Oracle® Flow Manufacturing

User's Guide

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Oracle Flow Manufacturing User's Guide, Release 11*i*

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Oracle Flow Manufacturing User's Guide, Release 11*i*

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Preface

Welcome to the Oracle Flow Manufacturing User's Guide, Release 11*i*.

This guide assumes you have a working knowledge of the following:

- The principles and customary practices of your business area.

- Oracle Flow Manufacturing.

  If you have never used Oracle Flow Manufacturing, Oracle suggests you attend one or more of the Oracle Applications training classes available through Oracle University.

- Oracle Self-Service Web Applications.

  To learn more about Oracle Self-Service Web Applications, read the *Oracle Self-Service Web Applications Implementation Manual*.

- The Oracle Applications graphical user interface.

  To learn more about the Oracle Applications graphical user interface, read the *Oracle Applications User's Guide*.

See Other Information Sources for more information about Oracle Applications product information.

How To Use This Guide

The Oracle Flow Manufacturing User's Guide contains the information you need to understand and use Oracle Flow Manufacturing. This guide contains a preface, ten chapters, and three appendices:

- Preface: Explains how this user guide is organized and introduces other sources of information that can help you.

- Chapter 1: Provides an overview of the features in Flow Manufacturing.

- Chapter 2: Describes how to set up Flow Manufacturing.

- Chapter 3: Describes Flow Manufacturing line design, and operation yields and calculations.

- Chapter 4: Describes the Graphical Line Designer Workbench functionality and setup tasks.

- Chapter 5: Describes the Mixed Model Map Workbench functionality and its use in designing a balanced production.

- Chapter 6: Describes Flow Sequencing, the process of determining when items are built on the production line for creating Flow schedules.

- Chapter 7: Describes the functionality in the Line Scheduling Workbench including creating flow lines and scheduling algorithms.

- Chapter 8: Provides an overview of feeder line synchronization, a process that calculates the date and time the subassembly is delivered to the particular line operation.

- Chapter 9: Describes Outbound Broadcast Sequencing—a process enabling the creation of replenishment signals on a Flow line for special supplier requirements.

- Chapter 10: Describes the Flow Execution Workstation, used to track the flow of shop floor work, and complete schedules.

- Chapter 11: Describes the Graphical Kanban Workbench functionality which combines kanban setup, kanban planning, pull sequence definition, and planning simulation.

- Chapter 10: Describes Oracle Flow Manufacturing Reports.

- Appendices:

  - Details the default navgator path for each Oracle Flow Manufacturing window

  - Line Scheduling calculation examples

  - Provides information on the Mixed Model Map window

  - Mixed Model Map Workbench calculations

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Other Information Sources

You can choose from many sources of information, including documentation, training, and support services, to increase your knowledge and understanding of Oracle Flow Manufacturing.

If this guide refers you to other Oracle Applications documentation, use only the Release 11*i* versions of those guides.

Online Documentation

All Oracle Applications documentation is available online (HTML or PDF).

- **PDF Documentation-** See the Online Documentation CD for current PDF documentation for your product with each release. This Documentation CD is also available on Oracle*MetaLink* and is updated frequently.

- **Online Help -** You can refer to Oracle Applications Help for current HTML online help for your product. Oracle provides patchable online help, which you can apply to your system for updated implementation and end user documentation. No system downtime is required to apply online help.

- **Release Content Document -** See the Release Content Document for descriptions of new features available by release. The Release Content Document is available on Oracle*MetaLink*.

- **About document -** Refer to the About document for information about your release, including feature updates, installation information, and new documentation or documentation patches that you can download. The About document is available on Oracle*MetaLink*.

Related Guides

Oracle Flow Manufacturing shares business and setup information with other Oracle Applications products. Therefore, you may want to refer to other guides when you set up and use Oracle Flow Manufacturing.

You can read the guides online by choosing Library from the expandable menu on your HTML help window, by reading from the Oracle Applications Document Library CD included in your media pack, or by using a Web browser with a URL that your system administrator provides.

If you require printed guides, you can purchase them from the Oracle Store at http://oraclestore.oracle.com.

Guides Related to All Products

Oracle Applications User's Guide

This guide explains how to enter data, query, run reports, and navigate using the graphical user interface (GUI). This guide also includes information on setting user profiles, as well as running and reviewing reports and concurrent processes.

You can access this user's guide online by choosing "Getting Started with Oracle Applications" from any Oracle Applications help file.

User Guides Related to This Product

Oracle Advanced Planning Implementation and User's Guide

This guide describes how to use Oracle's supply chain planning performance for forecasting and managing both supply and demand for your items. You plan your requirements, and execute and release the plan for discrete jobs, repetitive schedules, and flow schedules.

Oracle Bills of Material User's Guide

This guide describes how to create various bills of materials to maximize efficiency, improve quality and lower cost for the most sophisticated manufacturing environments. By detailing integrated product structures and processes, flexible product and process definition, and configuration management, this guide enables you to manage product details within and across multiple manufacturing sites.

Oracle Cost Management User's Guide

This guide describes how to use Oracle Cost Management in either a standard costing or average costing organization. Cost Management can be used to cost inventory, receiving, order entry, and work in process transactions. It can also be used to collect transaction costs for transfer to Oracle Projects. Cost Management supports multiple cost elements and multiple subelements. It also provides comprehensive valuation and variance reporting.

Oracle General Ledger User's Guide

This guide explains how to plan and define your chart of accounts, accounting period types and accounting calendar, functional currency, and set of books. It also describes how to define journal entry sources and categories so you can create journal entries for your general ledger. If you use multiple currencies, use this manual when you define additional rate types, and enter daily rates. This manual also includes complete information on implementing Budgetary Control.

Oracle Inventory User's Guide

This guide describes how to define items and item information, perform receiving and inventory transactions, maintain cost control, plan items, perform cycle counting and physical inventories, and set up Oracle Inventory.

Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide

This guide describes how to anticipate and manage both supply and demand for your items. Using a variety of tools and techniques, you can create forecasts, load these forecasts into master production schedules, and plan your end-items and their component requirements. You can also execute the plan, releasing and rescheduling planning suggestions for discrete jobs, repetitive schedules, and flow schedules.

Oracle Order Management User's Guide

This guide describes how to enter sales orders and returns, copy existing sales orders, schedule orders, release orders, create price lists and discounts for orders, run processes, and create reports.

Oracle Purchasing User's Guide

This guide describes how to create and approve purchasing documents, including requisitions, different types of purchase orders, quotations, RFQs, and receipts. This guide also describes how to manage your supply base through agreements, sourcing rules and approved supplier lists. In addition, this guide explains how you can automatically create purchasing documents based on business rules through integration with Oracle Workflow technology, which automates many of the key procurement processes.

Oracle Quality User's Guide

This guide describes how Oracle Quality can be used to meet your quality data collection and analysis needs. This guide also explains how Oracle Quality interfaces with other Oracle Manufacturing applications to provide a closed loop quality control system.

Oracle Work in Process User's Guide

This guide describes how Oracle Work in Process provides a complete production management system. Specifically this guide describes how discrete, repetitive, assemble-to-order, project, flow, and mixed manufacturing environments are supported.

Installation and System Administration

Oracle Applications Concepts

This guide provides an introduction to the concepts, features, technology stack, architecture, and terminology for Oracle Applications Release 11*i*. It provides a useful first book to read before an installation of Oracle Applications. This guide also introduces the concepts behind Applications-wide features such as Business Intelligence (BIS), languages and character sets, and Self-Service Web Applications.

Installing Oracle Applications

This guide provides instructions for managing the installation of Oracle Applications products. In Release 11*i*, much of the installation process is handled using Oracle Rapid Install, which minimizes the time to install Oracle Applications, the Oracle8 technology stack, and the Oracle8*i* Server technology stack by automating many of the required steps. This guide contains instructions for using Oracle Rapid Install and lists the tasks you need to perform to finish your installation. You should use this guide in conjunction with individual product user's guides and implementation guides.

Upgrading Oracle Applications

Refer to this guide if you are upgrading your Oracle Applications Release 10.7 or Release 11.0 products to Release 11*i*. This guide describes the upgrade process and lists database and product-specific upgrade tasks. You must be either at Release 10.7 (NCA, SmartClient, or character mode) or Release 11.0, to upgrade to Release 11*i*. You cannot upgrade to Release 11*i* directly from releases prior to 10.7.

About Document

For information about implementation and user documentation, instructions for applying patches, new and changed setup steps, and descriptions of software updates, refer to the About document for your product. About documents are available on Oracle*MetaLink* for most products starting with Release 11.5.8.

Maintaining Oracle Applications

Use this guide to help you run the various AD utilities, such as AutoUpgrade, AutoPatch, AD Administration, AD Controller, AD Relink, License Manager, and others. It contains how-to steps, screenshots, and other information that you need to run the AD utilities. This guide also provides information on maintaining the Oracle applications file system and database.

Oracle Applications System Administrator's Guide

This guide provides planning and reference information for the Oracle Applications System Administrator. It contains information on how to define security, customize menus and online help, and manage concurrent processing.

Oracle Alert User's Guide

This guide explains how to define periodic and event alerts to monitor the status of your Oracle Applications data.

Oracle Applications Developer's Guide

This guide contains the coding standards followed by the Oracle Applications development staff. It describes the Oracle Application Object Library components needed to implement the Oracle Applications user interface described in the *Oracle Applications User Interface Standards for Forms-Based Products*. It also provides information to help you build your custom Oracle Forms Developer 6*i* forms so that they integrate with Oracle Applications.

Oracle Applications User Interface Standards for Forms-Based Products

This guide contains the user interface (UI) standards followed by the Oracle Applications development staff. It describes the UI for the Oracle Applications products and how to apply this UI to the design of an application built by using Oracle Forms.

Other Implementation Documentation

Oracle Applications Product Update Notes

Use this guide as a reference for upgrading an installation of Oracle Applications. It provides a history of the changes to individual Oracle Applications products between Release 11.0 and Release 11*i*. It includes new features, enhancements, and changes made to database objects, profile options, and seed data for this interval.

Multiple Organizations in Oracle Applications

This guide describes how to set up and use Oracle Flow Manufacturing with Oracle Applications' Multiple Organization support feature, so you can define and support different organization structures when running a single installation of Oracle Flow Manufacturing.

Oracle Workflow Guide

This guide explains how to define new workflow business processes as well as customize existing Oracle Applications-embedded workflow processes.You also use this guide to complete the setup steps necessary for any Oracle Applications product that includes workflow-enabled processes.

Oracle Applications Flexfields Guide

This guide provides flexfields planning, setup and reference information for the Oracle Flow Manufacturing implementation team, as well as for users responsible for the ongoing maintenance of Oracle Applications product data. This manual also provides information on creating custom reports on flexfields data.

Oracle eTechnical Reference Manuals

Each eTechnical Reference Manual (eTRM) contains database diagrams and a detailed description of database tables, forms, reports, and programs for a specific Oracle Applications product. This information helps you convert data from your existing applications, integrate Oracle Applications data with non-Oracle applications, and write custom reports for Oracle Applications products. Oracle eTRM is available on Oracle*MetaLink*

Oracle Manufacturing APIs and Open Interfaces Manual

This manual contains up-to-date information about integrating with other Oracle Manufacturing applications and with your other systems. This documentation includes APIs and open interfaces found in Oracle Manufacturing.

Oracle Applications Message Reference Manual

This manual describes all Oracle Applications messages. This manual is available in HTML format on the documentation CD-ROM for Release 11i.

Training and Support

Training

Oracle offers a complete set of training courses to help you and your staff master Oracle Flow Manufacturing and reach full productivity quickly. These courses are organized into functional learning paths, so you take only those courses appropriate to your job or area of responsibility.

You have a choice of educational environments. You can attend courses offered by Oracle University at any one of our many education centers, you can arrange for

our trainers to teach at your facility, or you can use Oracle Learning Network (OLN), Oracle University's online education utility. In addition, Oracle training professionals can tailor standard courses or develop custom courses to meet your needs. For example, you may want to use your organization structure, terminology, and data as examples in a customized training session delivered at your own facility.

Support

From on-site support to central support, our team of experienced professionals provides the help and information you need to keep Oracle Flow Manufacturing working for you. This team includes your technical representative, account manager, and Oracle's large staff of consultants and support specialists with expertise in your business area, managing an Oracle server, and your hardware and software environment.

Do Not Use Database Tools to Modify Oracle Applications Data

Oracle STRONGLY RECOMMENDS that you never use SQL*Plus, Oracle Data Browser, database triggers, or any other tool to modify Oracle Applications data unless otherwise instructed.

Oracle provides powerful tools you can use to create, store, change, retrieve, and maintain information in an Oracle database. But if you use Oracle tools such as SQL*Plus to modify Oracle Applications data, you risk destroying the integrity of your data and you lose the ability to audit changes to your data.

Because Oracle Applications tables are interrelated, any change you make using Oracle Applications can update many tables at once. But when you modify Oracle Applications data using anything other than Oracle Applications, you may change a row in one table without making corresponding changes in related tables. If your tables get out of synchronization with each other, you risk retrieving erroneous information and you risk unpredictable results throughout Oracle Applications.

When you use Oracle Applications to modify your data, Oracle Applications automatically checks that your changes are valid. Oracle Applications also keeps track of who changes information. If you enter information into database tables using database tools, you may store invalid information. You also lose the ability to track who has changed your information because SQL*Plus and other database tools do not keep a record of changes.

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Overview of Flow Manufacturing

This chapter will give you an overview of the features contained in Oracle Flow Manufacturing, including:

- Overview of Flow Manufacturing on page 1-2
- Demand Management on page 1-3
- Line Design and Balancing on page 1-4
- Line Scheduling and Sequencing on page 1-6
- Production Execution on page 1-8
- Kanban Planning and Execution on page 1-10

Overview of Flow Manufacturing

Flow Manufacturing is a manufacturing approach employing the following practices:

- Building to customer demand rather than building to a forecast

  Reduces finished goods inventories, reduces cost, and increases customer satisfaction.

- Linear manufacturing rather than batch production

  Reduces work in process inventory, rework, and scrap and increases product quality as quality and assembly problems are immediately addressed.

- Mixed model production rather than process layout

  Enables a mix of products to be produced on one production line in the same day, which allows the manufacturer to respond to the demand generated by customer orders.

- In-process quality rather than inspecting quality into the product after assembly

  Builds quality into the product during the production process resulting in less rework, less scrap, lower cost, and higher customer satisfaction.

- JIT Replenishment of component materials rather than receipts of MRP forecasted demands.

  Reduces the amount of component inventory and reduces costs.

- Uses rate-based production rather than work orders

  Simplifies shop floor activities and reduces cost.

- Labor flexibility rather than labor specialization

  Increases productivity and reduces costs.

- Backflush material and costs upon completion rather than at each operation

  Simplifies shop floor activities and reduce costs.

Oracle Flow Manufacturing includes a comprehensive set of features that support the entire flow process from line design and balancing to production execution. It enables implementation of the demand pull system using kanbans for both raw material and in-process assemblies. The planning process is streamlined using Flow schedules to sequence and schedule mixed model production.

The features provided by Oracle Flow Manufacturing are classified into the following categories:

- Demand Management on page 1-3

- Line Design and Balancing on page 1-4

- Line Scheduling and Sequencing on page 1-6

- Production Execution on page 1-8

- Kanban Planning and Execution on page 1-10

Demand Management

Demand management is a factor during both the initial design of flow production lines and the daily execution of the rate-based schedules. During the design phase, the objectives of demand management are to group similar products into families, which allows for planning at an aggregate level and to develop a peak daily volume for all products that will be used for line balancing and kanban planning. During production execution, the objectives are to increase responsiveness to customer demand and to maximize resource use.

Oracle Flow Manufacturing uses the demand management tools provided in Oracle MPS/MRP, Supply Chain Planning and Advanced Planning and Scheduling to plan production volumes.

Line Design

Line design is based upon the anticipated demand for a product or product family. This anticipated demand represents the peak daily volume. All production resources, machines, and labor are then calculated based on these volumes. Additionally, these demand figures and factory schedule hours are used to derive the takt time, or rate that products must be produced to meet the schedule. This figure represents the rate that products must leave the end of the line in order to meet customer demand. See: Product Synchronization on page 3-2

Kanban Planning

Oracle Flow Manufacturing uses a kanban pull replenishment system to signal material requirements and pull material from its defined source as needed to meet daily customer demand. The objective of the kanban replenishment system is to continuously improve the production with zero stock outs, shorter lead times, reduced inventory, and minimal supervision. The statement of demand used to balance flow lines to peak daily demand is generally used size kanbans of

components. The use of a MPS or MRP plan for kanban items gives visibility to the long term plan. This plan is then communicated to trading partners, including marketing and suppliers.

In Oracle Flow Manufacturing, any number of baseline and simulation kanban plans can be created in which kanban quantities for each item or kanban location can be calculated and stored. Optimal kanban quantities can be calculated for the desired demand schedule.

Production Execution

In a flow manufacturing environment, daily production rates tend to be based on customer demand, including marketing orders. Flow lines are balanced with machines and resources to produce at the takt needed to meet the peak daily volume. By design, the daily customer demand should be less than that peak, ensuring that customer demand will be met. However, the mixed and demand represented in daily customer orders are not necessarily in the same ratios as the peak daily volumes design for. To manage the demand fluctuations, Oracle Flow Manufacturing uses simple flow schedules to schedule and sequence sales orders.

