.

	Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶	BBQ-FLA	BBQ Flavoring	FLA-500	Receiving	997	Pounds
	BAG-BBQ	BBQ Mixed Nut -...	BAG-500	Receiving	3600	Pieces

106. In the entity list, click **ProductionStorage**.

The **Inventory** grid displays the **BMX-130** production lot associated with **WO-130**.

	Item ID	Item	Lot No	Entity Name	Qty. Left	Units
▶	BMX-BBQ	Baq of Mixed Nut-...	BMX-130	ProductionSto...	400	Pieces

You have now completed the work order and updated the inventory in runtime.

107. Check the reports in **DB Views**.



Module 8 – Application Maintenance

Section 1 – Middleware	8-3
Section 2 – Database	8-5
Section 3 – Data Archival, Purge, and Restore	8-7
Section 4 – Data Editor	8-19
Section 5 – Rejected Message Viewer	8-25

Module Objectives

- Discuss the Rejected Message Viewer
- Describe tools for data archival, purge, and restore (APR)
- Explain mechanisms for database creation, backup, and upgrade
- Examine tools to configure component Middleware operational parameters

Section 1 – Middleware

This section discusses the tools to configure component Middleware operational parameters.

Middleware Configuration Editor

You can configure the custom mapping file that middleware uses while processing commands. The Middleware Configuration Editor allows you to edit the database and middleware communication configuration items. The Middleware Configuration Editor runs on the middleware server.

To open the Middleware Configuration Editor, click **Start | All Programs | Wonderware | MES | Utilities | Middleware Configuration Editor**.



The Middleware Configuration Editor allows you to modify custom middleware mappings and to change how messages are processed by the WCF Middleware.

The Middleware Configuration Editor allows you to configure the following settings:

- Middleware Settings
- Command (SP) Timeouts
- Custom DB SP Mappings
- Custom Batch SP Mappings
- Extensibility Hooks

You must restart the MES Middleware Host service if you change these settings. In some cases, you have to restart any running clients also. You can use this tab to configure the middleware settings. The middleware settings affect the communication of the MES Middleware Host with the clients and the MES database.

When any changes are made to the Client Settings, all running clients must be restarted before they detect the changes. Also, changes to the HTTP or TCP Ports requires all running clients to be restarted.

Timeout Command Values

You can configure a timeout command value in the Wonderware MES database. This is necessary for a procedure that runs longer than the default command time. If clients consistently get timeout errors from the database when calling a specific middleware method, they may have to increase the timeout for the specific method.

The Command (SP) Timeouts tab shows the stored procedures or methods and the corresponding timeout values under the Method Name and Timeout value columns respectively.

A method name is a two part **object.command** name that the middleware maps to a stored procedure name. The method name is derived from the Object/Cmd/MsgType elements in the XML message sent to the Middleware. If the MsgType is **exec** or **getspec**, then the method name is created by combining the Object and Cmd with a period, for example ent.add. If the MsgType is **getall**, **getbykey**, or some other value, then the method name is created by combining the Object and the MsgType with a period, for example ent.getbykey.

Custom Mapping

You can use the **Middleware Settings** tab to configure the custom mapping for a stored procedure in the Wonderware MES database. The Wonderware MES Middleware Service accepts the XML commands that have the Object/Command/MsgType identifier.

The middleware generates an automatic mapping between the Object/Command/MsgType identifiers and their associated stored procedures. You can configure the mappings between the Object/Command/MsgType identifiers and their associated stored procedures on this tab.

You can use this tab to configure the custom mapping for the custom batch-oriented stored procedures in the Wonderware MES database.

These custom stored procedures accept XML as their first parameter and process the XML internally. The stored procedures process the XML commands in batches.

The **Custom DB SP Mappings** tab shows the method names and the corresponding stored procedure names in the **Custom Method Name** and **Custom Stored Procedure Name** columns respectively.

The difference between this mapping and the mapping defined by the **Custom DB SP Mapping** tab is that the stored procedures that are defined here must have an input parameter named xml_source or in_xml_source. The stored parameter is passed for the entire XML command.

Extensibility Hooks

Extensibility Hooks allow for the execution of custom code or stored procedures prior to (pre-hook) or after (post-hook) the execution of a specific middleware method.

Section 2 – Database

This section discusses the mechanisms for database creation, backup, and upgrade. This section also discusses the Database Connection Editor.

Database Creation

The Database Configuration Utility allows you to create or modify the MES database as a stand-alone operation external to the MES Installation setup. This utility is executed after the Wonderware MES Software/Operations installation is completed.

You can use the Database Configuration Utility to:

- Create or modify the database on both SQL Server and Oracle.
- Dump the scripts on your local computer if you want to modify the database creation scripts before executing them.

You can create or modify the MES database. By default, the utility creates the MES database and you can change the name of the database if you are using SQL Server. If a database is migrated, the originating database name is retained.

Migration of the database does not create the custom indexes, views, procedures and functions that are created by the user. The user has to manually recreate these entities.

You can dump all of the embedded resources in the database configuration to the **FactDbResources** directory using the Database Configuration Utility.

This option is useful when you run into specific problems during the execution of the default database script files. You can dump the database scripts at a specific location in your computer.

If you choose to select the Dump Database Scripts to Disk, you cannot run the scripts manually. You must run the same Database Configuration Utility to create your database which will run the scripts you dumped to disk by default.

You can use the dumped database scripts from a specific location in your computer, edit the scripts, and then re-execute the utility to create the database based on the modifications. The utility fetches the edited file for execution instead of the file in the memory.

If you run the utility again after dumping the scripts, the utility always uses the dumped scripts and prompts a warning message **Local script files is being used**. If you want to use the embedded resources in the database configuration, you must delete FactDbResources folder before running the utility.

Upgrading to Wonderware MES Software/Operations

You can upgrade Wonderware MES Software/Operations from a version not older than 3.4. To upgrade from a version older than 3.4 to the current version of the software, you must first uninstall the previous version, and then install the new version. The MES database Configuration Utility delivered with this release supports migration of databases from version 3.1 and later. Migration from versions earlier than 3.1 requires manual steps to first update the database to version 3.1. Custom modifications to any version of the Factelligence database may not be supported by the utility and may prevent migration.

You must save a copy of the existing middleware configuration file (Middleware.cfg) before uninstalling the existing Wonderware MES version. After the installation is complete, replace the newly created Middleware.cfg file with the original file to restore all connectivity and passwords. Be sure to restart the MES Middleware Host application after replacing this file.

While you are upgrading the Wonderware MES from a previous version, you can click Backup on the Wonderware Database Configuration Utility dialog box, to take a backup of the previous database. This creates a copy of the database, migrates the existing database in the specified place, and retains the data. If you do not want to migrate, create a new database with a different name or rename the original database prior to installing Wonderware MES Software/Operations.

Section 3 – Data Archival, Purge, and Restore

This section discusses the tools for MES data archival, purge, and restore (APR).

Overview

You can use the new Archive, Purge, and Restore feature introduced in MES 4.0 and the Database Maintenance Utility to archive, purge, and restore the MES database. This section allows you to create, run, delete, modify, and view the Archive, Purge, and Restore (APR) jobs.

Using the Archive, Purge, and Restore Functions

The following example uses a 2008 Server machine with SQL Server 2008 and the Wonderware MES Software/Operations. The database being restored is called MESDB; however, your database name will differ.

Note: Be sure you do not restore to your production database or serious performance issues will result.