Line Design and Balancing

Line design and balancing is the foundation of a flow production line. The objective is to balance lines for mixed model production at the expected peak demand that take the least possible time to execute. This is accomplished through flat product structures and simple processes which can be communicated visually to meet customer demand daily. Line design includes grouping products into product families, defining the processes and events required to produce each product, and re-grouping events into line operations to approximate takt time.

Effective flow line design and balanced production smoothes production and eliminates bottlenecks. Flow lines are designed to reduce production time and resource costs by identifying value add events and eliminating non-value events. Simplified processes are designed to reduce overhead costs by optimizing floor space utilization. This simplified design also helps increase communication on the production floor through visual management tools. Quality is improved by implementing quality into the process, instead of inspecting in at the end.

Product Synchronization

Product synchronization defines the processes used to make each product and the sequence of events within each process. Events are granular tasks within the

process that define the physical activities on the line. Each event is assigned the machine and labor times used to perform the event.

Product synchronization tasks are performed in Oracle Flow Manufacturing using flow routings. Flow routings support both processes and sequence of events. In addition flow routings can be used to define the network of processes including feeder lines, rework loops, and both primary and alternate processes required to produce an item. This will help model the line as is to the system. Flow routings and the routing network are also used to calculating the total product cycle time. Total product cycle time is the longest time path on the production line, including feeder lines, required to make the product.

See Also

Creating a Routing, *Oracle Bills of Material User's Guide.*

Product Synchronization on page 3-2

Mixed Model Map Workbench

The Mixed Model Map Workbench is used to achieve balanced flow lines. The Mixed Model Map Workbench combines the information from the products assigned to a specific line—including their routing, product family grouping, and forecasted demand. This information is displayed in a graphical interface.The takt time is calculated from the daily production requirements (demand) and the available production hours in a day. The summary portion of the Mixed Model Map displays the machine and labor resources needed to meet the takt time. Since takt time establishes the rhythm of the line, all the processes along the line are streamlined to complete within the takt time. This ensures that each product moves from process to process within the takt time, which maintains the steady production rate necessary to meet the demand. See: Overview of Mixed Model Map Workbench on page 5-2

Line Balancing

While engineering provides information on product routings in the form of processes and sequence of events, manufacturing faces the challenge of organizing work on a production line so that bottlenecks are minimized and work cells are balanced. As a result, manufacturing evaluates the feasibility of reorganizing the events into groups that approximate takt time. Managing the imbalances leads to analysis for the following:

- Reducing or eliminating non-value-added work

- Using smaller units for the work, or grouping into larger units

- Increasing resource (machine, labor) capacity

- Increasing in-process inventory

- Adding additional lines

Once the current line has been set up with items, organizations, the flow line, a forecast, and the product routings defined, the line can be balanced through iterative processes using the Graphical Line Designer Workbench. See: Accessing Graphical Line Designer Workbench Windows on page 4-9

Operation Method Sheets

Operation Method Sheets (OMS) provide the needed information to shop floor personnel for performing an operation on the line. This information can include pictures of the assembly process, required materials, and written work instructions. These are the primary tools used to perform the operations and are especially critical on lines making many models.

Oracle Flow Manufacturing supports Operation Method Sheets using the Attachments feature. Multimedia documents can be attached to, and maintained for, each line operation on the flow routing of each item.

Line Scheduling and Sequencing

In flow manufacturing, line scheduling is equal to line design and balancing in terms of importance. A line well designed to meet average daily demand that is scheduled improperly can cause excessive change-over, large peaks in demand to kanbans, or unbalanced demand on resources. Each of these will undermine the line's ability to perform to takt. Oracle Flow Manufacturing allows for the creation and use of simple scheduling rules to schedule either sales or planned orders for the flow line. The objective of line scheduling is to sequence production to maximize resource utilization and minimize delays.

Line scheduling allows for:

- Creation of a scheduling rule based on pre-defined sequencing criteria and scheduling algorithms

- Viewing of all unscheduled orders for your line and choose which orders you want to schedule

- Scheduling the line and viewing the final flow schedule.

Scheduling rules determine the logic used to create flow schedules from orders. They are a combination of sequencing criteria and scheduling algorithms that can

help you pull demand forward or backward in time, in order to meet takt for each day.

Scheduling Algorithms

Scheduling algorithms are used to smooth demand by restricting the number of each assembly that is scheduled in any given day. Demand smoothing is important because the line is designed based on an average daily mix. However, seldom if ever will a line produce exactly the mix for which it was designed. Demand smoothing ensures that the mix is maintained as closely as possible, which helps the line to operate more efficiently and achieve takt time on a daily basis.

> **Note:** Line Scheduling does not schedule a portion of a product: the algorithm rounds decimal quantities up to whole units before scheduling.

Sequencing Criteria

Sequencing criteria is used to determine the priority in which sales orders are scheduled.

Flow Manufacturing Sequencing and Execution

Sequencing is the process of determining the order assembly items are built on a production line. Attributes, constraints, rules, are used in your production lines to create sequencing tasks. The sequence assembly items are built determines the efficiency of the line, and therefore, the productivity of the manufacturing organization. The Sequencing pages enable you to set up task components, generate tasks, and view the results. The Flow Sequencing concurrent program takes the sequencing task as input, and creates Flow schedules to meet production demands.

See Also

Production Execution

As through-put time and inventory levels are driven down during implementation of Oracle Flow Manufacturing, the need for and value of detailed production information becomes less critical. This creates the opportunity to eliminate or streamline production execution transactions. One of the tools provided by Oracle Flow Manufacturing to help in this process is the Work Order-less Completion transaction.

Mixed Model Map Workbench

The Mixed Model Map Workbenchis the tool that Oracle Flow Manufacturing uses to achieve balanced flow lines. After lines have been designed and during the production cycle, the Mixed Model Map becomes a tool to evaluate the impact of the current production schedule on the resources, operational times and in-process kanbans. In this mode, the summary portion of the Mixed Model Map displays the machine and labor resources needed to meet the takt time for the current production load. The baseline comparison highlights where labor resources can be removed to allow for flexing and where extra resources or overtime may be needed to produce to demand. See: Overview of the Mixed Model Map Workbench on page 5-2

Work Order-Less Completions

Production is recorded with the Work Order-less Completion transaction against flow schedules created with the Line Scheduling Workbench. Completions can be either unscheduled or scheduled against a flow schedule. The system backflushes all components and performs resource and overhead transactions upon recording completion of the finished product. Additionally, Oracle Flow Manufacturing allows assembly completions to be recorded without having to create work orders, a job or repetitive schedule, or a flow schedule.

Work order-less completions do the following:

- Backflush pull and push components
- Charge resources and overhead based on the flow routing

See: Work Order-less Completions, *Oracle Work in Process User's Guide*

Manufacturing Costing

The costing method of the organization determines whether mixed manufacturing methods can be used. Costing in a flow environment is usually done using standard costing methods. Average costing may also be used, particularly when used in

conjunction with project manufacturing. Cost variances are collected and posted during the Work Order-less Completion transaction.

Component Picking

You can perform component picking transactions for flow schedules using the rules based system in Oracle Warehouse Management. Flow manufacturing environments use kanban signals to control the replenishment of components on the line. However, the picking functionality can be used for slower moving or randomly used planned components to create move orders for supply push components. The Component Pick Release window is used to select requirements and create move orders. It is a graphical workbench that displays fields applicable to the job or schedule type accessed. The features in component picking for flow schedules include:

- There is a distinct Component Pick Release window for the Flow Manufacturing mode.

- The source for material picked is based on Oracle Inventory allocation rules entered on the Picking Rules window. Or, if Oracle Warehouse Management is installed, rules based picking recommendations.

- Material must be defined at a valid line operation.

- The status of the line must be Open.

- Move orders are generated when all quantities for the flow schedule components can be filled.

- Components must be a supply type of Push.

- Move orders are only generated when the flow schedule components can be filled. If the components are not on-hand, backorders are not created.

- You can run the pick release multiple times until the requirement is filled since move orders are not generated for flow schedules with component shortages.

See Also

Overview of Component Picking, *Oracle Work in Process User's Guide*

Navigating on the Component Pick Release Window, *Oracle Work in Process User's Guide*

Using the Component Pick Release Window, *Oracle Work in Process User's Guide*

Flow Execution Workstation

The Flow Execution Workstation provides features for tracking the flow of work, completing assemblies, and viewing detail information. You can view Flow schedules, line operations and their corresponding event sequences, components, resources, and instructions. The workstation enables you to complete schedules and line operations, customized your display of information, and check for eligible engineering change orders (ECOs). See: Initializing the Flow Execution Workstation on page 10-8

Kanban Planning and Execution

A key objective of flow manufacturing and JIT production is to minimize inventory and increase inventory turns. Raw material is pulled into production as needed to meet demand and the pulled material is replenished using a kanban signal. The minimum amount of material possible, based on replenishment time is held at the line in kanban bins. As each bin is emptied, a signal is issued to replenish the bin and the next bin is used to pull the material.

There are many kanban systems in use today but the most commonly used are (i) the two-bin (two card) system and (ii) multi-bin (multi card) system. Oracle Flow Manufacturing supports both these systems for planning and execution during production.

Calculation of Kanban Size and Number of Cards

Oracle Flow Manufacturing calculates the optimal number of kanbans needed in each kanban location. It can calculate the number of kanbans needed when a bin quantity is specified or it can calculate the kanban size if the number of bins are specified. Oracle Flow Manufacturing allows the simulation of multiple kanban plans. Kanbans currently in use can be compared and adjusted against kanban requirements for consistently varying demands. This process helps in both maintaining minimal material inventory and continuity of material flow from the supplier to the production line.

Pull Sequences

Oracle Flow Manufacturing helps you define the kanban locations for each item along with the supply source information. The supply source can be suppliers, other production lines, other inventory organizations in the enterprise, or other kanban locations in the same organization. A complete chain of demand-supply pull sequences can be defined for kanban planning.

Non-Replenishable Kanbans

Non-replenishable kanbans are used to meet unexpected peaks in demand. For demand variations that are infrequent and unplanned, Oracle Flow Manufacturing allows non-replenishable kanban cards. These cards are created for specific items in specific quantities as needed. Non-replenishable kanbans cycle through the system only once, after which they are removed from production.

Kanban Execution

Oracle Flow Manufacturing generates appropriate events for each kanban signal. For kanbans that are sourced through suppliers, the system can generate requisitions and purchase orders. Sourcing rules can also be used to create blanket releases against purchase contracts. Internal requisitions can be generated for inter-organization replenishments.

Oracle Flow Manufacturing supports different statuses of kanban cards to help track their release cycle. Supported statuses include Full, Empty, In-Process, In-Transit, Hold, and others. Kanban Cards can also be accumulated and released together when a minimum order quantity greater than the kanban size is specified. A number of modifiers such as safety stock days and lot multiplier allow you to create a smooth signaling and replenishment system.

See Also

2

Flow Manufacturing Setup

This chapter describes the processes involved in setting up Oracle Flow Manufacturing, including:

- Setup Objectives on page 2-2
- Setup Steps on page 2-3

Setup Objectives

Setting up Oracle Flow Manufacturing follows the business process for a flow implementation, and relates directly to the tasks performed in the implementation. The sequence the tasks are performed is important in relationship to data dependencies.

> **Note:** For detailed instruction and data field considerations, see: Oracle Flow Manufacturing Implementation Manual.

Oracle Flow Manufacturing setup steps are classified into logical groups, and assigned to business processes to achieve specific implementation objectives. These include:

Setup Prerequisites

- Naming Convention Definition
- Profile Options
- Organizations
- Item Flexfields
- Inventory Parameters
- Cost Accounts Creation for Work in Process costing
- Subinventories creation for flow lines
- Bills of Material Parameters
- Purchasing Setup for suppliers and purchasing functionality
- Order Management Setup for sales orders

Item Templates

- Flow Finished Goods Template, or Flow Assembly—used to define the standard template for creation of Finished Goods items.
- Flow Component Template—used to define the standard template for creation of Flow Components items. A Flow Component can be Buy, Make, or Phantom.

Demand Management

- Products and Parts—defines the products and parts to be produced, and groups them to facilitate demand forecasting and production assembly.

- Bills of Material—creates a bill of materials for the products and parts to include their family relationship, location in the flow line, and the source of their supply.

- Planning—used to identify and create the appropriate planning tools which apply expected demand to the product family structures, item demand locations and item supply locations for calculating the flow line capacity and rates.

Line Design and Balancing

- Flow Line—defines the flow lines, production resources and departments.

- Product Synchronization—defines the activities and processes in the flow line, and balance the resources and processes to meet demand.

Line Scheduling

Define your scheduling rules

Production Execution

Work Order-less Production—to meet daily production requirements.

Kanban Planning and Execution

Define the flow line's replenishment chain for execution of the requested material, just in time, in the expected quantity to the place it is needed.

Setup Steps

Demand Management

In designing a flow line, a company analyzes the market forecast for the products and takes a look at the long term forecast. Since production planning occurs at the aggregate level, creating a production plan involves grouping products into product families. These groupings are based on product's similarities in design, manufacturing process, and resource usage.

In demand management you can assign planning percentages to members of the product family, and use the relationship between a product family item and its members in:

- Forecast explosion

- Consumption

- Master Scheduling

- Capacity and Materials Planning

In production planning you can explode product family forecasts down to the product family members—based on the planning percentages and effectivity dates for the member items.

Sales orders for member items consume the forecast for the member items as well as for the product family. Throughout the application, processing is done at both the aggregate and detail level. The setup objectives of demand management and production planning are achieved through the successful implementation of:

- Products and Parts Setup

- Bills of Material Setup

- Planning Setup

❏ Products and Parts

The objectives of products and parts setup are to create both finished goods and component items, and to group the products and parts in logical product families. This facilitates demand forecasting and production assembly. To implement Oracle Flow Manufacturing it necessary to set up:

- Items

- Product Families

- Product Family Members

- Categories and Category Sets

❏ Bill of Materials

The objective of bill of materials setup is to create a bill of material for the products and parts, and to assign a subinventory to each item in the bill of material. The fundamental setup requirement for Oracle Flow Manufacturing is that the subinventory assigned in the pull sequence for an item matches with the subinventory assigned in the bill of material or item master for the same item. Pull sequences are defined in kanban planning and execution.

❏ Planning

The setup objectives of planning are to identify and create the appropriate planning tools to apply expected demand to the product family structures, item demand locations, and item supply locations. This is used to calculate the Flow line capacity and rates. To implement Oracle Flow Manufacturing it necessary to set up planning capabilities:

- Forecasting
- Master Demand Schedules

Line Design and Balancing

In a Flow Manufacturing environment, products are produced on a flow line to meet customer demand. Typically one flow line makes a mix of products. The exact mix depends on how much flex is built into the line design. Factors that determine flex include employees certified to work multiple processes (operations,) and machines that perform more than one function. You can define and update, but not delete, production lines. A production line describes a unique set of processes or line operations that produce one or more of your products. You can associate production lines with work order-less completions.

In line design and balancing, you define items and inventory organizations, create the flow line, and set up the production synchronization tools to balance the line. The setup objectives of line design and balancing are achieved through the successful implementation of:

- Items and Organizations
- Flow Lines
- Product Synchronization

❏ Flow Line Setup

The flow line is an organization of resources and departments. Once the flow line is defined, processes and activities (events) are applied to create operations on the flow line. Oracle Flow Manufacturing provides a planning tool, the Mixed Model Map Workbench, to calculate process times and volumes to balance resources and events—and optimize flow line efficiency.

To implement Oracle Flow Manufacturing it necessary to set up:

- Flow Lines

- Resources

- Departments

❏ Product Synchronization

Product synchronization is an approach to defining the processes, and sequence of events within each process, to manufacture a product. The objectives of product synchronization are to organize the flow line activities and processes. This is performed while balancing the resources to schedule smooth production while meeting daily demand. After you have defined the organizations, departments, resources and items to be produced on the flow line, you:

- Identify the route each item moves towards completion

- Produce a Mixed Model Map to balance the resources and processes to meet demand

In order to implement these objectives, define and set up:

- Standard Events

- Standard Processes

- Flow Routings

- Standard Operations

❏ Event and Resource Functions in a Standard Processes Example

This example illustrates the relationship of Standard Processes, Resources and Events. A line worker has two work events to perform to install handle bars on a bike—mount bar to frame, and bolt it to the frame

The standard process is to Install Handle Bars. The resource assigned to the process is one line worker. The events assigned to the process are mount and bolt.

❏ Flow Routing Functions in Product Synchronization

Perform product synchronization in Oracle Flow Manufacturing using flow routings. Flow routings support both processes and sequence of events. In addition, you can use flow routings to define the network of processes including feeder lines, rework loops, and primary and alternate processes required to produce an item.

You can also use flow routings and the routing network to calculate the total product cycle time—the longest time path on the production line (including feeder lines) in making the product.

❑ Planning Percentage Functions in Product Synchronization

You can assign planning percentages to each of the operations including primary and alternate operations, and rework loops, to use in the calculation of required material and resources to balance a production line.