Configuration Prerequisites

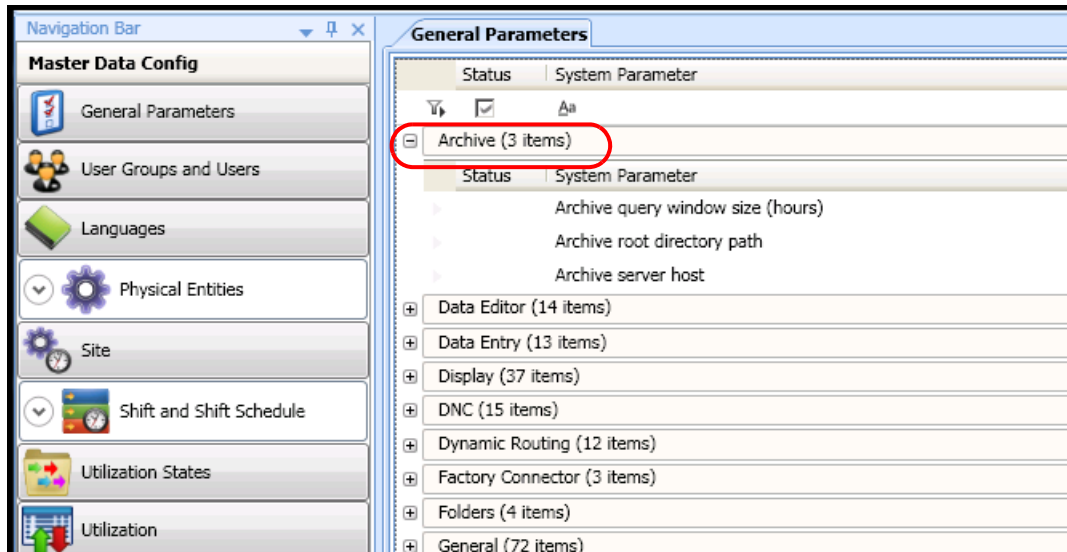
Before using these features, you must configure the Archive parameters. To configure the Archive parameters:

1. Start the Wonderware MES Client and click the **General Parameters** tab.
2. Click **Archive**.

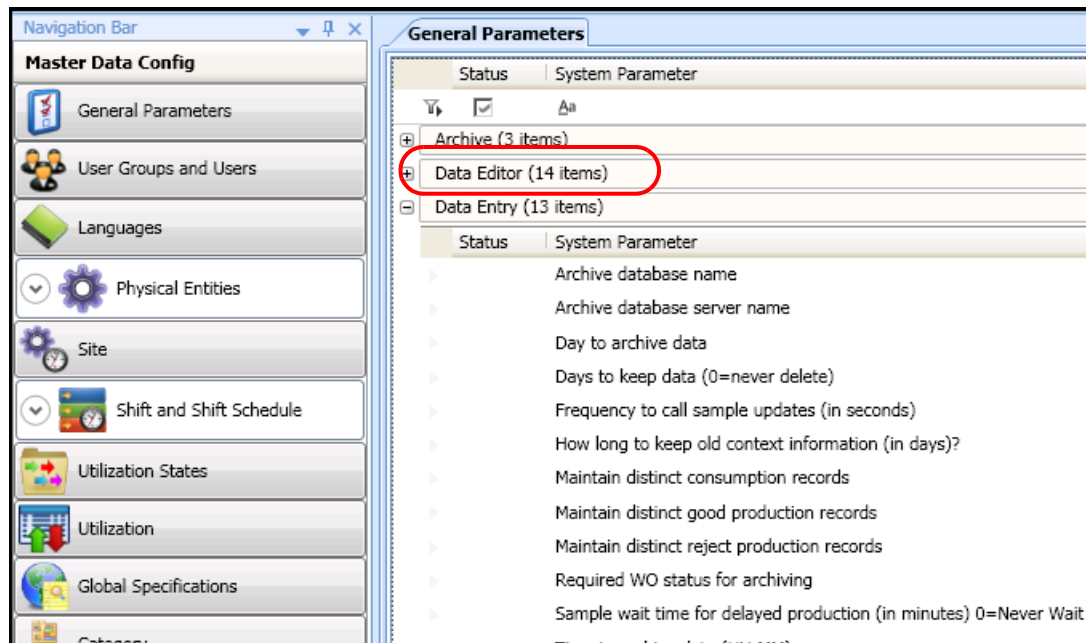
The **Archive** section has three parameters. You will use the default settings for the **Archive query window size (hours)** and **Archive root directory path** parameters. You can change the settings later if necessary.

The **Archive query window size (hours)** parameter controls the span of individual recordsets retrieved during the archive, purge, and restore operations. Basically, this parameter will change the number of records retrieved at one time from the tables to be archived. This parameter can be varied to influence the speed of the archive, purge, or restore operations. This will potentially increase or decrease the impact of these operations on other database operations within the system.

3. In the **Archive server host** field, enter the server name where the Archive database is located. In this example, the TSVM2008 server is used.



4. Expand the **Data Entry** field.
5. In the **Archive database name** field, enter the name of the database where you will restore the data after it was archived. In this example, the MESDB database is used.



Note: For creating a new database for restoring, refer to the Database Maintenance chapter in the Wonderware MES Software/Operations Client User Guide on WDN.

6. In the **Archive database server name** field, enter the server name where the Archive database is going to reside. In this example, TSVM2008 is used.

The screenshot shows the 'General Parameters' window with a navigation bar on the left. The 'Master Data Config' section is expanded, showing 'General Parameters' as the selected item. The main area displays a list of system parameters. The 'Archive database server name' parameter is highlighted with a red circle, and its value is 'TSVM2008'.

Status	System Parameter	Value
<input checked="" type="checkbox"/>	Archive database name	MESDB
<input checked="" type="checkbox"/>	Archive database server name	TSVM2008
<input checked="" type="checkbox"/>	Day to archive data	Daily
<input checked="" type="checkbox"/>	Days to keep data (0=never delete)	0
<input checked="" type="checkbox"/>	Frequency to call sample updates (in seconds)	30
<input checked="" type="checkbox"/>	How long to keep old context information (in days)?	365
<input checked="" type="checkbox"/>	Maintain distinct consumption records	No
<input checked="" type="checkbox"/>	Maintain distinct good production records	Yes
<input checked="" type="checkbox"/>	Maintain distinct reject production records	Yes
<input checked="" type="checkbox"/>	Required WO status for archiving	Complete
<input checked="" type="checkbox"/>	Sample wait time for delayed production (in minutes) 0=Never Wait	0
<input checked="" type="checkbox"/>	Time to archive data (HH:MM)	00:01
<input checked="" type="checkbox"/>	Verify quantity entry	No

7. For the **Day to archive data** parameter, use the default **Daily** setting.

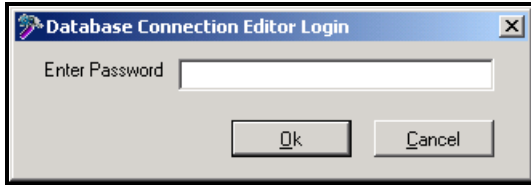
The screenshot shows the 'General Parameters' window with a navigation bar on the left. The 'Master Data Config' section is expanded, showing 'General Parameters' as the selected item. The main area displays a list of system parameters. The 'Day to archive data' parameter is highlighted with a red circle, and its value is 'Daily'.