Line Scheduling Setup Steps

The primary objective of Line Scheduling is to synchronize production with customer demand. This objective is achieved through the Line Scheduling Workbench. To schedule your production, you must first setup the scheduling rules you will use to prioritize your demand for scheduling purposes

❑ Scheduling Rules Setup

If you are creating a custom rule, this value is user-defined. The following rules are provided in the system:

- Mixed Model—mixed model by order request date

- Level Daily Rate—level daily rate by order request date

- Request Date—order request date with no leveling

- Schedule Date—order schedule date with no leveling

- Promise Date—order promise date with no leveling

- Production Sequence Forward—order schedule date, order production date sequence in ascending order with no level loading

- Production Sequence Reverse —order schedule date, order production date sequence in descending order with no level loading

Production Execution

The primary objective of setting up production execution is to meet daily production requirements. This objective is achieved through the setup of Work in Process Parameters. You can complete assemblies using the Work Order-less Completions window without having to create a job or repetitive schedule. Additionally, if you require quality collection plans for work order-less completions.

Work in Process

Set up parameters in the following tabbed regions of the Work in Process Parameters window:

❑ Discrete

- Default Discrete Class: Flow

- Default Lot Number Type: Based On Inventory Rules

- Respond To Sales Order Changes: Always

❑ Move Transactions

- Require Scrap Account: No

- Allow Creation Of New Operations: Yes

- Allow Moves Over Move Shop Floor Status: Yes

❑ Backflush Defaults

- Supply Subinventory: user defined

- Supply Locator: user defined

- Lot Selection Method: Expiration Date

- Lot Verification: Exceptions Only

❑ Other

- Component ATP Rule: Standard

- Default Over Completion Tolerance%: n/a

Kanban Planning and Execution

An item that is pulled through the kanban system, rather than pushed by the planner, is called a kanban item. The kanban location for a kanban item is the designated location where that item is stored, and where replenishment is delivered. For every kanban item, there is a pull sequence- a series of kanban locations that models the actual replenishment network on the shop floor or external suppliers, specifying the sequence to follow to obtain the kanban item.

❏ Replenishment Chain Setup

The objective of setting up the kanban replenishment chain is to execute the flow of the materials through the line:

- Pull Sequence

- Sourcing Rules

- Assignment Sets

❏ Purchasing Blanket PO, ASL, Sourcing Rules and Quotation

You may enter the supplier and supplier site on the pull sequence. This information is moved to the requisition through the Requisition Import process. If you do not enter the supplier and supplier site information on a pull sequence, and a replenishment signal is generated,—the resulting requisition can pull the source information from a valid source document.

3

Line Design and Balancing Procedures

This chapter describes the steps to design Flow manufacturing lines including:

Product Synchronization

Product Synchronization is the process of defining your product's process flow. This is done through the Flow routing where you are able to define processes, events and operations for your flow line. You can then define the process network, add process yield information, and calculate operation times, yields and total product cycle time.

Standard processes and standard operations must be created before adding them to your flow routing. They are created either on the Graphical Line Designer Workbench, or in the Standard Processes or Standard Operations windows. See: Creating the Graphical Network on page 4-29

To create product synchronization for standard items:

1. Navigate to the Flow Routing window, and create a Flow routing for an item.

    To reduce data entry, you can copy the product family Flow routing to the product level Flow routings. You can then modify as needed. Processes and line operations that are copied from the family to the member will retain any references to corresponding standard processes or line operations.

2. Assign the processes and events that you have defined.

> **Note:** Processes should either be copied or referenced from the standard processes. Events can be flow routing specific and do not have to be copied or referenced.

3. Assign resources to non-standard events.

> **Note:** To edit the resources for a standard event, deselect the referenced check box.

4. Optionally, enter Process Yields.

5. Create a routing network. See:Creating a Routing Network on page 3-14

6. Calculate operation yields.

7. Calculate operation times.

8. Calculate total cycle time (TPCT).

9. Optionally, create a forecast, master demand schedule, and / or master production schedule with demands for the items.

> **Note:** This step is not part of the product synchronization procedure and can be performed at any time before generating the mixed model map.

To create product synchronization for product family items

1. Navigate to the Flow Routing window.

2. Optionally, create a flow routing for the product family item. Assign the processes and events that you have defined.

> **Note:** Processes should either be copied or referenced from the standard processes while events can be flow routing specific and do not have to be copied or referenced.

3. Assign resources to the non-standard events.

> **Note:** Processes should either be copied or referenced from the standard processes. Events can be flow routing specific and do not have to be copied or referenced.

4. Optionally, enter Operation Yields.

5. Calculate Operation Yields.

6. Calculate Operation Times.

7. Calculate total cycle time (TPCT).

8. Create a flow routing for the members of the product family. You can copy the family routing to the members, then edit as needed. Recalculate Yields Operation Times, TPCT.

9. Optionally, create a forecast, master demand schedule, and/or master production schedule with demands for the members of the product family.

> **Note:** This step is not part of the product synchronization procedure and can be performed at any time before generating the mixed model map.

Defining Flow Manufacturing Standard Processes

Standard Processes can be created and used only with Oracle Flow Manufacturing. Processes are generic activities that often comprise of multiple events which are performed in a specific sequence.

> **Note:** Processes and standard processes can also be created on the Graphical Line Designer Workbench. See: Creating the Graphical Network on page 4-29

Prerequisites

To define flow manufacturing processes, you must first define a line in Oracle Work in Process.

To define a Standard Process for a flow manufacturing line

1. Navigate to the Standard Processes window.

2. Enter the line identifier, sequence number, code and description.

3. Select a department.

4. Optionally, enter a display sequence and minimum transfer quantity.

Defining Flow Manufacturing Standard Events

Standard Events can be created and used only with Oracle Flow Manufacturing. Events and standard events can only be created and used with Oracle Bills of Material. Events and Standard Events can also be created on the Graphical Line Designer Workbench. See: Creating the Graphical Network on page 4-29

Note: When using Oracle Flow Manufacturing, the Operation Sequence on the Bill of Materials refers to the Event Sequence.

Prerequisites

To define Flow manufacturing line operations, you must first define a line in Oracle Work in Process.Defining Production Lines, *Oracle Work in Process User's Guide*.

To define a Standard Event for a flow manufacturing line

1. Navigate to the Standard Events window.

2. Enter the code and description.

3. Choose the Event Resources button to define resources.

   When defining events, you must choose whether a resource is scheduled or not scheduled. In Flow, a non-scheduled resource is a resource that is used in parallel to a scheduled resource. Un-scheduled resources are included in the total time for the resource type (labor or machine), but is not included in the total elapsed time for the process. Scheduled resources are included in both.

   Therefore, in the case of parallel processes, the activity with the longest resource time should be scheduled because the system elapsed time calculation should always consider the longest resource time.

See Also

Creating a Routing Network on page 3-14

Calculating Operation Times on page 3-15

Defining Flow Manufacturing Standard Line Operations

Standard operations for flow manufacturing allows you to create line operations for a regular manufacturing line as well as a flow manufacturing line. In Oracle Flow Manufacturing, Operations are used to group events into balanced work groups. They are generally defined and assigned after viewing the Mixed Model Map although they can be entered at any time.

> **Note:** Operations and standard operations can also be created on the Graphical Line Designer Workbench. See:

> **Note:** When using Flow Manufacturing, the Operation Sequence on the BOM refers to the Event sequence.

To define a Standard Line Operation for a flow manufacturing line

1. Navigate to the Line Operations window.

Line	Code	Description	Department	Display Seq	Min Transfer Qty	Option Dependent	[ ]
Laptops	LOP1	Shell Fabrication	METAL_FAB	10	0	☑	
Laptops	LOP2	Shell Assembly	ASSEMBLY	20	0	☑	
Laptops	LOP3	Test Station 1	TESTING	30	0	☑	
Laptops	LOP4	Final Assembly	ASSEMBLY	40	0	☑	
Laptops	LOP5	Test Station 2	TESTING	50	0	☑	
Laptops	LOP6	Packaging	PACKAGING	60	0	☑	
						☐	
						☐	

2. Enter the line identifier, sequence numbers, code and description.

3. Select a department and optionally choose the remaining options.

Flow Manufacturing Line Balance

To balance a Flow manufacturing line

1. Generate a mixed model map for a line, product family, or forecast. You can also assign a boost percentage, number of days, and number of hours per day for the line.

    The Mixed Model Map Workbench displays the line takt time, process takt times, and weighted average times. See: Overview of the Mixed Model Map Workbench on page 5-2

2. Create line operations for the current line.

    See: Creating the Graphical Network on page 4-29

3. Assign line operations to the product level routings.

    > **Attention:** You can copy or reference all of the line operations for the current line into the routing to reduce data entry effort.

4. Regroup events on each product level routing into line operations to approximate takt time.

    You can do this by assigning the line operation in the Parent Line Op field of the event.

5. Create a routing network for operations.

6. Optionally, add yields to operations.

7. Recalculate yields, operation time and total cycle time, using operations instead of processes.

    Regenerate the mixed model map by line operation to review and confirm that the line is balanced. The mixed model map will also show the resource (machine/labor) and IPK requirements. See: Overview of the Mixed Model Map Workbench on page 5-2

Creating a Flow Routing

To create a product synchronization you can design a flow routing including events, processes, and line operations.

> **Attention:** You cannot create Flow routings for planning or pick-to-order items.

Prerequisites

❏ You must define at least one department before you can create a routing.

❏ You must define a line.

❏ BOM Allowed must be set to Yes for the item you are creating a routing for.

> **Note:** You can create a routing manually, copy an existing routing, or reference a common routing. See: Copying Bills and Routings and Referencing Common Bills and Routings

To create a Flow routing

1. Navigate to the Routing window.

2. Select the item for which you are creating a flow routing.

> **Note:** You can create a flow routing for a product family item.

> **Attention:** For ATO Items, the ATO Model Flow Routing will be used for line balancing, and will be used to create the configured routings during auto-create config. Therefore, define a routing for the model that contains all possible events, processes and operations for all possible options in your model. Then assign the model routing as a common routing for all option classes.

3. You can assign an existing routing, copy a routing, or create a new one.

   ▪ To assign a common routing, choose Assign Common Routing from the Tools menu and select an item to copy.

- To copy an existing flow routing, choose Copy Routing From in the Tools menu and select an item to copy.

- To create a new routing, select the Events, Processes, or Line Operations tab to define the elements of your flow routing.

4. If you are creating an alternate flow routing, enter an alternate. For a primary flow routing, do not enter an alternate. See: Primary and Alternate Routings

   Note: To create a standard (non-flow) routing for the same item, you must first switch to the Bills of Material responsibility.

5. Enter the line for which you are creating the flow routing.

6. If you are updating an existing flow routing, enter the routing revision and the effective date.

   Note: Items can have flow and non-flow routings. To define non-flow revisions, you must switch to the Bills of Material Responsibility.

7. Optionally, enter a total cycle time for the flow routing.

   The total cycle time can be manually input now or can be calculated by the application after you have defined processes and events.

8. If you would like this item to be considered in the capable to promise capacity check, select the Capable to Promise button.

   Note: Capable to promise describes an available to promise calculation that considers both available material and capacity of manufacturing and distribution resources. You are able to define one and only one CTP routing for each item.

9. Select a display option to display All, Current, or Future and Current operations effective as of the revision date you specify.

10. There are three ways to set up events, processes, and operations:

■ Choose the Process tab and enter the first process sequence and code. Choose the Events button and enter all events for that process. Close and repeat for all processes. When you are ready to balance your line, choose the operations tab to enter operation sequences and codes. Then assign events to the operations through either the event tab or the routing network designer.

> **Note:** The sequence number determines the order in which the processes are displayed in the Mixed Model Map Workbench.

■ Choose the Process tab, and enter in all process sequences and codes. Optionally, choose the Operations tab, and enter all operation sequences and codes. Choose the Events tab, and enter in each event in sequence, assigning each to a process, and optionally operation.

■ Choose the Process tab, and enter in the desired processes. Optionally, choose the Operations tab and enter the desired operations. Choose Events, and enter the desired events. Use the Routing Network Designer to assign events to a process, and optionally, to line operations.

> **Attention:** In Oracle Flow Manufacturing, the operation sequence on the BOM refers to the event sequence on the routing where the part is used.

> **Note:** The operation sequence and code must be unique for each flow routing.

11. If you are using non-standard events or editing standard events, choose the Event Resources button from the Events tab and define resource values. For an event, you can also define a department, parent process, and parent line operation.

> **Note:** Processes and line operations must already be assigned to the routing before you assign them to events. See: Three Ways to Setup Events, Processes, and Operations.

12. Enter an effective date range.

13. For operations in ATO model and option class flow routings only, indicate whether the event is option dependent. An event is option dependent when the event is dependent on the choice of an optional component. The default is enabled. A configured routing will contain all selected components and their related events, all mandatory components and their related events, and all events which are not assigned to a specific component.

> **Note:** All processes and operations will always appear on the configured routing, regardless of whether or not any events assigned to them are included.

> **Note:** You can attach Operation Method Sheets (OMS) to routing events. This will enable you to create custom OMS for ATO items.

14. Choose the WIP tab to indicate whether to backflush components on shop floor moves at this operation. A backflush transaction automatically pulls operation pull components from inventory. Work in Process also pulls all Operation pull components at non-backflush operations preceding this operation using the previous completed backflush operation. The default is Enabled.

15. Choose the Operation Times tab to define or view operation times and yields.

16. To view rolled-up operation times, select Calculate Operation Times from the Tools menu. Optionally, enter user defined times. Either can be used in Mixed Model Map Workbench calculations.

17. Switch to the Operation Times tabbed region and optionally enter operation yield values for processes and/or line operations.

> **Note:** Operation yield values are required to perform calculation of cumulative and reverse cumulative operation yields.

18. Create a routing network.

19. Once the routing network is created, calculate cumulative yield, reverse cumulative yield, and net planning percent, by selecting Calculate Operation Yields from the Tools menu. Choose Update Events to add these yields and

calculations to events. This is required if you want kanban planning to consider process yields when calculating kanban sizes.

> **Note:** You can also manually insert these values.

20. To calculate Total Product Cycle Time, choose Total Cycle Time from the tools menu.

21. To enter completion subinventory and locator information, view a common flow routing, or enable the routing for use in the Mixed Model Map Workbench choose the Routing Details button to open the Routing Details window.

> **Note:** If this item is a member of a product family, it will be specified in the Product Family field of the Routing Details window. This field is read-only.

> **Note:** For an item to be eligable for display and use in the Mixed Model Map Workbench for a line, you must have a routing enabled for Mixed Model Map. You can only select one routing per item to be included in a mixed model map.

22. While in the Routing Details window, optionally, enter a priority. Lowest priority routing will be used for backflushes and during auto-create config on ATO items.

23. Save your work.

Creating a Routing Network

In defining product synchronization you must specify the network of processes through which the item is routed. This includes specifying alternate processes, planning percent, rework loops, rework percentage, and feeder lines. The Routing Network Designer is a graphical tool that allows users to define a product routing network as a visual network of operations and flows.

Prerequisites

❏ You must have defined events and either processes or line-operations.

❏ If you are using a copied routing, you must first save the routing before you can see and edit the routing network.

To create a flow routing network:

1. From the Routing window, choose Routing Network.

2. Choose to view either processes or line-operations by selecting the appropriate tab.

   When the Routing Network Designer window appears, all of the processes or line operations are listed in the left canvas and graphically represented on the right.

   > **Attention:**   You cannot mix processes and line operations in the same window.

3. Choose Connector at the top of the screen to create a link between any two processes/line operations.

4. Then select a process or line operation and drag to the process or line operation you are linking.

   A window displays, enter the connection type and the percentage of material from is moving from the source.

   > **Note:**   If you drag a connection and drop it on a part of the canvas or where there are no processes/line operations, the entire drag-and-drop sequence is cancelled.

> **Note:** The total outgoing primary and alternate path percentages must be less than or equal to 100%. If you try to make a path in which the total outgoing percentage to greater than 100%, you will get an error.

5. You can associate an event with a process/line operation by dragging the event to a process or line-operation directly above the events.

   If you have not already associated events with processes or line operations, the events are listed on the bottom left of the window.

   If you have already associated events to processes and/or line operations, you can drill down into a process or line operation to view the events composing the process/line operation. Events are moved from process to process by dragging and dropping.

   When you drag and drop events around the Routing Network Designer tree, the times on the process and Line Operation nodes change dynamically.

6. You can access node information through two buttons located on the right of the tool bar.

   Description: allows you to view the description on the nodes.

   Times: allows you to view the machine, labor and elapsed times on the nodes of the tree. You can toggle between User Times or Machine Calculated Times views.

   > **Note:** Any event can be associated with one and only one process or line operation.

7. Save your work.

See: Creating the Graphical Network on page 4-29

Calculating Operation Times

You can calculate machine time, labor time, and elapsed time for your processes, line operations, and events defined in your flow routing. You can also enter your own machine times, labor times and elapsed times in the Flow Routing window.

Prerequisites

❏ You must first define any events, processes and line operations to be included in your flow routing.