Status	System Parameter	Value
<input checked="" type="checkbox"/>	Archive database name	MESDB
<input checked="" type="checkbox"/>	Archive database server name	TSVM2008
<input checked="" type="checkbox"/>	Day to archive data	Daily
<input checked="" type="checkbox"/>	Days to keep data (0=never delete)	0
<input checked="" type="checkbox"/>	Frequency to call sample updates (in seconds)	30
<input checked="" type="checkbox"/>	How long to keep old context information (in days)?	365
<input checked="" type="checkbox"/>	Maintain distinct consumption records	No
<input checked="" type="checkbox"/>	Maintain distinct good production records	Yes
<input checked="" type="checkbox"/>	Maintain distinct reject production records	Yes
<input checked="" type="checkbox"/>	Required WO status for archiving	Complete
<input checked="" type="checkbox"/>	Sample wait time for delayed production (in minutes) 0=Never Wait	0
<input checked="" type="checkbox"/>	Time to archive data (HH:MM)	00:01
<input checked="" type="checkbox"/>	Verify quantity entry	No

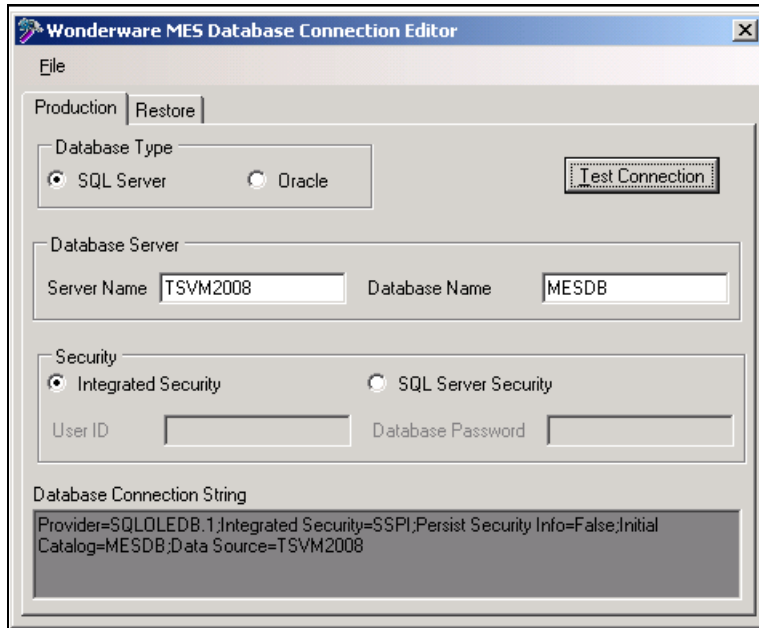
Set Up the Database Connection

Next set up the database connection string to point to the correct database for restoring the data to the restore database, MESDB.

1. Open and log on to the **Database Connection Editor**.



2. Click the **Restore** tab.
3. In the **Server Name** field, enter the name of the **Archive** database server.
4. In the **Database Name** field, enter the target restore database.
5. Test the connection and save.
6. Restart the middleware.

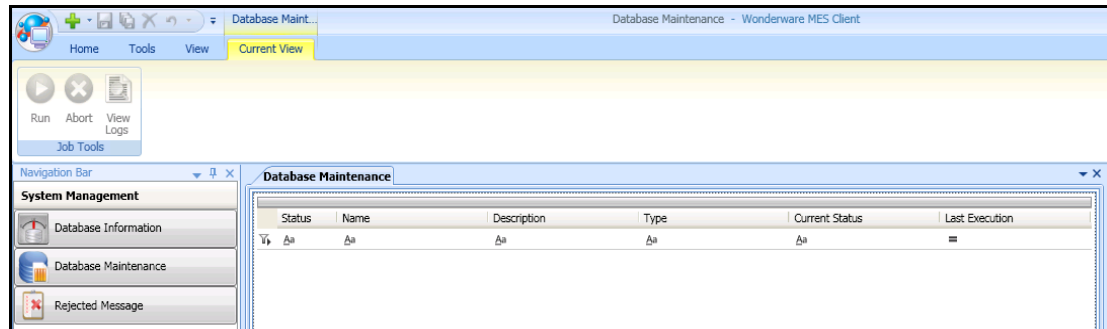


Create and Run the Jobs

Several job types are available. This section shows running and managing the **Archive** and **Restore** jobs as two separate operations.

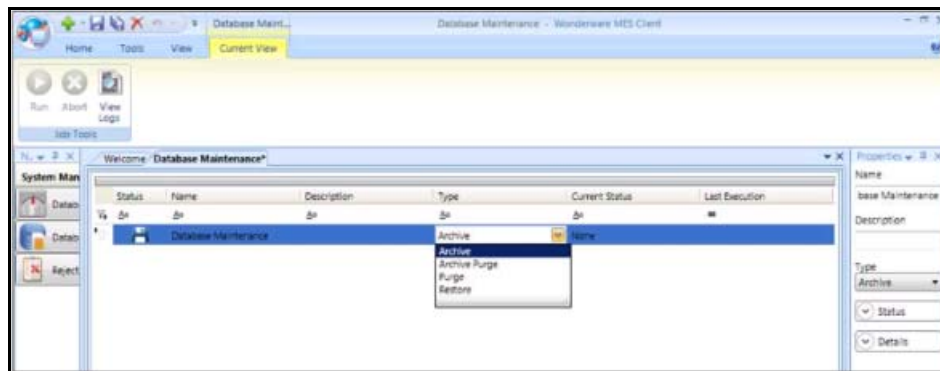
Running the Archive Job

1. In the Wonderware MES Client, click **System Management** and then click **Database Maintenance**.



Now that you have completed the setup for this feature, run an Archive job.

2. In the **Database Maintenance** field, right-click and then click **New**. The name for the Archive job is arbitrary, so it can be named anything. In this example, it is called **Database Maintenance**.
3. In the **Type** drop-down list, click **Archive**.



4. In the **Properties** pane, you can view **Status** and **Details**.

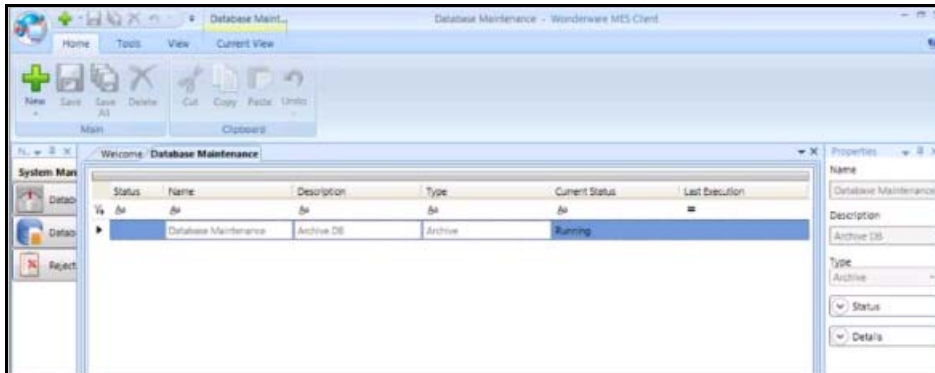
Note: Refer to the Database Maintenance chapter in the Wonderware MES Software/Operations User Guide for more details on what you want to do depending on the site requirements.

5. Highlight the job and right-click it.

8-12 Module 8 – Application Maintenance

- Click **Run** to start the job manually.

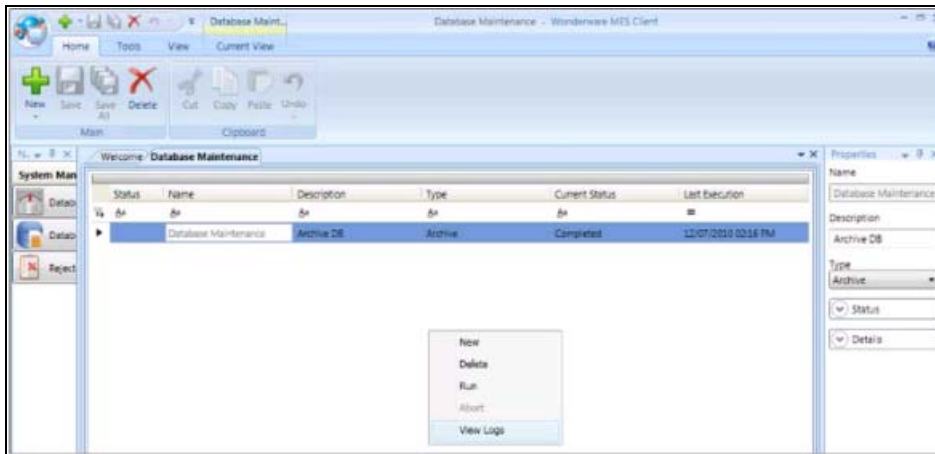
In the **Current Status** column, the job status changes to **Running**.