To calculate operation times

1. Navigate to the Flow Routing window.

2. Place your cursor in the Total Cycle Time field in the header.

3. Select Calculate Operation times from the Tools menu. Choose to calculate either process times or operation times.

> **Note:** In the Flow Routing window the unit of measure for all times is hours.

> **Note:** You must re-perform the operation times and total product cycle time calculations any time you make a change to events, processes or operations.

> **Note:** You can also enter your own machine times, labor times, and elapsed times in the Flow Routing window. To do so, manually enter this information in the User Machine Time, User Labor Time, and User Elapsed Time fields. You determine when creating a mixed model map, whether the calculations are based on rolled-up or user entered times.

Operation Times Calculations

The operation times calculations are based on resources in the Flow Routing which have the resource unit of measurement (UOM) in the UOM class associated with the BOM profile option, BOM: HOUR UOM.

Calculated Labor Time

Calculated labor time per event is the sum of both scheduled and unscheduled labor resource usage rates for the event. Calculated Labor Time per process or operation is the sum of the labor times for all the events underneath each process or

operation. If you entered events by lot, it will temporarily convert the number to an item basis for the purposes of this calculation.

Note: For ATO model routings: The program goes to the multi-level BOM for the model, and searches for the planning percentage on items that are assigned to specific routing events. It then multiplies the calculated labor time for this event by the planning percent to get a weighted value for the event time. If an event is NOT assigned to any part on the multi-level BOM, planning percent is assumed to be 100%

This will work only if you define a routing for the ATO model, and than use it as a common routing for all the option classes underneath it.

Each Option on the routing must belong to a unique event in order for operation calculations to be successful.

Calculated Machine Time

Calculated Machine Time is the same as Calculated Labor time, only it uses the scheduled and unscheduled machine resources for each event.

Calculated Elapsed Time

Calculated Elapsed Time for each event is the sum of the scheduled Labor and Machine usage rates for each event. Elapsed time per process or operation is the sum of the elapsed times for all the events underneath each process or operation. If you entered events by lot, it will temporarily assumes the time entered is per item for the purposes of this calculation.

Times for ATO model routings are adjusted based on the planning percent of the item assigned to an event, as described in calculated labor times.

Calculating Total Product Cycle Time

You can calculate the total product cycle time (TPCT) for your line. TPCT is the sum of all elapsed event times along the longest path on your Flow Line.

Prerequisites

❑ You must first define the events, processes and/or line operations to be included in your flow routing.

❑ You must first create a routing network for either processes or operations.

❑ You must first calculate operation times

To calculate Total Product Cycle Time

1. Navigate to the Flow Routing window.

2. Place your cursor in the Total Cycle Time field in the header.

3. Select Calculate Total Cycle Time from the Tools menu. Choose to calculate either process times or operation times.

   Total Product Cycle time is always calculated using the rolled-up (system calculated) elapsed times, even if you entered manual elapsed times. You can manually enter a Total Cycle Time as well.

   You must re-perform the operation times and total product cycle time calculations any time you make a change to events, processes or operations.

   Once the routing network and the Total Cycle Time for a routing is finalized for each item on your flow line, return to the organization item master and update the fixed lead time to equal your total cycle time. The Takt time (which is displayed on the MMM) for the line should be entered in the variable lead time

   Note: In the Flow Routing window, the unit of measure for all times is hours.

Calculating Operation Yields

The system will calculate the cumulative yield, reverse cumulative yield and net planning percent for each process and line operation. This information is used in Mixed Model Map Workbench calculations and kanban planning.

Prerequisites

❑   Optionally, enter a value for yield at some or all processes or line operations.

❑   You must define a routing network for either the processes or the line operations.

To calculate operation yields

1. Navigate to the Flow Routing window.

2. Place your cursor in the Total Cycle Time field in the header.

3. Select Calculate Operation Yields from the Special menu.

4. Select process or operation. Choose update events to translate yields and net planning percent to events.

> **Attention:**   You must update events (manually or by choosing to update events when you perform the calculations) if you want kanban planning to consider yields when sizing kanbans.

> **Attention:**   If you have yields in your line, you must either calculate or manually enter operation yields for each process/line operation for the mixed model map results to be accurate

Operation Yields Calculations

The system will calculate the cumulative yield, reverse cumulative yield and net planning percent for each process and line operation. This information is used in Mixed Model Map Workbench calculations and kanban planning. Please see the diagram below for an illustration of the set-up used in the example calculations.

Feeder Line — 100 → 200

Primary Path — 10 — 80% → 20 → 30 → 40 → 50

5% Rework (from 50 to 30)

(0.90) (0.95) (0.98)

20% → 25

Alternate Path
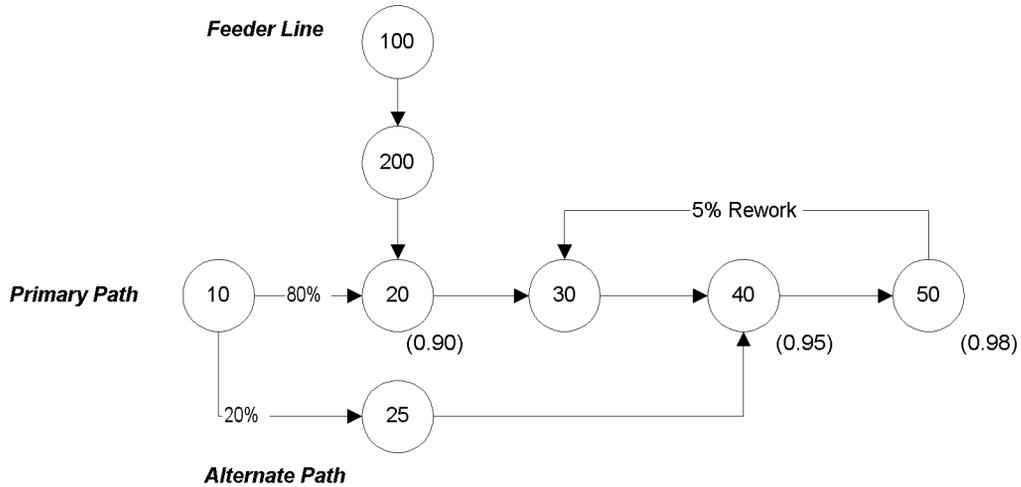
In the above example, the primary path is operation 10 through 50. The numbers in parenthesis are the yields for the operation number above it, as entered by the user. The percentages on the network paths represent the network percent assigned to each path via the routing network designer. Blank paths assume 100% network percentages. (The incoming network percentage for the first operation and the outgoing network percentage for the last operation is always 100%.

)

> **Attention:** Any alternate path must skip at least one operation (or process) on the main line in order for the yield and planning percent calculations to work properly.

Net Planning Percent

The system calculates the net planning percent by using the following formula.

$N_c = S (P_p * I_c) + S_r (I_o * W_o)$

Where:

N = Net Planning Percent, in decimal format

S = sum over all paths

P = Planning Percent = $(P_p * I_c)$ (system calculated - not displayed)

> **Note:** Planning percent for the first operation is always 100%.

I = Incoming Network Percent, in decimal format (From Routing Network)

> **Note:** Incoming network percent for the first operation is always 100%.

p = previous operation

c = current operation

Sr = Sum over all rework loops within which is this operation

W = Rework percent (from the routing network)

o = Operation originating the rework

In other words, the system calculates the net planning percent by taking the sum over all primary and alternate paths of the product of the network percentages along that path, then adds a rework calculation if the operation is within the rework loop. The planning percent and incoming network percent for the first operation on the primary path is always 1. The planning percent for the Feeder line is always the same as the operation to which they feed.

The rework calculation is equal to the planning percent of the rework's originating operation, times the rework percent coming from that operation (in this example, OP50 is the originating operation for the rework, and it's planning percent is 100%, and the rework loop is 5%. Therefore the rework calc is 100%*5% = 5%. This value is added to all operations in the loop (30, 40 and 50)

The number of paths are determined by working backwards along primary and alternate paths from the end of the line (so in the example, operations 30, 40 and 50 each have two paths due to the alternate path.

> **Attention:** If a rework loop returns to an operation that is also fed by a feeder line, the feeder line will include the rework loop percent in the Net Planing Percent.

Operation	Incoming Network Percent	Planning% Calculation	+	Rework Calculation	Net Planning Percent
10	100	1 * 1	+	0	1
20	80	1* 0.80	+	0	0.84
25	20	1* 0.20	+	0	0.20
30	100	(1 * 0.80 * 1)	+	1 *.05	1.05
40	100	(1 * 0.80 * 1 * 1 + 1 * 0.20 * 1)	+	1 *.05	1.05
50	100	(1 * 0.80 * 1 * 1 * 1 + 1 * 0.20 * 1 * 1)	+	1 *.05	
100	feeder - so it uses network% from 20	0.80	+	0	0.80
200	feeder - so it uses network% from 20	0.80	+	0	0.80

Cumulative Yield

The cumulative yield for the first operation along the main line and any feeder lines is the yield entered by the user. The system calculates the cumulative yield for all other operations using the following formula:

$$C_c = Y_c * S (C_p * P_p * I_c / P_c)$$

Where:

C = Cumulative Yield

Y = Yield (User entered)

S = sum over all paths

P = Planning Percent, in decimal format (P = Net Planning% - Rework Calc)

I = Incoming Network Percent, in decimal format (From Routing Network)

p = previous operation

c = current operation

For example, operation 20 in the example above:

C20 = Y20 * S(C10 * P10 * I20 / P20) = 0.90 * (1 *1 * 0.8 / 0.8) = 0.9

Starting from the front of the line, the results for the example are:

Operation	Yield (User Entered)	Incoming Network% (from routing network)	Plan% (from table above)	Cumulative Yield Calculation	Cumulative Yield
10	blank	100	1	1	1
20	0.90	80	0.8	0.90 * (1 * 1 * 0.8 / 0.8)	0.90
25	blank	20	0.2	1 * (1 * 1 * 0.2 / 0.2)	1
30	blank	100	0.8	1 * (0.9 * 0.8 * 1 / 0.8)	0.9
40	0.95	100	1	0.95 * ((0.9 * 0.8 * 1 / 1) + (1 * 0.2 * 1 / 1))	0.874
50	0.98	100	1	0.98 * (0.874 * 1 * 1 / 1)	0.8565
100	blank	100	1	1	1
200	blank	100	1	1 * (1 * 1 * 1 / 1)	1

Reverse Cumulative Yield

The reverse cumulative yield for the last operation along the main line is the yield entered by the user. The system calculates the reverse cumulative yield for all other operations using the following formula:

R c = Y c * S (O c * R n)

Where:

R = Reverse Cumulative Yield

Y = Yield (User entered)

O = Outgoing Network Percent, in decimal format (From Routing Network)

> **Note:** Outgoing network percent for the first operation is 100%.

n = next operation

c = current operation

S is the sum over all outgoing paths

For example, operation 20 in the example above:

R20 = Y20 * S(O 20 * R 30) = 0.90 * (1 * 0.931) = 0.8379

Operation	Yield	Outgoing Network%	Reverse Cumulative Yield Calculation	Reverse Cumulative Yield
50	0.98	100	0.98	
40	0.95	100	0.95 * (1 * 0.98)	0.98
30	blank	100	1 * (1 * 0.931)	0.931
20	0.9	100	0.9 * (1* 0.931)	0.8379
25	blank	100	1 * (1 * 0.931)	0.931
10	blank	80 and 20	1 * ((0.8 * 0.8379) + (0.2 * 0.931))	0.85652
200	blank	100	1 * (1 * 0.838)	0.8379
100	blank	100	1 * (1 * 0.838)	0.8379

4

Graphical Line Designer Workbench

This chapter describes the functionality in the Graphical Line Designer Workbench including:

Overview of the Graphical Line Designer Workbench

The Graphical Line Designer Workbench offers an integrated user interface for performing product synchronizations. This workbench enables the automatic creation of standard processes, standard events, and standard operations by using defaulted information. The features in the Graphical Line Designer Workbench include:

- Ability to drag and drop icons onto a canvas to add processes, events and line operations to the item routing.

- Processes, events, and line operations added to a routing are also automatically added to the line as a standard entity.

- Routing calculations are automatically performed every time a change is made to the routing.

- Information fields for Quality, value added, and process efficiency

- Ease of use features for drawing size changes, and graphical view of network planning percentage connections under 100 percent.

See Also

Product Synchronization on page 3-2

Navigating on the Graphical Line Designer Workbench on page 4-3

Accessing Graphical Line Designer Workbench Windows on page 4-9

Creating the Graphical Network on page 4-29

Events, Processes, and Line Operations

Events represent the detailed work content of your line. You can assign resources and times to events.

Processes are generally logical groupings of events that represent what is being done on the shop floor before going to flow. They can equal the discrete routing operations (assembly, welding, machining, test, and so forth). They can also be at an even lower level than that—especially in an assembly environment (assemble fan, add engine, inspect welds, and so forth). You may want to define processes first to give you a chance to take a look at the balance of your shop before moving to flow, using the Mixed Model Map Workbench. It gives you a starting point to divide or group work to equal takt. You are not required to define processes.

Operations are balanced groupings of events, and represent the workstations on your flow line. They may be more detailed than processes such as when one process

is divided into several operations. Or, operations may be more generic such as when several processes are grouped into a single operation. This may be the case in a low volume assembly shop. Operations must be defined in order to be able to scrap assemblies through work order-less completions, to use the flow workstation, and to perform feeder line synchronization.

Navigating on the Graphical Line Designer Workbench

The Graphical Line Designer Workbench is comprised of two panes. The left pane is the tree hierarchy and the right pane displays the graphical network.

The View By list box allows you to change the way you view data in the tree—your choices are by Item, Product Family, or Common Routing.
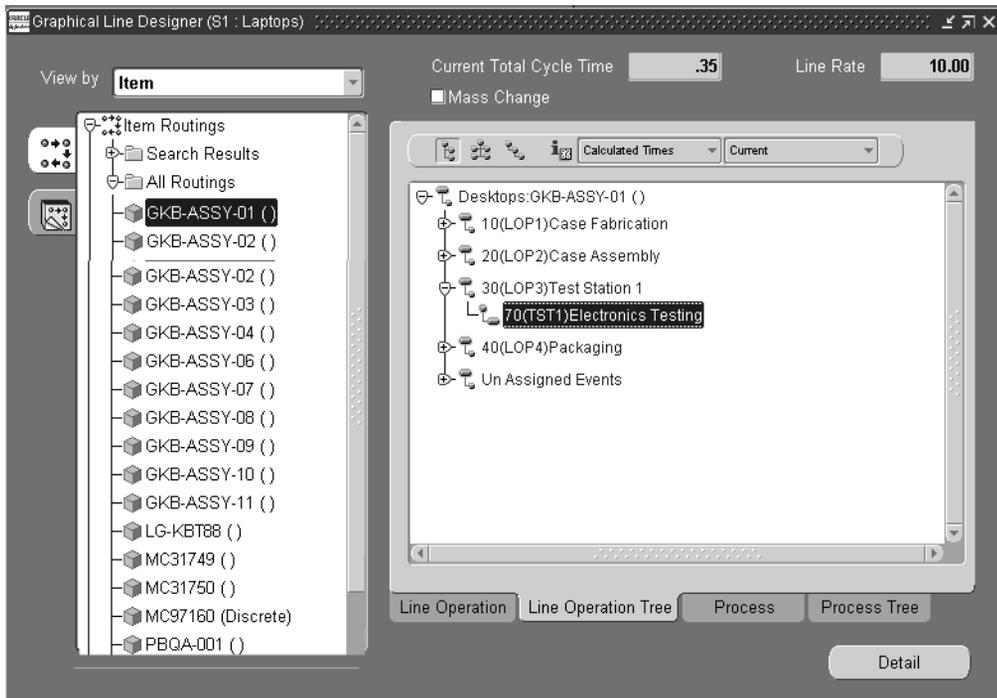
There are two tree tabs located to the left of the tree hierarchy that enable you to toggle between the Item Routings and Template Routings views on the right pane. The Item Routings tab displays the routings for all items assigned to the designated line, while the Templates tab gives access to product family routings that can be

used as templates for copying information into routings. The right pane contains the data that is associated with the selected item on the tree. When an item is selected four tabs at the bottom of the window provide access to windows displaying Line Operation network, Line Operation Tree, Process network, and Process Tree.

Resizing the Detail Pane

You can change the size of the detail pane—enabling you have a larger working canvas area when creating and modifying the graphical network.
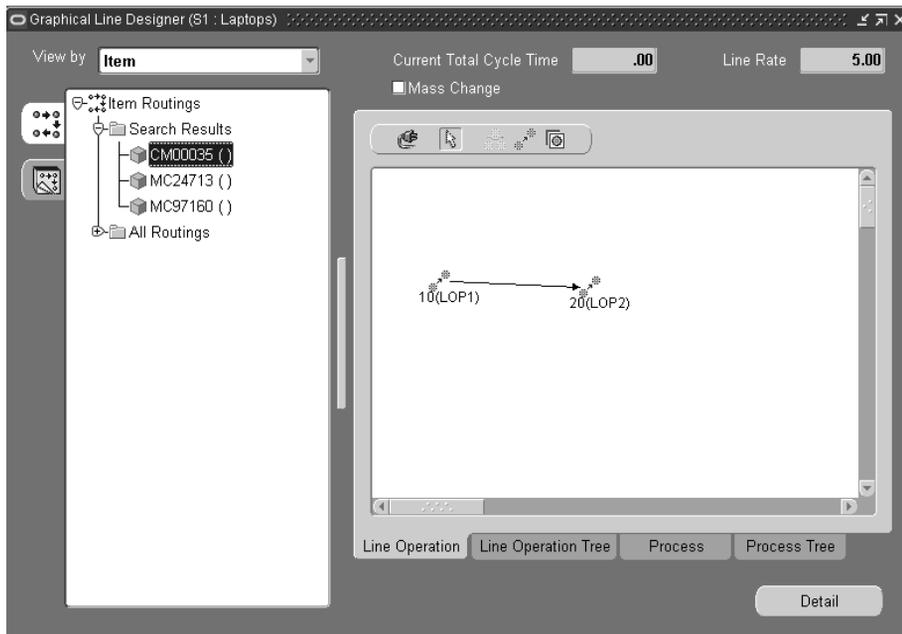
To resize the Graphical Line Designer Workbench window:

❑ Select the button between the navigation tree, and the detail pan, to maximize the window.

When you maximize the window size in this method, the navigation tree is not displayed. This button enables you to toggle between the full screen and divided pane sizes.
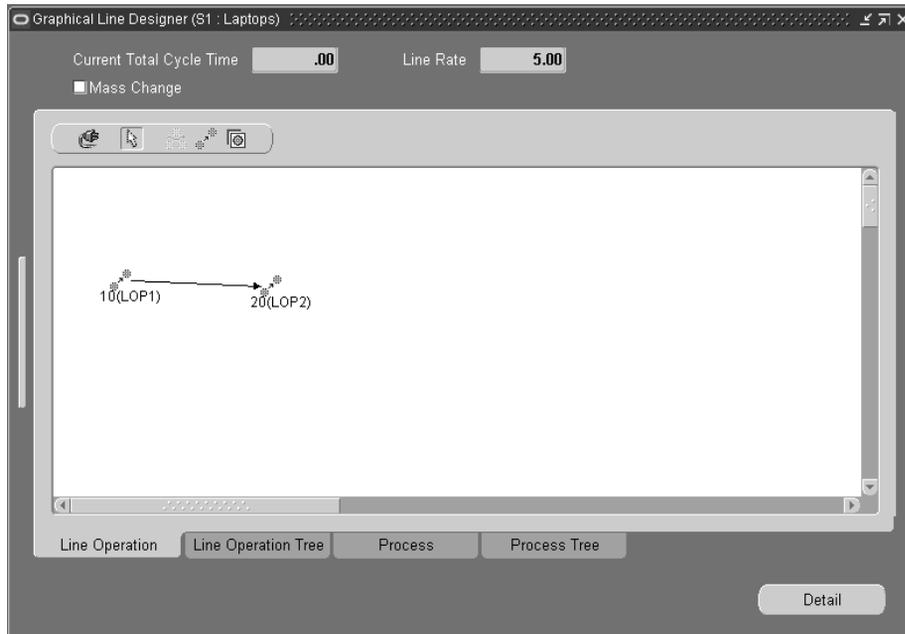
❏ You can also resize the detail pane by resizing the entire workbench. Select the resize icon

This method maximizes the window size, and also displays the navigation tree. This icon enables you to toggle between the full screen and smaller pane sizes.

Workbench Toolbars

In the right pane canvas, there are two toolbars containing icons used for creating and modifying your graphical network. One toolbar displays when you are in the Line Operation or Process windows.

This toolbar contains icons for:

■ *Connector*: Enables you to create links between entities on the canvas

- *Pointer*: Allows you to move existing entities on the canvas
- *Process*: Enables you to add a new process to the routing
- *Line Operation*: Enables you to add a new line operation to the routing
- *Event*: Enables you to add a new event to the routing

The other toolbar displays when you are in the Operation Tree or Process Tree windows.

It contains three icons that allow you to change the display view of the tree including:

- *Vertical Style*: The tree is displayed in an up-and-down format by routing, line, line operation code, and description.
- *Organizational Chart Style*: The tree is displayed in a hierarchical box format. The routing is at the top level, the lines, line operation codes, and descriptions are graphically displayed below the routing.
- *Interleaved Style*: The tree is displayed in an indented hierarchical box format. The routing is at the top level and displayed on the left of the pane—the line, line operation codes, descriptions are graphically displayed to the right of the routing.
- *Showtime*: Toggles the view of the event, line operation and process times when viewing the data in a tree format.

This toolbar also contains two pull down menu boxes. One box allows you to choose views on the pane by either current, future and current or all events on the routing.

The Times box has two selections, Calculated Times and User Times. This enables you to choose whether to view the operation time that is calculated by the system or entered in manually

Tools Menu and Pop-up Menus

The Graphical Line Designer Workbench enables you to access other manufacturing functionality. These options are available, depending upon the currently active window and other conditions, in the Tools menu and pop-up menus.

The Tools Menu

Standard Events: Accesses the Standard Events window. It displays all standard events for a particular line. Defining Flow Manufacturing Standard Events on page 3-5

Standard Processes: Accesses the Standard Processes window. It displays all standard processes for a particular line. See:Defining Flow Manufacturing Standard Processes on page 3-4

Standard Line Operation: Accesses the Standard Line Operations window. It displays all standard line operations for a particular line. See: Defining Flow Manufacturing Standard Line Operations on page 3-7

Mixed Model Map: Accesses the Mixed Model Map Workbench enabling you to generate a mixed model map. See: Overview of the Mixed Model Map Workbench on page 5-2

Resource Where Used: Accesses the Resource WhereUsed window in Oracle Bills of Material for viewing the operation and routings that use a particular resource. See: Viewing a Resource Usage, *Oracle Bills of Material User's Guide*.

Routing Revisions: Accesses the Routing Revisions window to view the changes for a particular routing. See: Viewing Routing Revisions on page 4-27

*Switch to Primar*y: Allows you to switch the selected alternate with the primary routing.

Items: Accesses the Master Item window in Oracle Inventory where you can define and update items and the attributes associated with them . See: Defining Items, *Oracle Inventory User's Guide*.

Product Family Members: accesses the Product Family window, enabling you to group products that have a similarity in resource usage, design, and manufacturing processes. See: Assigning Product Family Members, *Oracle Bills of Material User's Guide*.

Bills of Material: Accesses the Bills of Material window that contains information on the parent item, components, attachments, and descriptive elements. See: Creating a Bill of Material, *Oracle Bills of Material User's Guide*.

I*ndented Bills*: Accesses the Indented Bill of Material window in Oracle Bills of Material where you can view an indented (multilevel, exploded) manufacturing or engineering bill of material. See: Viewing an Indented Bill of Material, *Oracle Bills of Material User's Guide*

Lines: Accesses the Production Lines window in Oracle Work in Process. See: Defining Production Lines, *Oracle Work in Process User's Guide*

Departments: Accesses the Departments window in Oracle Bills of Material. See: Defining a Department, *Oracle Bills of Material User's Guide*

Item Selection List: Accesses the Apply Changes window for creating mass changes, edits, and deletions on multiple flow lines. See: Mass Changes on Item Routings on page 4-43

Set Resource Cost Rollup: Accesses the Set Resource Cost Rollup window used to specify if an event is included in the cost rollup. See: Specifying Cost Rollup Resource Information on page 4-52

Pop-up Menus

You can access windows and functions in the pop-up menus by right-clicking on an icon in the right pane, or a node in the tree hierarchy.

The following choices are available, depending upon the currently active window and other conditions, by right-clicking on an operation, process, event, or connection icon in the right pane:

- *Cut*: Allows you to remove an operation, process, event, or any connections to it from the item routing.

- *Paste*: Allows you to restore an operation, process, event, or connection you have just cut from the item routing.

- *Delete*: Allows you to permanently remove the operation, process, event, and any connections to it from the item routing.

- *Properties*: Accesses the Operation, Process or Event window. For example, if you select an event, the Event window opens.

- *Standard*: Accesses the Standard Line Operations, Standard Processes or Standard Events window—depending on which entity you have selected. For example, if you select a process, the Standard Processes window opens.

The choices available in the pop-up menu in the tree hierarchy include the applicable Tools menu, Workbench menu options, and these additional menu options in the tree hierarchy:

- *New*: Accesses the Add Item Routing window enabling you to create new routings. See: Adding a New Item Routing on page 4-18

- *Routing Details*: Accesses the Routing Details window enabling you to view specifics or to add information to a routing. See: Using the Routing Details Window on page 4-28

- *Copy/Common Routing To*: Accesses the Copy Routing window used to copy that items's routing to other items—or create routings that are common to it. See: Copying and Common Flow Routings on page 4-22

- *Copy Routings To*: Accesses the Copy Routings window enabling you to copy a routing to a different flow line. See: Copying a Routing to a Different Flow Line on page 4-25

- *Component Assignments*: Accesses the Update Component window where you can associate the components on the bill of material with the routing events where they are consumed. See: Component Assignments on the Bill of Material on page 4-49

- *Delete*: Accesses the Delete Routing window to delete a routing from your navigation tree. See: Deleting a Routing on page 4-21

Accessing Graphical Line Designer Workbench Windows

◗ **To access windows for creating product synchronizations:**

1. Select the Graphical Line Designer from the Flow menu.

   The Select window displays.
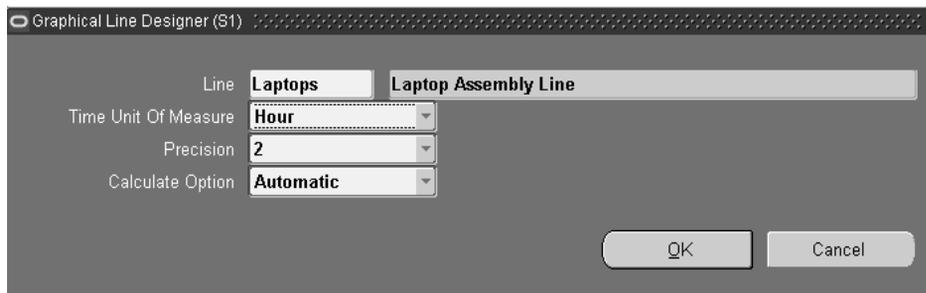
2. In the Line field, select the assembly line you want to view on the workbench.

3. In the Time Unit of Measure field, select the unit of measure you are using for routing calculations.

Your choices are hour, minute, or second.

4. In the Precision field, select a value for the number of decimal places you want displayed in routing calculations.

Your choices are 1, 2, 3, 4. For example, if you enter 2—two decimal places display.

5. Select a Calculate Option for calculating the Current Total Cycle Time. This value displays on the workbench. Your choices are:

- Automatic—Current Total Cycle Time is automatically calculated every time there is a change or update.

- Deferred—Current Total Cycle Time calculation is only initiated manually. when you select Calculate s on the workbench.

6. Choose OK.

The Graphical Line Designer displays.

In the initial view the Item Routing tree tab is selected and the tree hierarchy is collapsed. The two tree tabs located to the left of the tree hierarchy allow you to toggle between the Item Routings and Template Routings views on the right pane.
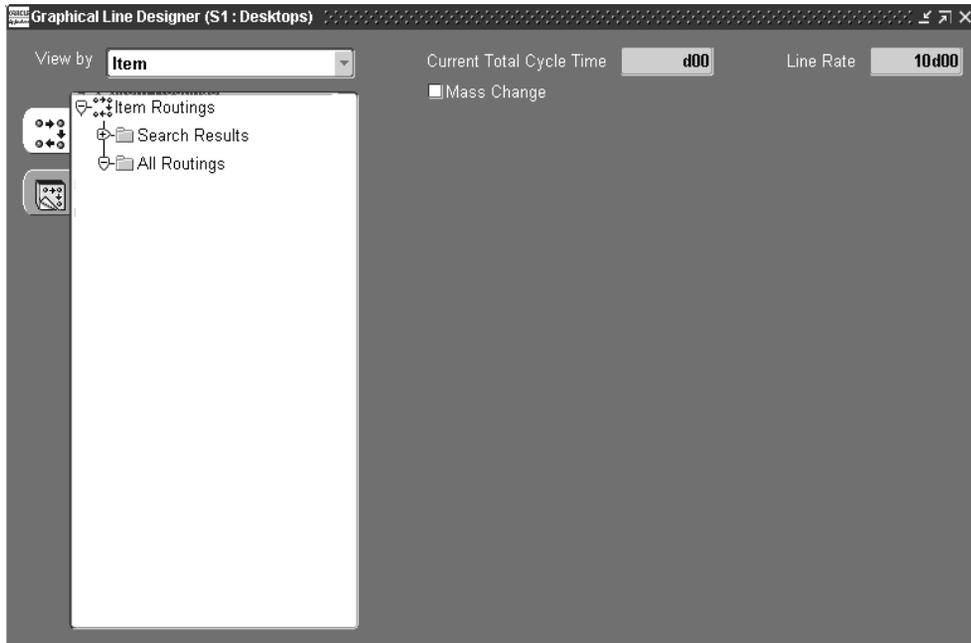
The Item Routings tab displays the routings for all items assigned to the line designated. In the initial view the right pane is blank, when you select an item, the graphical network displays.

- The View By list box is used to select the way you want to view data in the tree.

- The Current Total Cycle Time field displays for this item. It is calculated automatically every time you change tabs, add entities on the routing, or change items. See: Calculating Total Product Cycle Time on page 3-18

- The Line Rate value defaults from the line definition.

In the Item Routing node, you can search for routings using the Search Results node, or view all the routings in the All Routings node.

7. In the View By list box, select to view data in the tree by Item, Product Family, or Common Routing.

If you choose product family and the items are assigned to a product family, the product family displays in between the line and item.
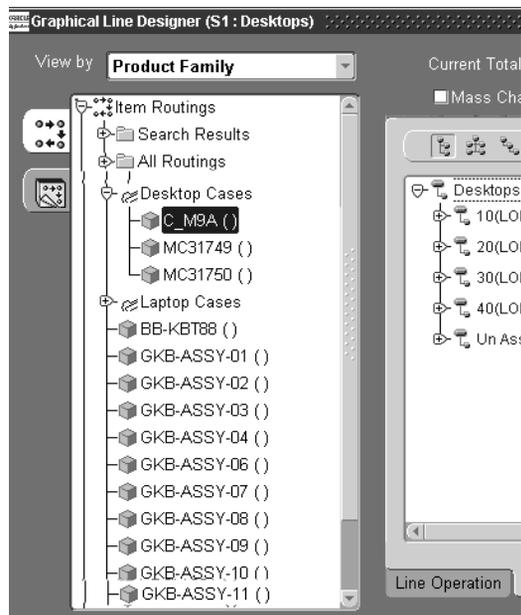
8. If you want to find a specific record, or range of records, select the Search Results node and right-click with your mouse to display the pull-down menu.

9. Select Search to display the Search Items window.
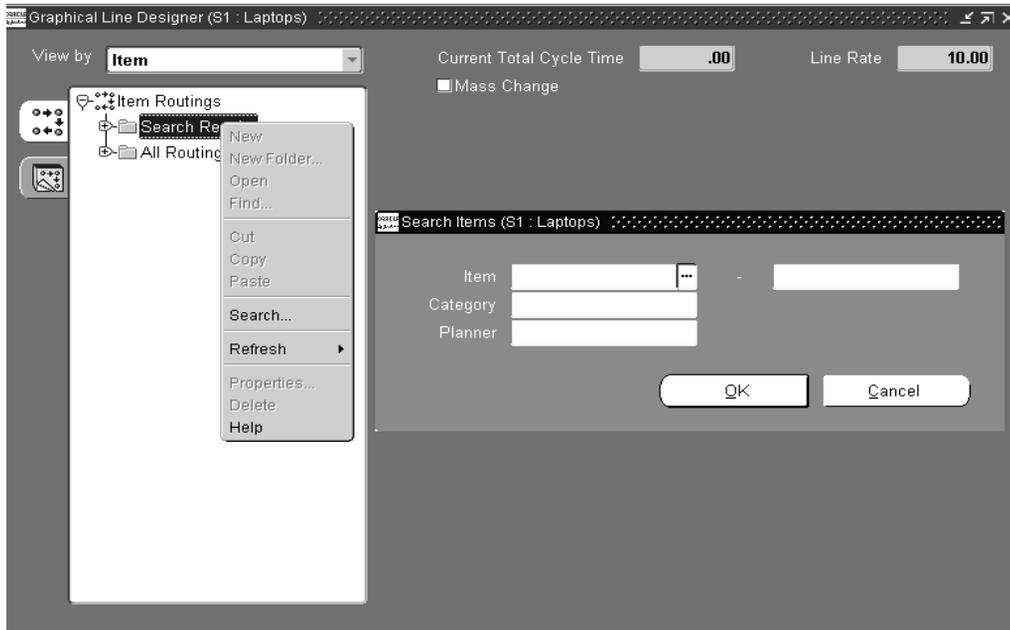
10. Enter search criteria; you can search by item, category, planner, or any combination of these values.