- When the job is complete, the status in the **Current Status** field changes to **Completed**.

Running the job also creates a log file that you can view in order to see the job details. If the job fails, this is the first place to check and see what the cause might have been, and then correct it using the editor.

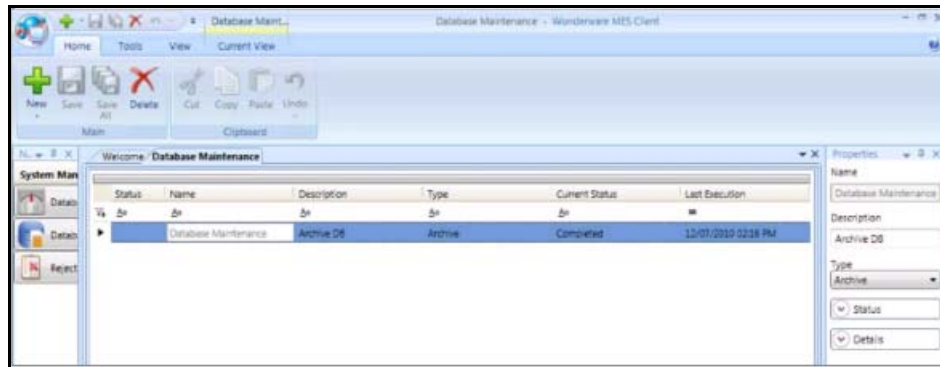
- Right-click the job and click **View Logs**.



- The following screenshot shows the content of the log file. If there are errors, this will give you an idea of what might have been the problem.



The following example shows the job is completed. If the job does not complete due to problems, an error is displayed in the **Current Status** column.

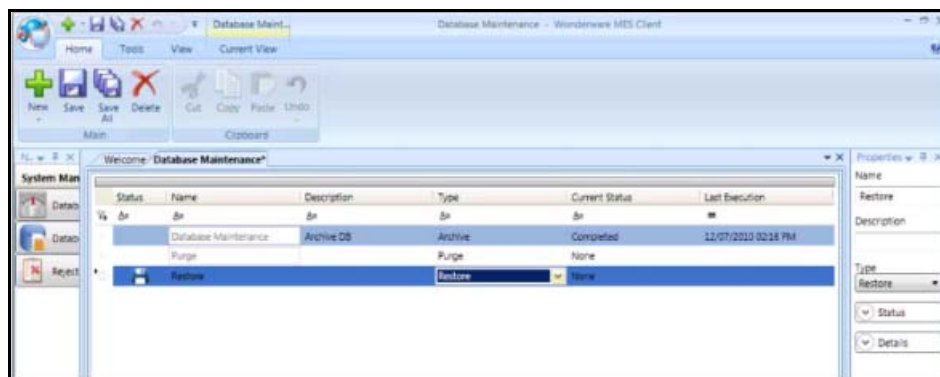


Running the Restore Job

For archive, purge, or archive purge jobs, follow the same steps but change the job type to the feature you want to use from the **Type** drop-down list.

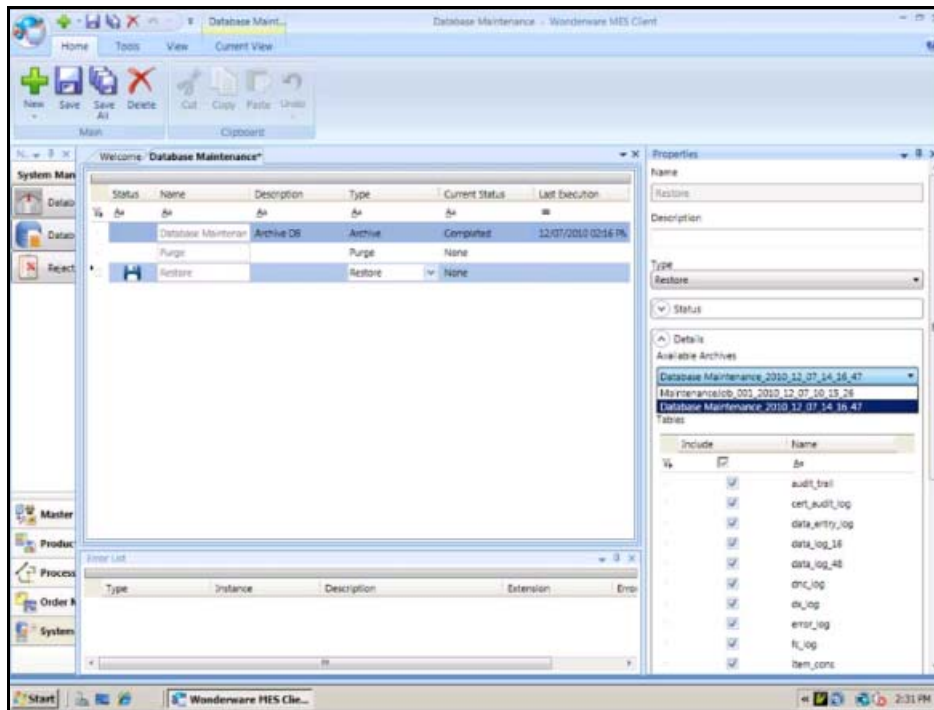
The following example uses the Restore feature and its options.

1. Create a new job.
2. In the **Type** drop-down list, click **Restore** and save the job.

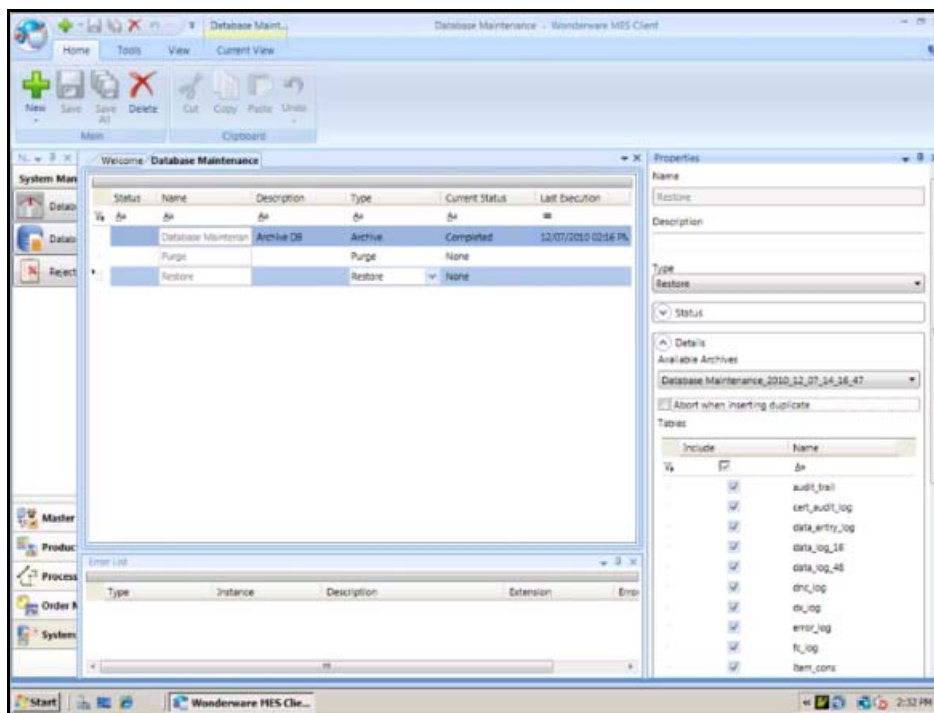


8-14 Module 8 – Application Maintenance

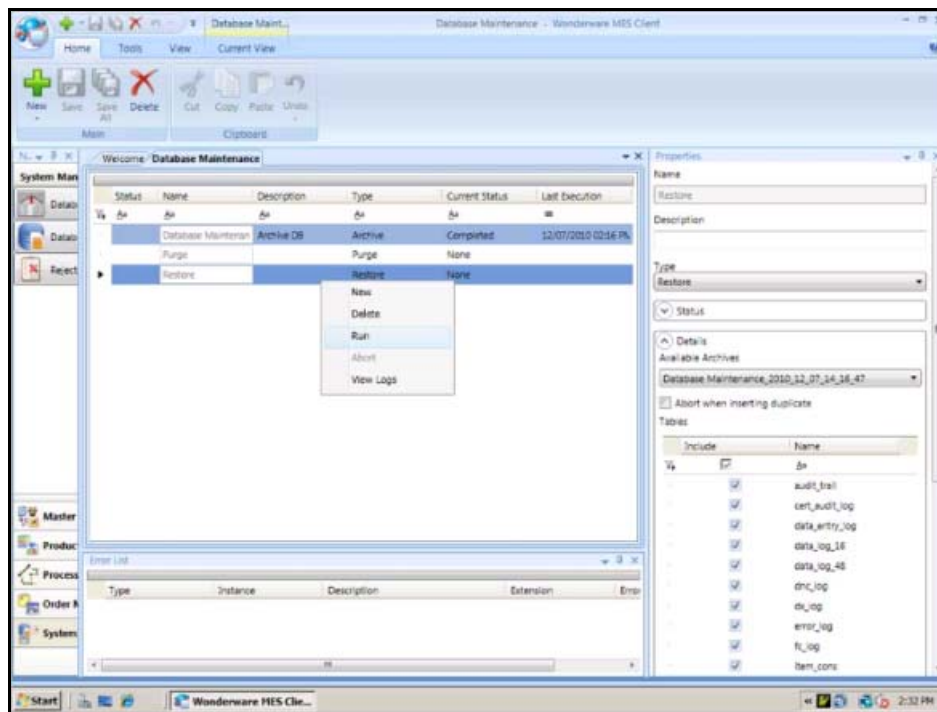
3. In the **Properties** pane, expand **Details** and select the data that you want to restore.



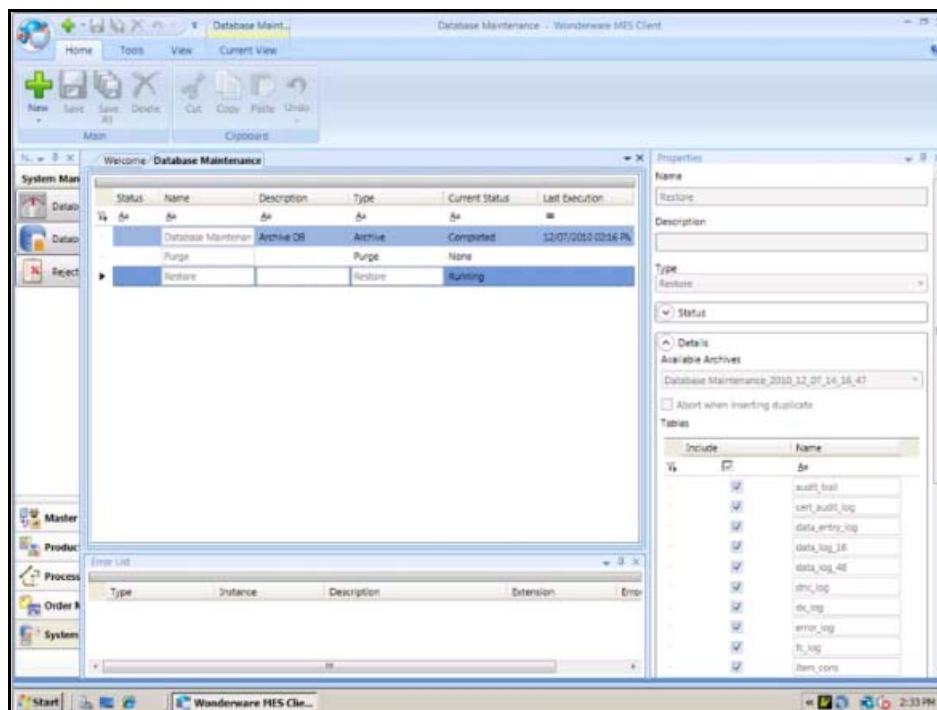
4. Select the correct database and save.



5. Right-click the **Restore** job and click **Run**.

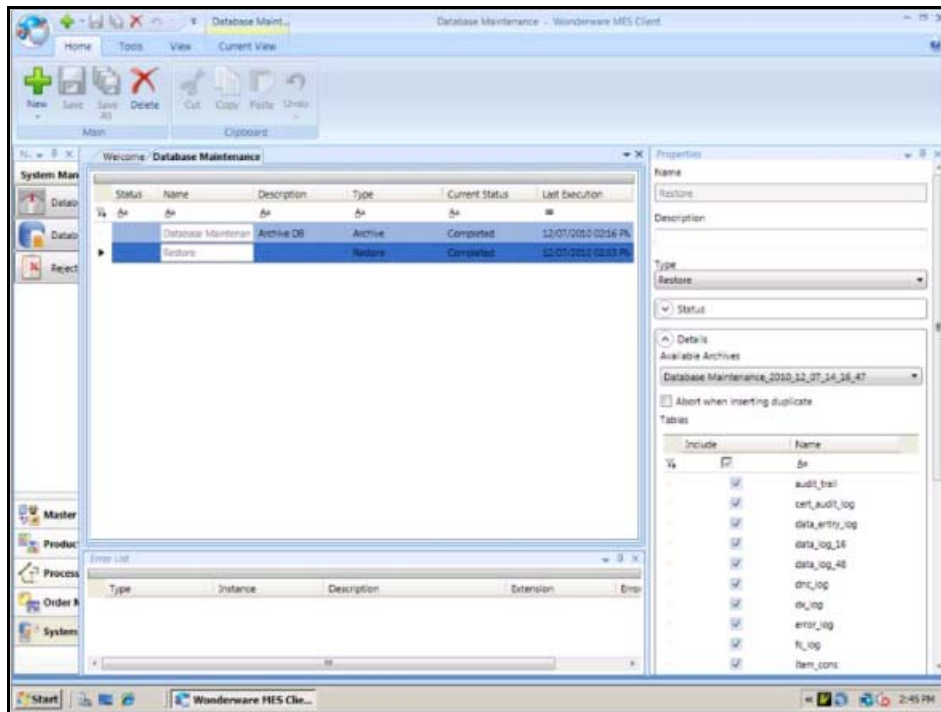


You will see the job running.



8-16 Module 8 – Application Maintenance

The status of the job changes to **Completed**.



6. Right-click the job and click **View Logs** to view the log file.

Using the Database Maintenance Utility

By default, **Database Maintenance** is grouped under the **System Management** group in the **Navigation** pane.

The transactional tables within the MES database grow rapidly and continuously. To keep the size of the MES database within manageable limits, you should archive and/or purge the database at regular time intervals. You can archive all the data of large tables and the associated (dependency) tables and then restore them to another database for reporting. In some selected cases, you might purge the data from the database if the data is no longer important for reporting by your users. This keeps the database from growing too large and slowing the performance of the reports.