11. Choose OK to display the results of your query under the Search Results node.
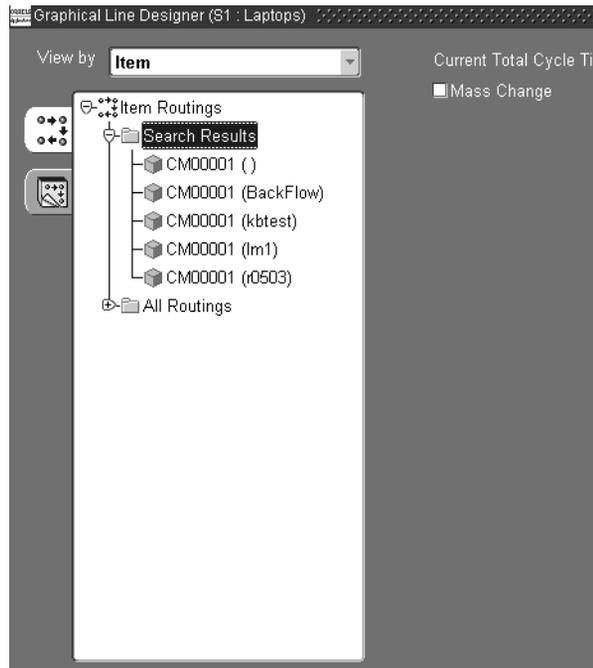
12. To display information in the right pane, select a node detail on the tree.

The graphical network displays a view of the line operation network in the first window tab, Line Operation.

You can add, change, delete, or move the icons in the graphical network. See: Creating the Graphical Network on page 4-29
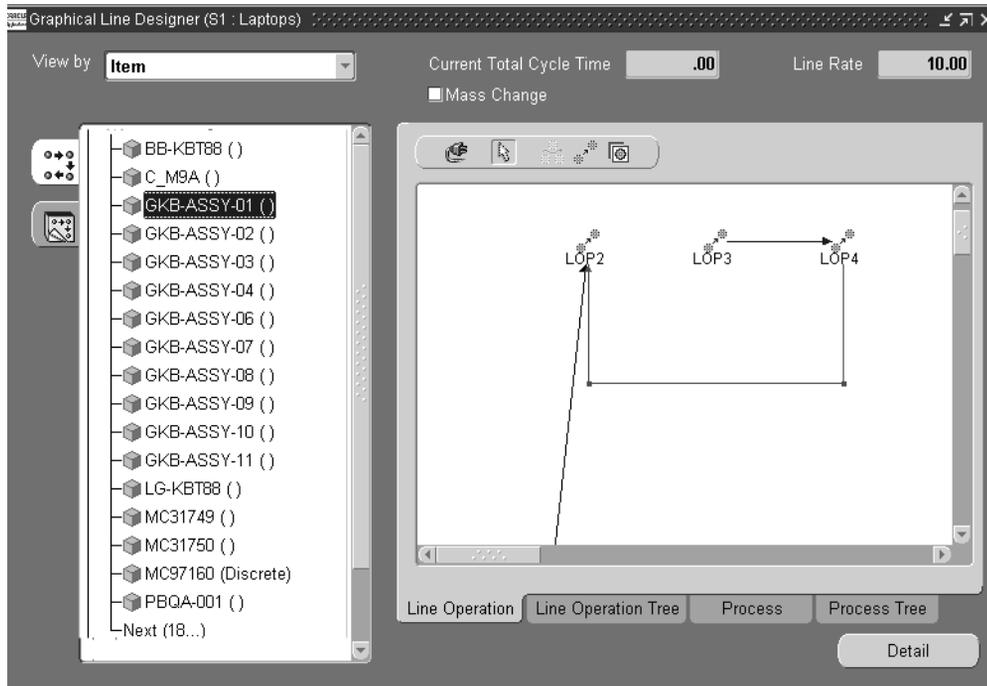
13. Select the Line Operation Tree tab.

14. Left-click with your mouse to select a node detail on the tree hierarchy.

In the right pane the top level of the routing for this item displays.
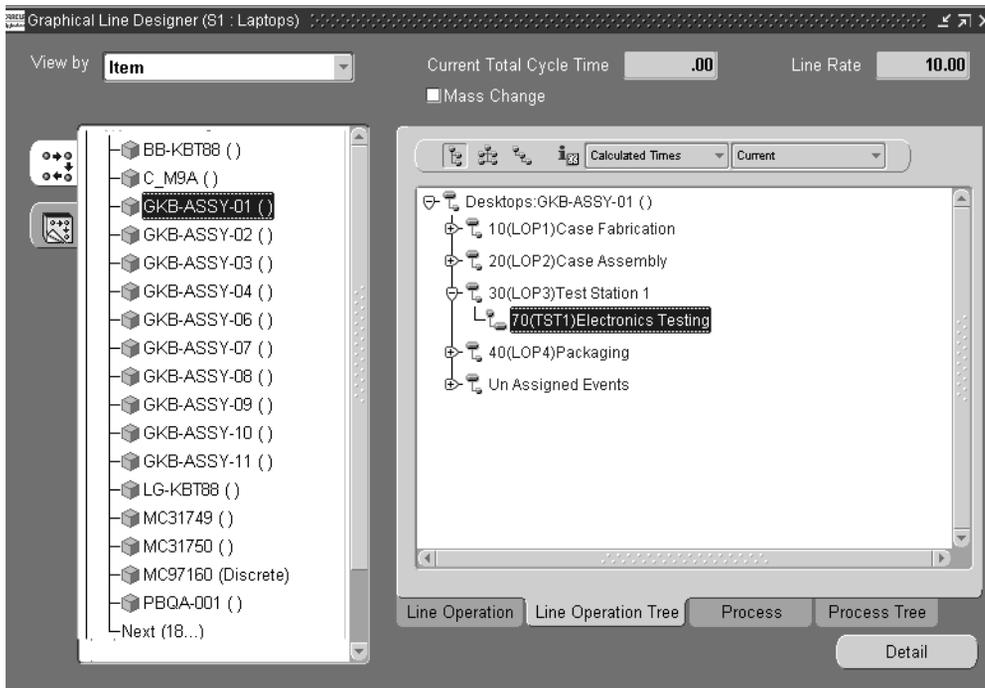
15. Expand the items on the routing to display the operations in the routing.

You can change the tree format to one of three styles. See: Workbench Toolbars on page 4-5 The icons in the tree will change to match those on the toolbar for the three entities. The last node at the bottom of the tree is named Unassigned Events. This a place holder for all the events that are on the routing but are not assigned to any line operation. For example, an event may be unassigned because you defined processes first, and have not assigned the events to the operations.

You can add, change, delete, or move the icons in the tree. See: Modifying the Line Operation Tree and Process Tree on page 4-36

The code and description are listed for each line operation and event.

The toolbar enables you to view the line operations and events on the routing by current, future and current, or all events. You can also see the times associated with each line operation and event.

16. Select the Process tab.

The graphical network displays a view of the process.

You can add, change, delete, or move the icons in the graphical network. See: Creating the Graphical Network on page 4-29
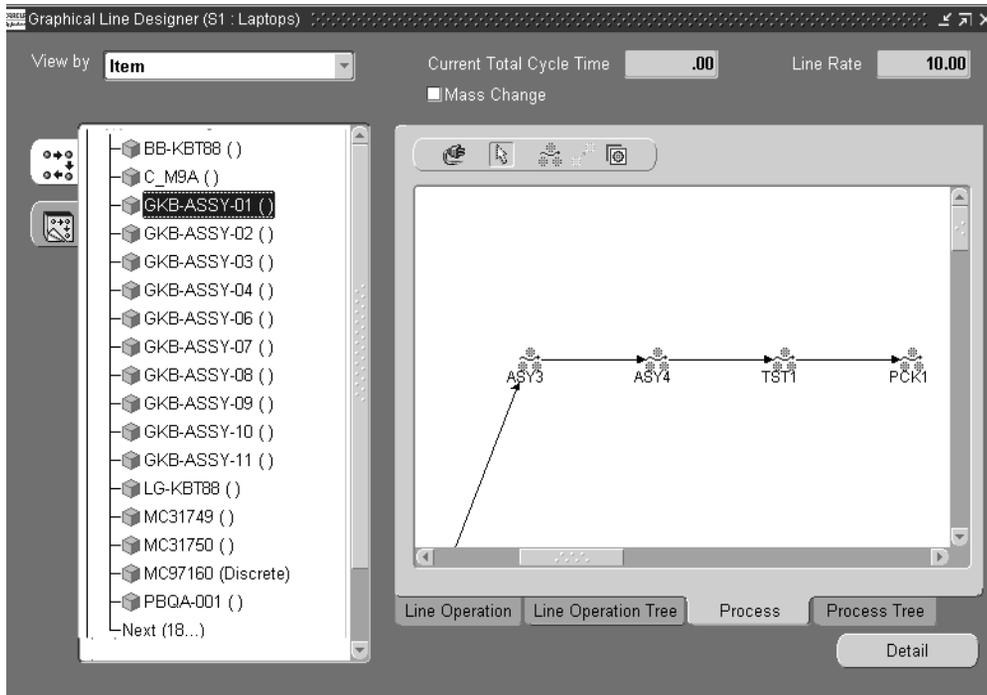
17. Select the Process Tree tab.

18. Select a node detail on the tree hierarchy, and left-click with your mouse.

In the right pane the top level of the routing for this item displays.

19. Expand the items on this routing to display the processes in the routing.

You can change the tree format to one of three styles. See: Workbench Toolbars on page 4-5 The icons in the tree will change to match those on the toolbar for the three entities.

The last node at the bottom of the tree is named Unassigned Events. This a place holder for all the events that are on the routing but are not assigned to any

process. For example, an event may be unassigned because you defined the operations first, and have not assigned the events to the processes.

You can add, change, delete, or move the icons in the tree. See: Modifying the Line Operation Tree and Process Tree on page 4-36

The code and description are listed for each process and event.

The toolbar has an option that enables you to see the times associated with each process and event.
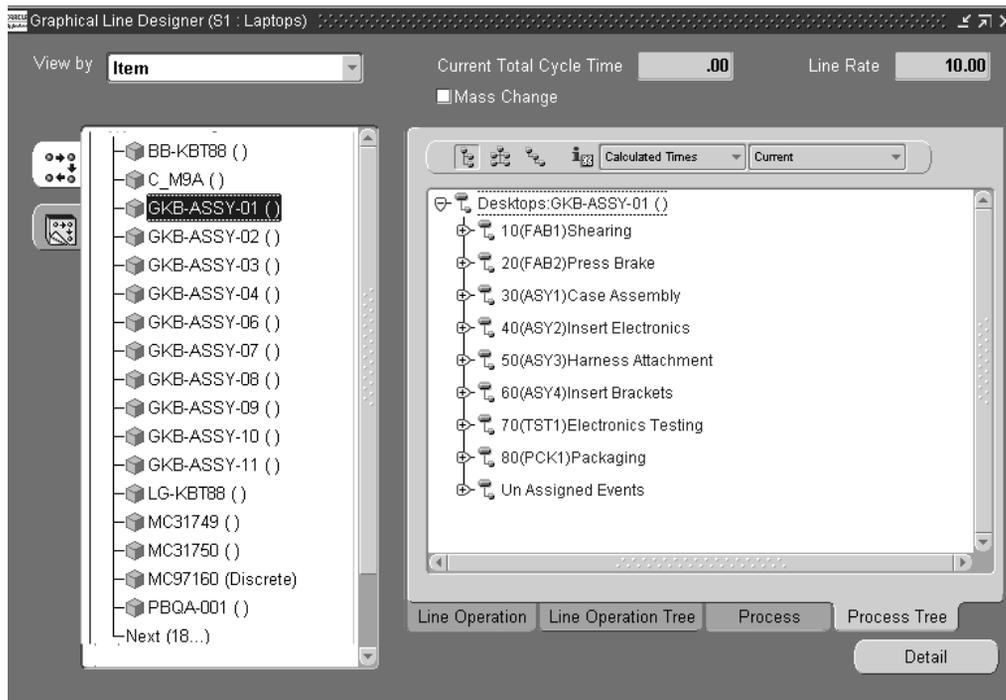
Adding a New Item Routing

The Add Item Routing window enables you to create new routings on the Graphical Line Designer Workbench. You have three options in creating routings. You can create a routing as an entirely new routing, copy it from another item or a template, or assign a common routing as a reference for the new routing.

▶ **To add a new item routing:**

1. Navigate to the Graphical Line Designer Workbench.

2. Select the top node on the tree hierarchy, Item Routings, and right-click with your mouse.

   The pop-up menu displays.

3. Choose New.

   The Add Item Routing window displays.

4. To create a new routing, select an item from the list of values in the Item field, and enter any appropriate information in the Alternate, Capable to Promise, Revision, and Date fields.

   See: Creating a Routing, *Oracle Bills of Material User's Guide.*

5. To create a routing by copying one from another item or a template, choose Copy From Item/Template in the Routing Source region.

   Your current Organization information displays.

In the Item field, select the routing to be used as a template from the list of values.See: Creating Routings in the Template Routings View on page 4-41

Enter the any appropriate information in the Alternate, Revision, Engineering Routing, and Date fields. See: Creating a Routing, *Oracle Bills of Material User's Guide*.

Select a Copy Option, your choices are:

- *Current:* operations effective on the revision date

- *Future and Current:* includes current and all future operations

6. To create a routing from a common routing, choose Assign Common Routing.

Any two items that are of the same bill type can share common bills and routings. See: Referencing Common Bills and Routings, *Oracle Bills of Material User's Guide*.

7. Select the routing you want to use from the list of values.

8. Optionally, you can choose Related Routings to view a list of the other routings that have been defined for this item on all the lines in this organization.
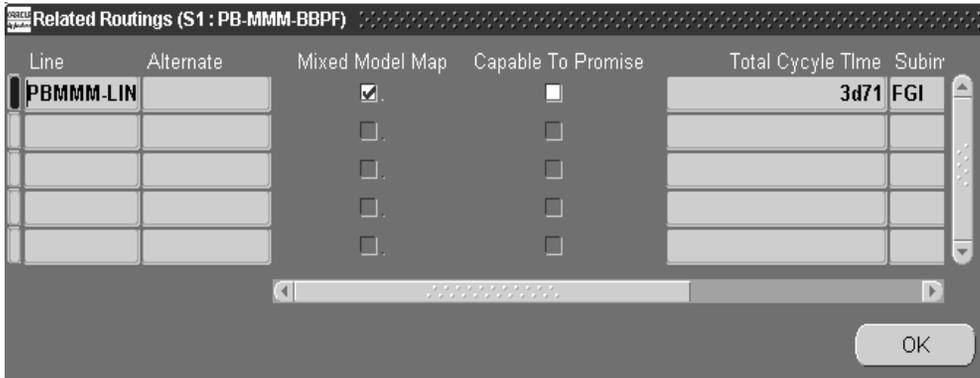
9. Choose OK to close the Related Routings window.

10. Choose OK to close the Add Item Routing window.

The new routing appears at the bottom of the routings list on the tree hierarchy, and it is highlighted. If this is a new routing, the right pane canvas is blank. If the routing was created from a template or a common routing, the right pane displays the inherited routing information.

11. Save your work.

Deleting a Routing

You have the option to delete a routing from the navigation tree by selecting a default delete group, or creating a new one. All operations are deleted when a routing is deleted. Any links to attachments are also severed.

To delete an item routing:

1. Navigate to the Graphical Line Designer Workbench.

2. Select the top node on the tree hierarchy, Item Routings, and right-click with your mouse.

3. Choose Delete from the pop-up menu to display the Delete Routing window.
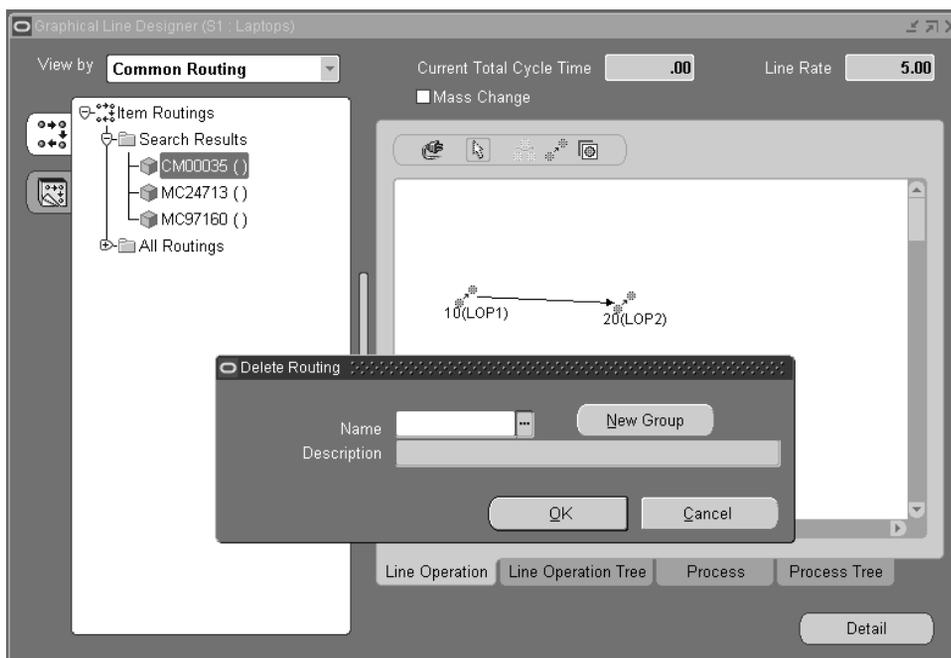
4. In the Name field, select the name of a Delete Group. The description displays for this group.

5. You also have the option to create a new Delete Group. Choose New Group to display fields for creating a new delete group.
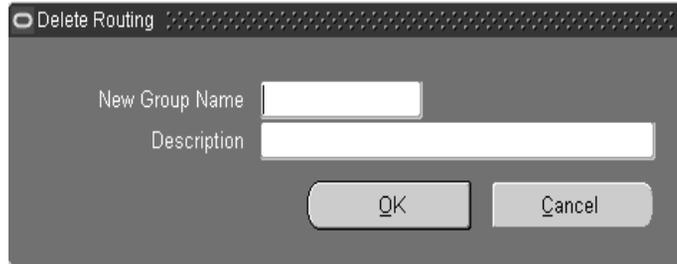
6. Enter a value in the New Group Name and Description fields.

7. Choose OK to save the New Delete Group Name.

8. Choose OK to save your work.

9. Navigate to the Deletion Groups window to delete the routing. See: Deleting Items, Bills, Routings, Components, and Operations, *Oracle Bills of Material User's Guide*

Copying and Common Flow Routings

You can select an item on the navigation tree, and then copy that items's routing to other items—or create routings that are common to it.

> **Note:** If an item already has a primary routing, the copy common transaction is not created.

You can also copy a routing to another flow line. When you select items and copy the routing to another flow line—all relevant standard operations, processes, and events are duplicated.See: Copying a Routing to a Different Flow Line on page 4-25

◗ **To copy or common a flow routing:**

1. Select the node detail for the item you want to copy to other items, then right-click with your mouse.

   The pop-up menu displays.

2. Select Copy/Common Routing To.

The Copy Routing window displays. The Source region displays the Item name and description.

3. In the Option region, choose either Copy or Common.

- Use Copy for copying this item's routing to one or more items. Select Current, or Future and Current to indicate the effective date. The system uses the effective date on the Routings window for the operation code.

- Use Common to create one or more routings that are commoned to this routing.

4. In the multi-row Item region, select the items and, if applicable, alternate designators, where the Source item is copied.

5. To add multiple items, choose Retrieve.

Add Item Retrieve window displays. This window restricts your search for items according to your specifications.

6. Select your search criteria.
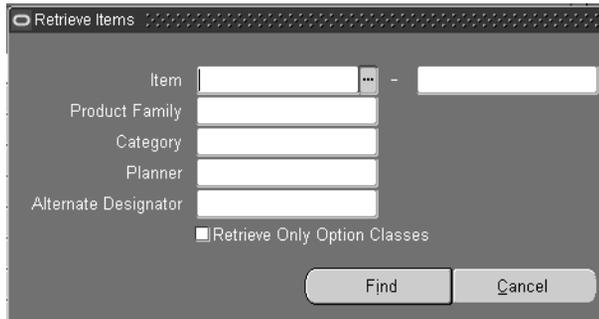
You can search by any combination of values including item, product family, category, planner, or alternate designator.

If this routing is for a Configure to Order model you can search for items by option class. Choose Common in the Option region, and enable the Retrieve Only Option Classes box. The system retrieves items for all option classes under the model and criteria specified.

7. Choose OK to display the list on the Copy routings window.

8. Choose Copy.

You will receive a confirmation message when the transaction is completed. You can view the copied routing for the item on the hierarchical tree and right pane of the Graphical Line Designer Workbench.

Copying a Routing to a Different Flow Line

You can copy a routing to a different flow line, enabling you to maintain multiple design models. All standard operations, processes, and events on the selected routing are copied to the line. When you perform the copy function:

- Both flow lines must be within the same inventory organization

- You have the option to duplicate the bill of material

- Only current and future versions of the routing and bill of material are copied

- When copying a referenced routing, the original routing referenced is copied

▶ **To copy a routing to another flow line:**

1. Navigate to the Graphical Line Designer Workbench.

2. Select the All Routings node, and right-click with your mouse to display the pop-up menu.
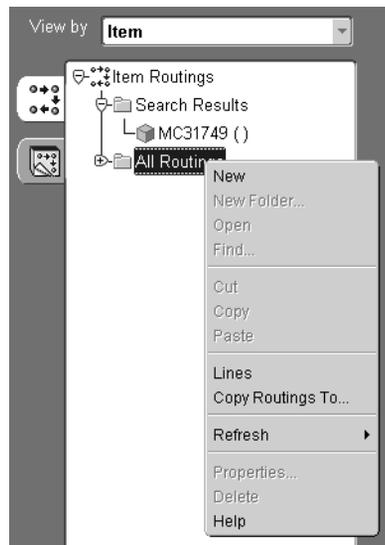
3. Select Copy Routings To.

   The Copy Routings window displays.
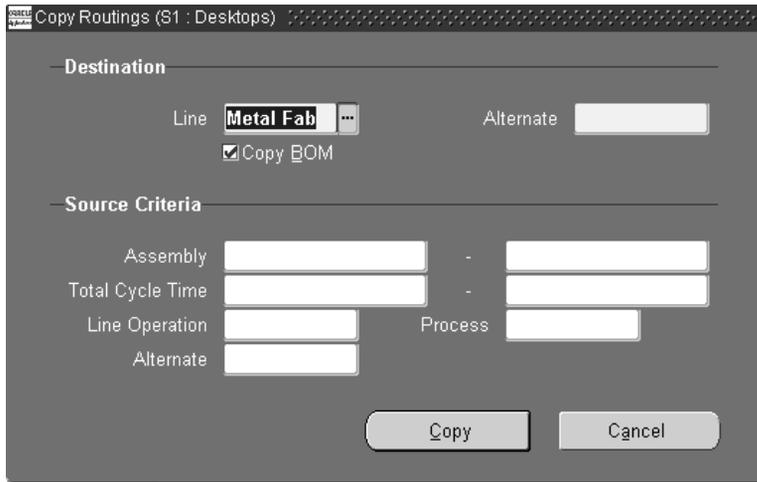
4. In the Destination region, select the line where the data will be copied.

5. In the Alternate field, enter the alternate destination designator.

   Flow routings names must be unique; the alternate designator is the new identifier for this copied routing. Either select an existing alternate designator from the list of values, or enter a new alternate name.

6. Optionally, you can copy the bill of material information by checking the Copy BOM check box.

7. In the Source Criteria region, specify the assembly to be copied in the Assembly field. Or select a range of criteria for copying.

   You can specify a range by assembly name, total product cycle time, alternate designator, or line operation and process.

8. Choose Copy

   The selected routing information is copied to the destination line with the given alternate designator and includes standard line operations, processes, events, and event resources.

Viewing Routing Revisions

The Routing Revisions enables you to view all the revisions and changes for a particular routing.

◗ **To view the revisions for a specific routing:**

1. Select a routing detail on the tree hierarchy

2. From the Tools menu or the pop-up menu, select Routing Revisions.

The Routing Revisions window displays. This window lists all the revisions and information for a specific routing. See: Creating a Routing Revision, *Oracle Bills of Material User's Guide*.

Changing from an Alternate to a Primary Routing

▶ **To change your routing from an alternate routing to a primary routing:**

1. Select a routing on the tree hierarchy that is an alternate routing.

   The tree hierarchy displays alternate routings by designating the alternate name in parenthesis on the tree.

2. From the Tools menu or the pop-up menu, select Switch to Primary.

   The Switch to Primary window appears with the alternate designation displaying. You can choose this routing, or select another routing from the list of values.
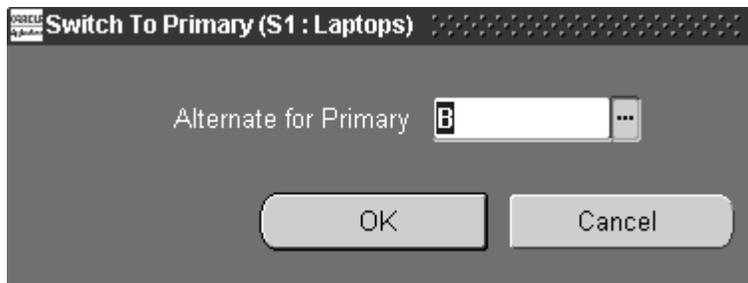
3. Save your work.

   See: Switching Between Primary and Alternate Routings, *Oracle Bills of Material User's Guide.*

Using the Routing Details Window

You can access the Routing Details window for a particular routing to view specifics or to modify information.

▶ **To view or modify routing details:**

1. Navigate to the Graphical Line Designer Workbench.

2. Left-click with your mouse to select a node detail on the tree.

   The graphical network displays a view of the line operation in the first window tab, Line Operation.

3. Choose Detail.

The Routing Details window displays.

You can change several of the fields on this window including: Date, Capable to Promise, Mixed Model Map, Priority, Subinventory, Locator, Comment, and Display. See: Creating a Routing Revision, *Oracle Bills of Material User's Guide*.

In the tabbed region, you can also modify Yield, User Labor, or User Machine Times for any line operation, process, or event.

4. Save your work.

The routing calculations are performed automatically.

Creating the Graphical Network

Product Synchronization is the process of defining your product's process flow. This is done through the flow routing where you are able to define processes, events and operations for your flow line. The Graphical Line Designer Workbench provides icons in the toolbar that you can drag and drop onto the right pane canvas to create the product synchronization. This graphical interface allows you to create, delete,

cut, and paste line operations, processes, events—and their connections. You can also add new item routings, see: Adding a New Item Routing on page 4-18

To add a new line operation on the Graphical Line Designer Workbench:

1. Select the Line Operation tab to display this window in the detail pane.

2. Select the Operation icon from the toolbar.

   This icon is only available in the Line Operation window of the workbench.

3. Left-click with your mouse on the right pane, in the section of the canvas where you want to locate this line operation.

   The Line Operation window displays.

4. Enter the Display Sequence and Code values.

   You have the option of entering a new code in the Code field, this creates a new standard line operation code which is added to the routing. Or you can select a code from the list of values, which adds the existing standard code to the routing.

5. Subinventory and Locator values default from the referenced standard operation. You have the option to enter values if there is no referenced standard operation.

6. Enter values in the Routing Specific Details region.

   If the Referenced check box is checked, the information displayed for the Descriptions field is referenced from the standard line operation. To edit, deselect the referenced check box.

   Information displays for Yield, Cumulative Yield, User Machine Time, Elapsed User Time, Net Planning Percent, Cumulative Yield, Reverse Cumulative Yield, and Process Efficiency values for machine and labor

   See:Mixed Model Map Calculations on page C-10, and Operation Yields Calculations on page 3-20

   You can access the Line Operation window through the pop up menu if you want to modify this data for a standard line operation.

7. Choose OK to close the window and perform routing calculations.

   The new line operation displays on the canvas.

8. Save your work.

◗ **To add a new process on the Graphical Line Designer Workbench:**

1. Select the Process tab to display this window in the right pane.

2. Select the Process icon from the toolbar.

   This icon is only available in the Process window of the workbench.

3. Left-click with your mouse on the right pane, in the section of the canvas where you want to locate this process.

   The Process window displays.

The information in the top region of the window is defaulted from where you positioned the icon on the workbench. You can change Display Sequence and Description information.

4. Enter values in the Routing Specific Details region.

If the Referenced check box is checked, the information displayed for the Description field is referenced from the standard process. To edit, deselect the referenced check box.

For information on Net Planning Percent, Cumulative Yield, and Reverse Cumulative Yield, see Operation Yields Calculations on page 3-20

You can access the Standard Processes window through the pop up menu if you want to modify this data for a standard process.

5. Choose OK to close the window and perform routing calculations.

The new process displays on the canvas.

6. Save your work.

◗ **To add a new event on the Graphical Line Designer Workbench:**

1. Select either the Line Operation or Process tab to display one of these windows in the right pane.

2. Select the Event icon from the toolbar.

This icon is only available in the Line Operation and Process windows of the workbench.

3. Left-click with your mouse on an existing line operation or process in the right pane.

The Event window displays.

4. Enter values in the Routing Specific Details region including Yield, Effectivity Date, and Disable Date.

If the Referenced check box is checked, the information displayed for the Description field is referenced from the standard event. To edit, deselect the referenced check box.

For information on Net Planning Percent, Cumulative Yield, and Reverse Cumulative Yield, see Operation Yields Calculations on page 3-20

You can access the Standard Events window through the pop up menu if you want to modify this data for a standard process.

5. Use the Option Dependent box to indicate if this event is dependent on the choice of an optional component.

6. Enable the Critical to Quality box if this is a quality related task.

7. Enable the Value Added box if this event adds value to the Process. Resource Efficiency calculations for the process or line operation consider this setting.

8. The Include Resource in Cost Rollup box is used to specify if the event is included in the cost rollup. This flag can be updated here, or from the Set Resource Cost Rollup window. See: Specifying Cost Rollup Resource Information on page 4-52

9. Optionally, indicate whether the resource is available 24 hours a day. You cannot assign shifts to a resource that is available 24 hours a day.

10. Choose OK to close the window and perform routing calculations.

   The new process displays on the canvas.

11. Save your work.

Defining a Network Connection

The Network Connection window is used when adding or modifying a connection on the Graphical Line Designer. This window is accessed though the pop up menu on the right pane.

> **Note:** Network planning percentage connections under 100 percent display on the detail pane of the graphical network.

To add a network connection on the Graphical Line Designer Workbench:

1. Navigate either to the Line Operation network or Process network window on the right pane of the Line Designer.

2. Select the Connections icon from the toolbar.

   This icon is only available in the Line Operation and Process windows of the workbench.

3. Left-click and hold with your mouse on the right pane, on the process or line operations where you want to start this connection—and drag the line to the process or line operation you want to it to join.

   The Network Connection window displays. In the Operation From and To fields, the operation codes that you connected on the canvas automatically display.
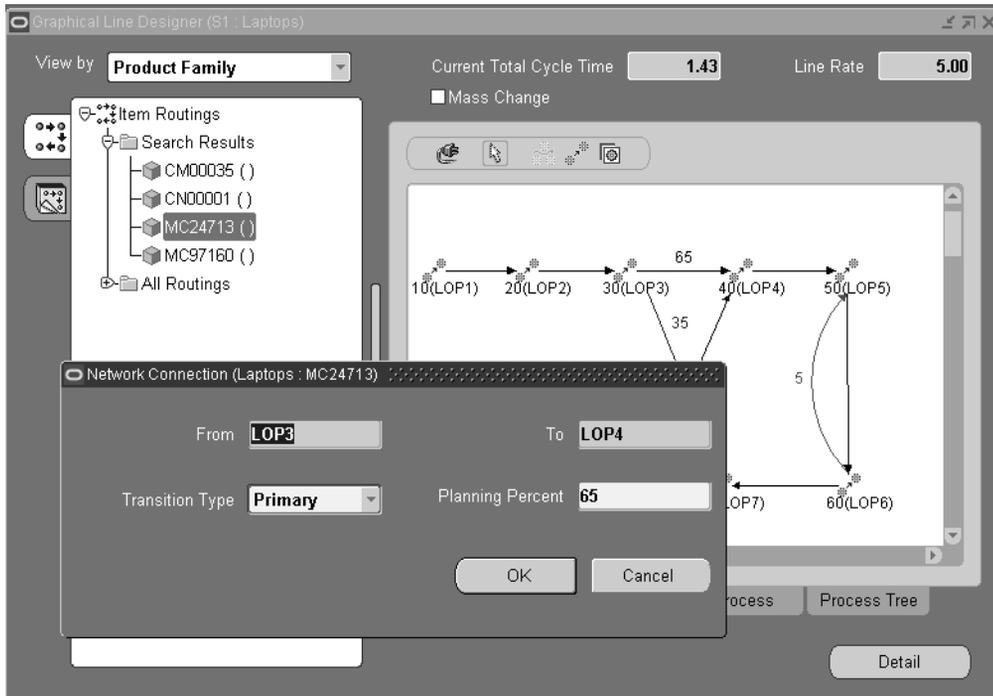
4. You can use the defaulted values in the Transition Type and Planning Percent fields, or enter other values.

   Transition type values are primary alternate, and rework.

   The planning percent is the percentage of product that follows this network path. If the planning percent for the network connection is less than 100 percent, the value displays on the graphical network detail pane.

5. Choose OK to close the window and perform routing calculations.

   The new connection displays on the canvas.

6. Save your work.

Modifying the Line Operation Tree and Process Tree

The Line Operation Tree and Process Tree windows display your product synchronizations for your routing network in a tree hierarchy format. The Graphical Line Designer Workbench enables you to modify the routing network tree—you can create, delete, cut, and paste line operations, processes, and events.

◗ **To modify components on the Line Operation Tree and Process Tree:**

1. Select either the Line Operation Tree or Process Tree tab to display the hierarchical view of the routing network.

2. Left-click with your mouse to select a node detail on the tree hierarchy.

   In the right pane the top level of the routing for this item displays.