You can create and manage archive, purge, and restore jobs using the **Database Maintenance** editor. The **Database Maintenance** editor allows you to:

- Create new jobs
- Run jobs
- View jobs
- Modify jobs
- Delete jobs
- Access job logs

In an environment where there is significant activity from the production transactions, the APR node should be configured to use a separate Middleware Server from the production Middleware Servers.

Archive and Purge Jobs

You can manually run the archive and purge jobs on the MES database to archive and/or purge the data and run the restore jobs on the non-production database. You can manually select one of the APR jobs currently defined in the database for execution. When you select a job, all configuration information for that specific job is shown. You can review and modify the specifications for the job before executing it.

- If you run an archive job or an archive purge job, the following is created on the **DB Maintenance Service** (at the configured root path):
- A directory is created with the job name, if it doesn't exist already

Under the job directory, as defined in the **Archive root directory path** in the **General Parameters - Archive** section, a time-stamped ZIP file is created that contains a .CSV file for each archived table. The ZIP file also contains a manifest file. A log file with the same name is created alongside the ZIP file.

You can remove an existing job using the **Database Maintenance** section. Before removing the job, make sure that the job is not running.

If you run a purge job or a restore job, the following is created on the DB Maintenance Service (at the configured root path):

- A directory is created with the job name, if it doesn't already exist
- Under the job directory, a time-stamped log file is created

You can schedule the APR job using the Windows Task Scheduler on the APR server. This allows the APR jobs to run automatically at a pre-determined time or on a regular basis, such as daily, monthly, and so on.

You must configure the scheduled job on the same computer as the APR server using the Windows Task Scheduler. The proxy must be configured to send requests to this service in order for the command line program to send its requests.

Archive Jobs

You can create a new archive job to execute a defined archive operation. This job will retrieve selected records from the MES database and record them in an archive file. You can also configure the archive jobs to execute a purge operation on the archived records following the successful completion of the archive operation.

To create an archive job:

1. Add a new job to the list and select its type.
2. Select the table or tables to be archived. The list of tables available represent the top level tables. All dependent tables related to the top level table are also included in the APR job.
3. Decide on the range of data to be archived and purged. This can be based on a fixed time range or a relative time range. It is also possible to specify a work order by name.

When the archive job is run, it will only archive work orders where all the jobs within the work order have been completed. Active jobs will prohibit a work order from being archived.

Restore Jobs

You can create a restore job to execute a restore operation. This job will insert records from an archive file into the MES Restore DB. The MES database must already exist and will not be created as part of the restore operation.

Purge Jobs

You can create a purge job to execute a purge operation. This job will remove records from an active, production MES database to free-up resources on the database server. The purge operation can be done independently or as a follow-up to an archive job.

Section 4 – Data Editor

This section describes using the Wonderware MES Data Editor to insert, modify, and edit data from the MES database.

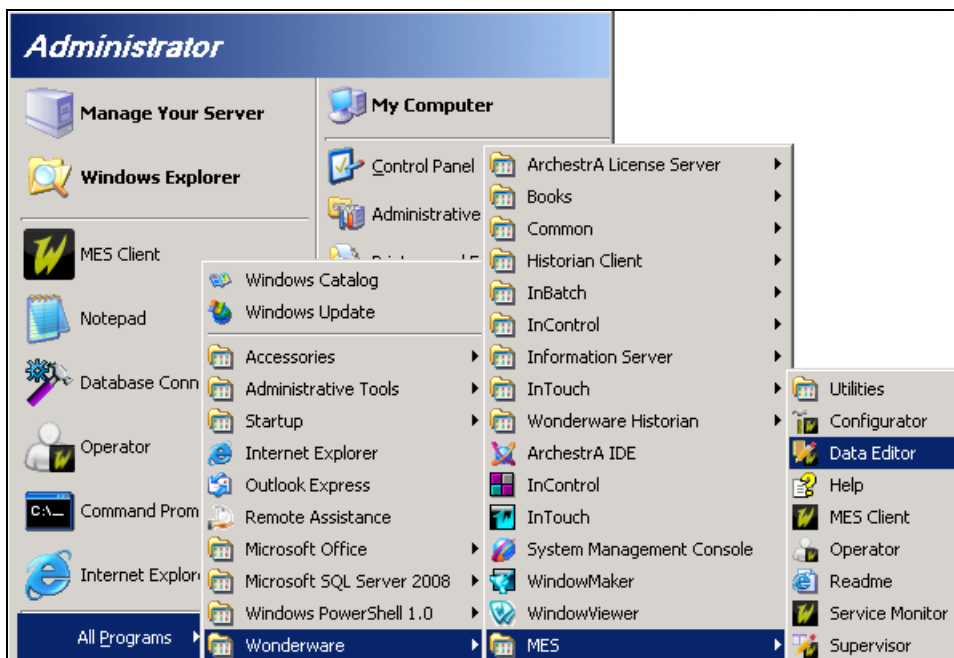
Overview

The Wonderware MES Data Editor is used to preserve the integrity of the MES database. You can use the Data Editor to insert, modify, and edit data in the MES database without corrupting the data records. Manually changing data in the MES database can create problems because the MES database records are typically interlinked. Therefore, using the Data Editor to insert, modify, and edit data updates the MES database records correctly and is the recommended method for making changes to data records.

You can also use the Data Editor to view and alter data for item production, item consumption, labor usage, item lots, job steps, and entity utilization.

Data Editor Login

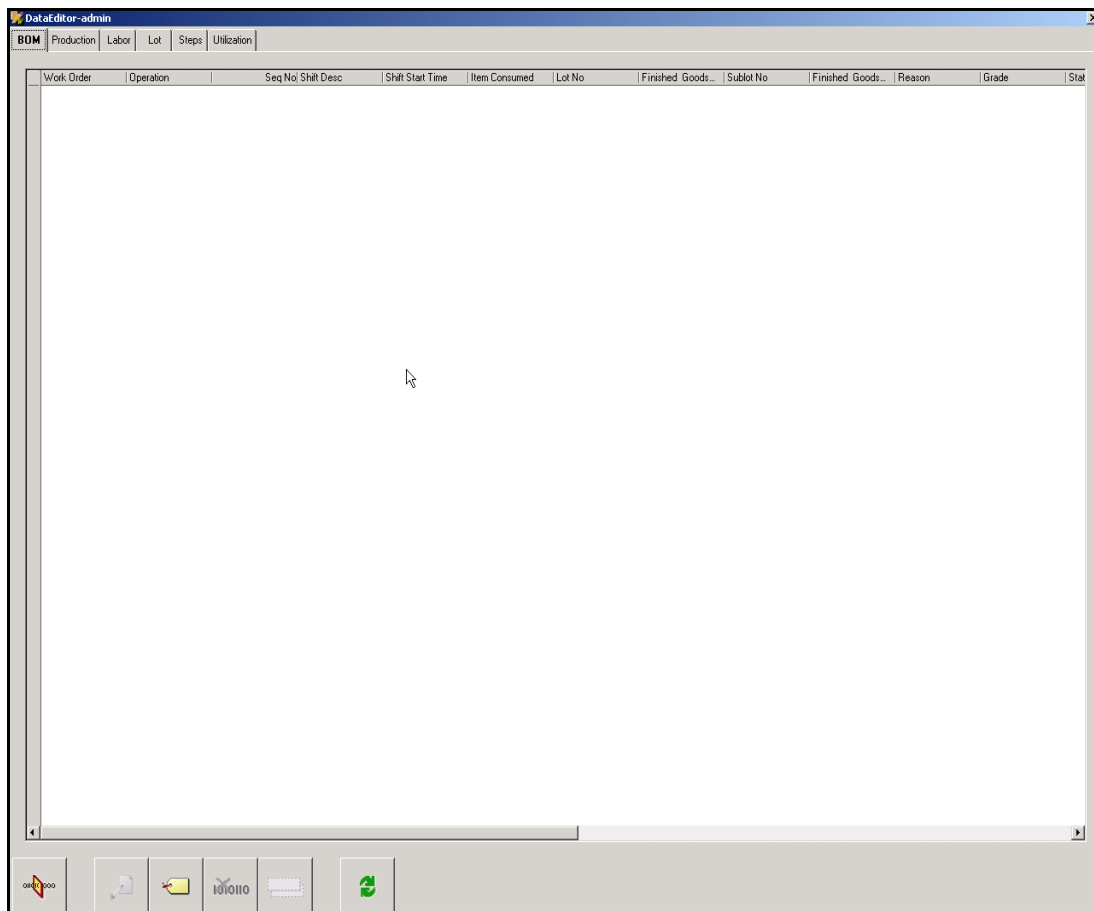
You can access the Data Editor from **Start | All Programs | Wonderware | MES | Data Editor**.



When the Data Editor opens, the **Data Editor** login screen appears.



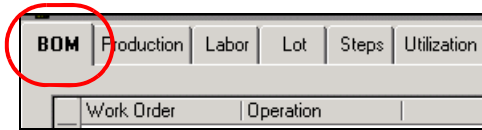
After logging in, the **DataEditor-admin** screen appears.



BOM Tab

The **BOM** tab displays the materials that compose the Bill of Materials and are consumed during production. You can add, edit, or view what is listed for consumption within the BOM. The **BOM** tab is only available if a Tracking Manager license has been purchased.

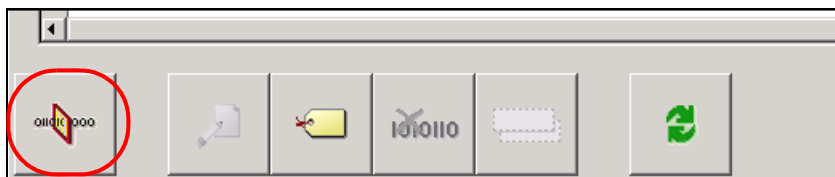
To access the **BOM** tab in the top-left corner of the Data .



The first time you click the **BOM** tab, the **Item Consumption Filter** dialog box will appear.

 A screenshot of the 'Item Consumption Filter' dialog box. It contains various input fields for filtering data: 'Work Order', 'Operation', 'Seq No', 'Shift', 'Shift Start (Begin)', 'Shift Start (End)', 'Item ID', 'Lot Number', 'Finished Goods Lot Number', 'Sublot Number', 'Finished Goods Sublot Number', 'Reason', 'Grade', 'State', 'Run Entity', 'Storage Entity', 'Quantity Consumed (Min/Max)', 'User', 'External Reference', and radio buttons for 'Scrapped' (Consumed, Waste, Both). At the bottom, there are four 'Item_Consumed' spare fields and three buttons: 'Apply', 'Cancel', and 'Clear'.

If the **Item Consumption Filter** dialog box does not appear, then you will need to select the **Enter filter criteria** button located at the bottom-left corner of the **DataEditor-admin** window.

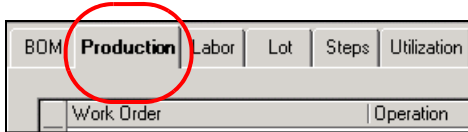


You can search for consumed items using the **Work Order** code, **Reason Code**, or **Item Consumed** name.

Production Tab

The **Production** tab displays the materials that are produced based on the BOM. Information from the production counters you create to track the BOM such as lot codes, vendor information, and consumption amount are all viewable in the **Production** tab. Therefore, the **Production** tab provides a convenient option for viewing produced items. The **Production** tab is only available if a Production Manager license has been purchased.

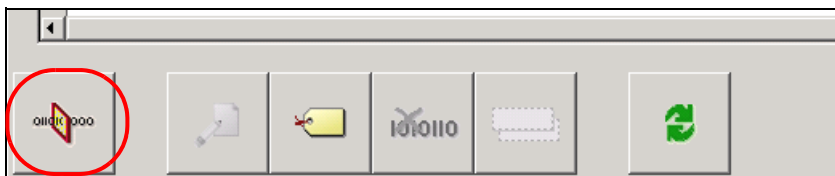
The **Production** tab is located in the top-left corner of the **DataEditor-admin** window.



The first time you click the **Production** tab, the **Item Production Filter** dialog box will appear.

A screenshot of the 'Item Production Filter' dialog box. It contains various input fields and filters for production data. Fields include 'Work Order', 'Operation', 'Seq No', 'Shift', 'Shift Start (Begin)', 'Shift Start (End)', 'User', 'Hour Start (Begin)', 'Hour Start (End)', 'Item ID', 'Lot Number', 'Sublot Number', 'Reason', 'Grade', 'State', 'Run Entity', 'Storage Entity', 'Quantity Produced (Min/Max)', and 'External Reference'. There are also radio button groups for 'Production' (Good, Reject, Both), 'Byproduct' (Byproduct, Main, Both), 'Processed' (Yes, No, Both), and 'Move Status' (Moved, Not Moved, Both). At the bottom, there are four more input fields labeled 'Item_Prod spare 1' through 'Item_Prod spare 4'. The dialog has 'Apply', 'Cancel', and 'Clear' buttons at the bottom.

If the **Item Production Filter** dialog box does not appear, then you will need to select the **Enter filter criteria** button located at the bottom-left corner of the **DataEditor-admin** window.



You can search for produced items using the **Item Production Filter**. You can enter common BOM information such as a work order codes, an operator ID, a reason code, or a shift ID into the corresponding fields of the **Item Production Filter**.

The **Item Production Filter** dialog box contains the following fields and controls:

- Work Order**: Text field with a browse button (...).
- Operation**: Text field with a browse button (...).
- Seq No**: Text field with a browse button (...).
- Shift**: Dropdown menu.
- Shift Start (Begin)**: Text field with a browse button (...).
- Shift Start (End)**: Text field with a browse button (...).
- User**: Dropdown menu.
- Hour Start (Begin)**: Text field with a browse button (...).
- Hour Start (End)**: Text field with a browse button (...).
- Item ID**: Text field with a browse button (...).
- Lot Number**: Text field with a browse button (...).
- Sublot Number**: Text field with a browse button (...).
- Reason**: Text field with a browse button (...).
- Grade**: Dropdown menu.
- State**: Dropdown menu.
- Run Entity**: Text field with a browse button (...).
- Storage Entity**: Text field with a browse button (...).
- Quantity Produced (Min/Max)**: Two text fields with browse buttons (...).
- External Reference**: Text field with a browse button (...).
- Production**: Radio buttons for ☐ Good, ☐ Reject, and ☒ Both.
- Processed**: Radio buttons for ☐ Yes, ☐ No, and ☒ Both.
- Byproduct**: Radio buttons for ☐ Byproduct, ☐ Main, and ☒ Both.
- Move Status**: Radio buttons for ☐ Moved, ☐ Not Moved, and ☒ Both.
- Item_Prod spare 1**: Text field with a browse button (...).
- Item_Prod spare 2**: Text field with a browse button (...).
- Item_Prod spare 3**: Text field with a browse button (...).
- Item_Prod spare 4**: Text field with a browse button (...).
- Buttons**: **Apply**, **Cancel**, and **Clear**.

Section 5 – Rejected Message Viewer

This section discusses the capabilities of the **Rejected Message Viewer**.

Overview

The middleware can reject an MES command message due to errors, such as network errors or invalid inputs. All the rejected MES command messages are stored in the **Rejected Message** table in the MES database. When you open the **Rejected Messages** section, a list of all the rejected messages appears in the .

By default, the **Rejected Messages** section is grouped under the **System Management** group in the **Navigation** pane.

You can use the **Rejected Messages** section to perform the following:

- Retrieve MES command messages from the database that are rejected by the middleware
- Edit and resubmit rejected MES command messages to the middleware
- Delete rejected MES command messages from the database

Without Response Mode

You can use the **Rejected Messages** section to view, edit, resubmit, and delete MES command messages that are rejected by the middleware while using the **Without Response** communication mode.

When the **Without Response** communication mode is used, the MES command messages, such as add production or add consumption are stored in the **Message Queue** table. The stored messages in the **Message Queue** table are sent to the middleware without waiting for any responses from the middleware.

View and Edit Rejected Message Information

You can view and edit the following information of a rejected MES command message:

- **Status** – Shows the status of a message. The green icon indicates that the message is modified, and the red icon indicates that the message contains an error.
- **ID** – Shows the unique identifier number of a message.
- **Time stamp** – Shows the date and time when a message was recorded.
- **Object** – Represents an entity object that is created by configuring the Operations Capability Object. The Operations Capability Object sends messages to the middleware. The messages that are rejected by the middleware are shown in the **Rejected Message Viewer**.
- **Error Message** – Shows the reason for a rejected message.
- **Current Status** – Shows the current status of the rejected messages, such as resubmitted with success or resubmitted with error.

Resubmit a Rejected Message

You can resubmit a rejected MES command message after you edit the message as per the error details, such as invalid inputs. You can also resubmit a rejected message without any editing if the message was not submitted earlier due to network errors such as connectivity problems.

You can simultaneously resubmit multiple rejected messages that do not require any editing, if messages were rejected due to system errors such as database connection error.

When you resubmit multiple messages, each message is submitted in a sequence using the **With Response** communication mode. The **Rejected Messages** section waits for a response for each resubmitted message and then submits the next message in a sequence to the middleware. The status of all the messages is updated in the MES database, and you can see the new status in the tabbed workspace.



invenys
Learning Services



Appendix A – MES Reports in Wonderware Information Server

Overview

The Wonderware MES reports can show you:

- Production data for all shifts for the specified entities and items
- Genealogy to track the specified items
- Overall Equipment Effectiveness (OEE) data
- Production event summaries for Utilization

To view the MES reports through Wonderware Information Server (WIS), first install and configure WIS and then install the Wonderware MES WIS components. Ensure that WIS is installed and configured before you install the Wonderware MES WIS components. Ensure the following before installing the MES reports:

- Reporting Services is running
- SQL Server Reporting Services (MSSQLSERVER) is running
- <http://localhost/reports> page, which is located on the WIS Server Node, displays no errors

Viewing MES Reports in WIS

You can view the available MES reports using either of the following features of WIS:

- Reporting Services
- Table Weaver

To view the MES reports in Reporting Services, select **Reporting Services Reports** when installing the Wonderware MES WIS components. To use the feature, during the installation process set up WIS to use the Microsoft Reporting Services feature and installed Information Server component.

If you select **Table Viewer Reports** during the installation, you can use the Table Viewer feature to view the MES reports. This feature allows you to view downtime reason groups, entities, items, lots, and the work order IDs as a list. You can also use this feature to search the entity names with Date Time Filter for OEE.

Available MES Reports

After the installation of the WIS components, you can view the following MES reports:

- Downtime Analysis Report
- Genealogy by Work Order Report
- OEE Analysis Report
- OEE by Shift Trend Report
- OEE Details Report
- Production by Entity Report
- Production Event Summary for Utilization Report
- Production Event Summary by Utilization Reason Group Report
- Events Report
- Genealogy Report
- Production Report

Downtime Analysis Report

The Downtime Analysis report shows the downtime data of a specified period for the selected parameters.

A downtime event may not end within the specified period. The end of the period is extended to include the full range of the longest event.

The Downtime Analysis report shows:

- The time, number of occurrences, and percentage of total time for each Downtime state reason. Downtime state reasons are grouped and then totaled by the state group
- Total duration and number of occurrences

For each reason group, two bar graphs show the top 10 durations organized by the reason group and reason.

Genealogy by Work Order Report

The Genealogy by Work Order report shows the source items used to produce a destination item. The report shows all consumed items that went into the production of any given item of a specified grade and status.

To generate genealogy, ensure that the produced items of the same production level have a common operation ID, Work Order ID, Sequence Number, and Lot Number. Genealogy does not take sublots into account.

OEE Analysis Report

The OEE Analysis report shows the OEE organized by entity over a specified period of time.

The OEE Analysis report shows:

- Efficiency Analysis Bar Chart displaying the four key performance indicators (KPIs) - percent OEE, percent utilization, percent performance, and percent quality - for each entity that matches the filter criteria
- OEE Trend Line Chart displaying the percentage of OEE per time period for each entity that matches the filter criteria

OEE by Shift Trend Report

The OEE by Shift Trend report shows the data related to the determination of the OEE of an entity for all shifts that started within a specified time period.

The report shows the four KPIs in the form of a table and a line chart. Both the table and line chart are organized by entity, day, and shift over a specified time period.

OEE Details Report

The OEE Details report shows the OEE organized by shift, day, or hour over a specified period of time.

The OEE Details report shows:

- **Efficiency Trend Chart** displaying the four KPIs over a specified time period
- **Efficiency Losses Bar Chart** displaying the total utilization time organized by Idle Time, Scheduled Time, Operating Time, Downtime, Net Operating Time, Fully Productive Time, Speed Losses, and Quality Losses
- **Downtime Events Duration Bar Chart** displaying the total duration by reason code for all downtime events
- **Runtime Events Duration Bar Chart** displaying the total duration by reason code for all runtime events
- **OEE Detailed Information Table**

Production by Entity Report

The Production by Entity report shows the production data for all shifts that started within a specified period for the selected entities and items.

The report shows the units produced, units rejected, and the calculated percentage quality in a table for each item for each entity.

Production Event Summary for Utilization Report

The Production Event Summary for Utilization report shows the production events over a specified period of time.

The Production Event Summary for Utilization report shows:

- Bar Chart displaying the top 10 events organized by reason
- Bar Chart displaying the top 10 event durations organized by reason
- Stacked Bar Chart displaying the chronological event durations organized by entity
- Pareto Chart displaying the event counts and durations organized by the Pareto high or low grouping
- Data table displaying the event details organized by the Pareto high or low grouping

Production Event Summary by Utilization Reason Group Report

The Production Event Summary by Utilization Reason Group report shows the production events organized by the utilization reason groups over a specified period of time.

The Production Event Summary by Utilization Reason Group report shows:

- Reason groups and their descriptions corresponding to an entity
- Production event data corresponding to an entity, such as the event start and end times, total number of events, and total and average duration of events

Events Report

The Events report shows the details of the production events. You can customize the report content as needed by configuring filters.

The Events report shows:

- Summary of PEM events retrieved from the production database. This summary contains the graph of total quantities organized by the event type
- List of events sorted by the selected filter criteria. The events are grouped at the highest level by the selected grouping. They are further grouped at the next level by the material. Within each group, the events are sorted by the event time

Genealogy Report

The Genealogy report shows the genealogy of a specified product. Genealogy is used to trace all the source materials from which an end product is manufactured. This helps identify any defective material or process.

The Genealogy report shows:

- Genealogy organized by the specified production attribute
- Genealogy and reverse genealogy tables
- Genealogy details

You can select either of the following options to view genealogy:

- **Segment ID:** Genealogy is generated by using the process segment and the segment response attributes that link intrasegments, and the specified lot ID or the serial number that link intersegments
- **Genealogy ID and Event Link ID:** Genealogy is generated by using the Genealogy ID that links intrasegments and the Event Link ID that links intersegments. This is the default setting

Production Report

The Production report shows the total quantity of items that are produced according to the event groups.

The Production report shows:

- Production summary that includes a pie chart indicating the production by the specified group within a given date time range
- Details of each production event according to the production items