3. Expand the items on the routing to display the operations or processes in the routing.

   The code and description are listed for each line operation and event.

   You can change the tree format to one of three styles. The toolbar has an option that enables you to see the times associated with each line operation and event. See: Workbench Toolbars on page 4-5

   The last node at the bottom of the tree is named Unassigned Events. This a place holder for all the events that are on the Routing but are not assigned to any line operation or process. For example, an event may be unassigned because you defined processes first, and have not assigned the events to the operations.

4. Select a detail on the tree and right-click to display the pop up menu.

   The pop up menu displays, depending on the conditions, several options: Cut, Paste, Delete, Properties, and Standard.

5. Select an event and drag it to another line operation.

   Routing calculations are automatically performed.

6. Save your work.

Modifying Line Operations, Processes, Events, and Connections

The Line Operation window is used when adding or modifying a line operation on the Graphical Line Designer. It contains routing specific details. This window is accessed though the pop up menu on the right pane.

To modify a line operation on the Graphical Line Designer Workbench:

1. Navigate to the Line Operation Tree or Line Operation network window on the right pane of the Line Designer.

2. Select the line operation you want to modify on the right pane canvas.

   If you are adding a new line operation, see: Creating the Graphical Network on page 4-29

3. Right-click on the operation icon in the right pane to display the pop up menu.

   See: Tools Menu and Pop-up Menus on page 4-7

4. Select Properties.

The Line Operation window displays. The information is defaulted from the icon on the workbench. You can change Display Sequence, Yield, User Machine Time, User Labor Time information. To change the description, uncheck the Referenced box. See: Creating the Graphical Network on page 4-29.

5. Choose OK to close the window and perform routing calculations.

6. Save your work.

The Process window is used when adding or modifying a process on the Graphical Line Designer. It contains routing specific details. This window is accessed though the pop up menu on the right pane.

▶ **To modify a process on the Graphical Line Designer Workbench:**

1. Navigate to the Process Tree or Process network window on the right pane of the Line Designer.

2. Select the process you want to modify on the right pane canvas.

If you are adding a new process, see: Creating the Graphical Network on page 4-29

3. Right-click on the process icon in the right pane to display the pop up menu.

See: Tools Menu and Pop-up Menus on page 4-7

4. Select Properties.

The Process window displays. The information is defaulted from the icon on the workbench. You can change Display Sequence, Yield, User Machine Time, User Labor Time information. To change the description, uncheck the Referenced box. See: Creating the Graphical Network on page 4-29

5. Choose OK to close the window and perform routing calculations.
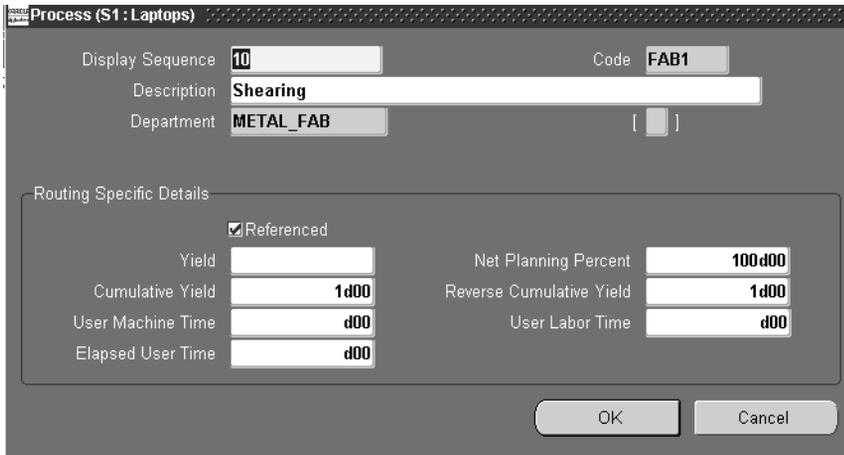
6. Save your work.

The Event window is used when adding or creating an event on the Graphical Line Designer. It contains routing specific details. This window is accessed though the pop up menu on the right pane.

To modify an event on the Graphical Line Designer Workbench:

1. Navigate either to the Line Operation Tree or Process Tree window on the right pane of the Line Designer.

2. Select the event you want to modify on the right pane canvas.

    If you are adding a new event, see: Creating the Graphical Network on page 4-29

3. Right-click on the event in the right pane to display the pop up menu.

    See: Tools Menu and Pop-up Menus on page 4-7

4. Select Properties.
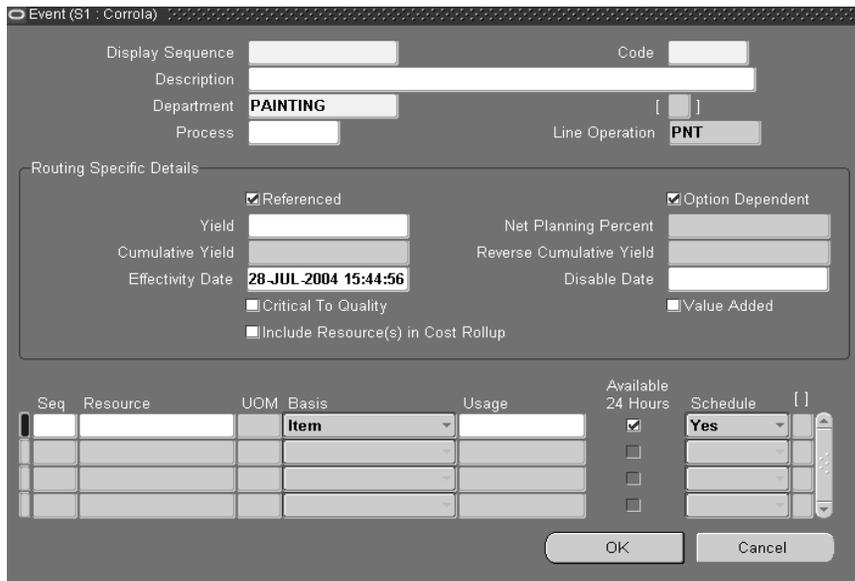
The Event window displays. The information is defaulted from the icon on the workbench. You can change Display Sequence, Effectivity Date, and Disable Date information. If you uncheck the Referenced box, you can change

description and resource information. See: Creating the Graphical Network on page 4-29

5. Choose OK to close the window and perform routing calculations.

6. Save your work.

The Network Connection window is used when adding or creating a connection on the Graphical Line Designer. This window is accessed though the pop up menu on the right pane.

◗ **To modify a network connection on the Graphical Line Designer Workbench:**

1. Navigate either to the Line Operation network or Process network window on the right pane of the Line Designer.

2. Select the connection you want to modify on the right pane canvas.

3. Right-click on the icon in the right pane to display the pop up menu. See: Tools Menu and Pop-up Menus on page 4-7

4. Select Properties.
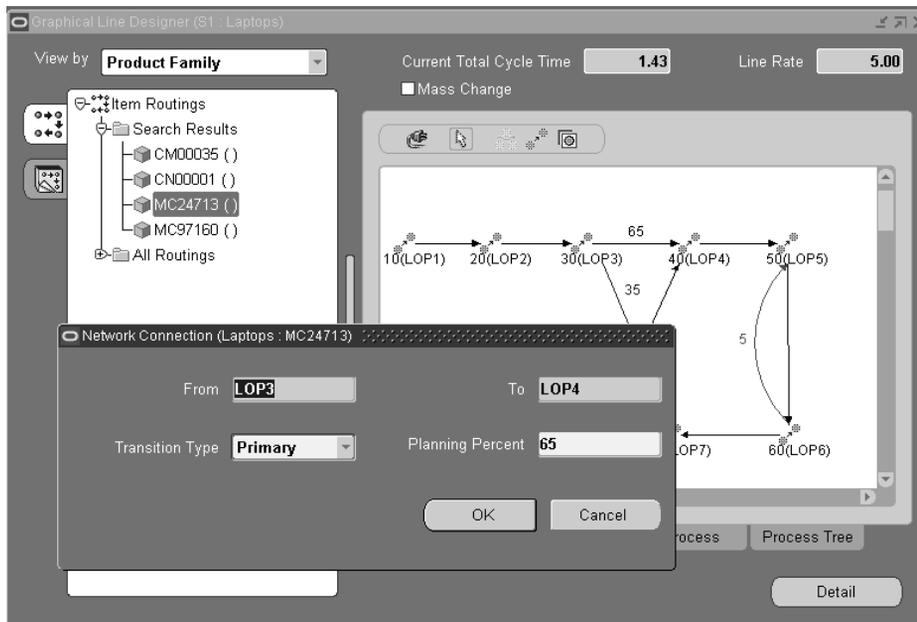
The Network Connection window displays and you can change the values, see:

Note: Network planning percentage connections under 100 percent display on the detail pane of the graphical network.

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5. Save your work.

Creating Routings in the Template Routings View

The Template Routings tree tab provides access to Product Family Routings that can be used as templates for copying elements to an item routing you are creating. You can define a routing for a product family the same way as performed in the Item Routings view of the workbench, and can perform all the same functions as in the routings region.

Using product family routings as templates:

1. Choose the Template Routings tree tab.
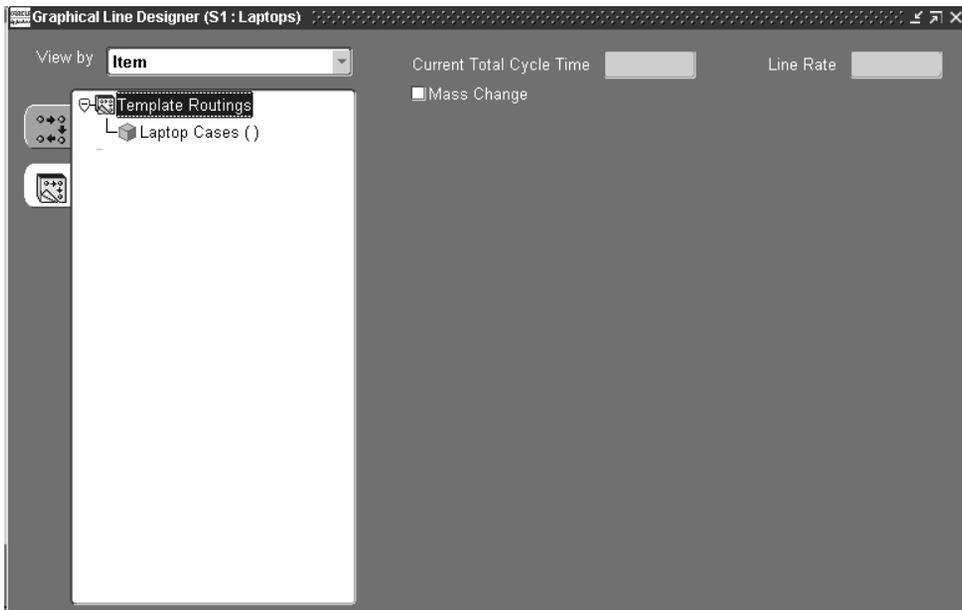
2. Select Template Routings node detail on the tree, and left-click with your mouse.

The Template Routings tab displays the routings for all Product Families assigned to the line designated. In the initial view the right pane is blank.

3. Select New from the popup menu.

Or you can create a new product family routing. In the Add Item Routing window, use the option to create an entirely new routing. See: Adding a New Item Routing on page 4-18

After you select a routing, a blank Line Operation window displays in the right pane. This blank window is the canvas used as a template.
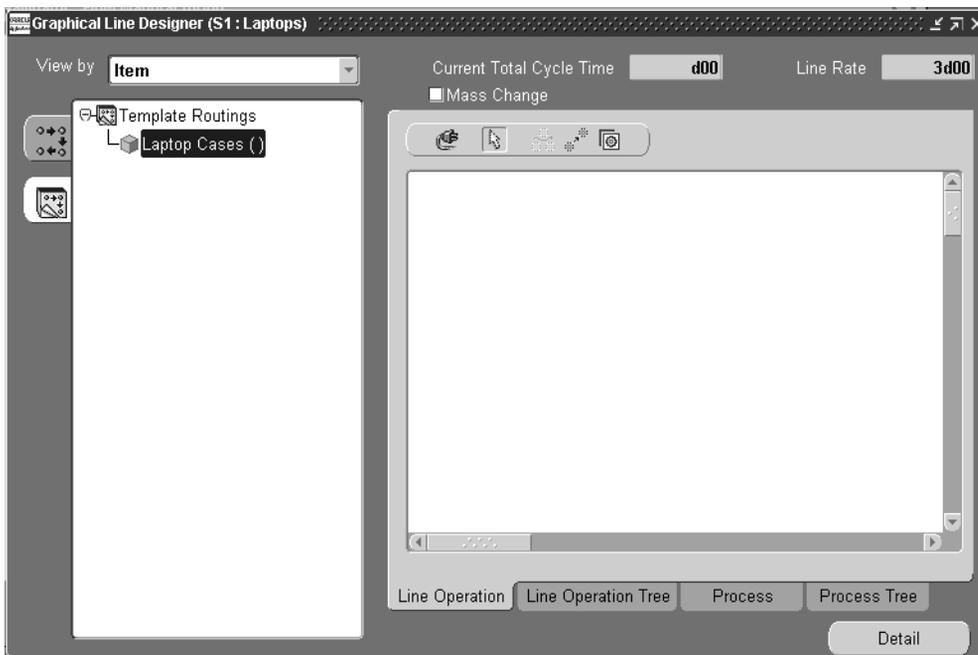
4. Use the toolbar to add icons to create a routing network. See: Creating the Graphical Network on page 4-29

5. Save your work.

This routing is now available to use when creating a new routing, see: Adding a New Item Routing on page 4-18

Mass Changes on Item Routings

You can simultaneously make changes, edits, and deletions to multiple flow routings. Work performed in the graphical pane can be updated for all items on the line, or in the product family. To enable this functionality, check the Mass Change check box on the graphical pane of the Graphical Line Designer Workbench. Mass change functionality is only available in the Line Operation and Process windows of the Graphical Line Designer Workbench:

❏ In the View by Item mode, you can mass change all item routings on that production line.

❏ In the View by Product Family mode or the Template Routing tree tab view, you can mass change routings that belong to the same product family.

❏ In the View by Common Routing mode or the Template Routing tree tab view, you can mass change routings that belong to the same common routing.

Changes are still created by selecting an icon or menu item, and making the changes on the related line operation, process, event, or connection property window. However, in the mass change mode, you can also:

■ Populate changes to a range of other item routings after you save the transaction

■ Update operation information for user machine time, user labor time, and yield

■ Revise outgoing network connections from the node for planning percentages and transition type allocations

▶ **To make mass changes to item routings:**

1. Navigate to the Graphical Line Designer Workbench.

2. Check the Mass Change check box on the graphical pane.

3. Select the line operation, process, event, or connection icon, and make the changes in the related window. See: Creating the Graphical Network on page 4-29

4. Choose OK on the related line operation, process, event, or connection window to save the transaction and display the Apply Changes window.

   When first viewed in a session, this window does not display data. The applied values from your query default for the subsequent operation changes.

   You can also access this window from the Tools menu by selecting Item Selection List.

5. Enter the specific items you want to change, and any applicable alternate designators.

6. You can also search for item routings by choosing Retrieve to display the Retrieve Routings window.
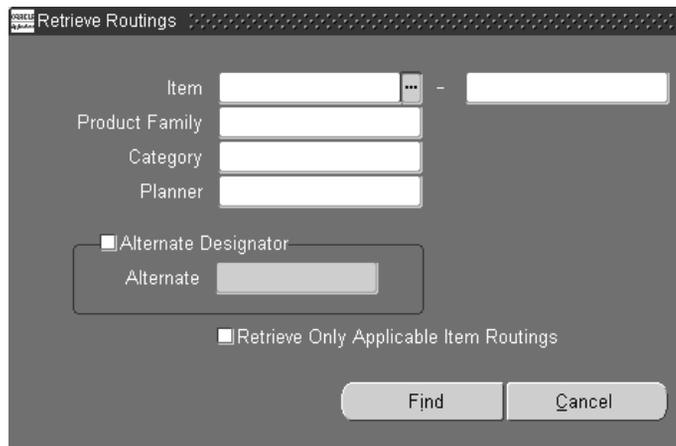
7. Select search criteria in Retrieve Routings window.

You can search by item or range of items, product family, category, planner, and alternate designator.

8. Check the Retrieve Only Applicable Items check box to display only eligible item routings.

   Eligible item routings are in context to the changes:

   - For event changes or deletions, routings with line operations or processes referencing that specific event. When adding the event, routings with line operations or processes that do not already have that event.

   - For line operation and process changes, routings with those specific line operations and processes.

   If you do not select this check box, and all search criteria fields are empty—when you choose Find all items routings display.

   > **Note:** Even though you can display all routings, updates occur only on applicable routings.

9. Choose Find to display your search on the Apply Changes window.

   Uncheck the items you do not want included in the mass update.

10. Choose Apply to create the mass update transaction.

    You can view the routing changes on the graphical pane of the Graphical Line Designer Workbench.

◗ **To update operation user time and yield information:**

1. Navigate to the Graphical Line Designer Workbench, and check the Mass Change check box.

2. Select an operation, and right-click with your mouse to display the pop-up menu.
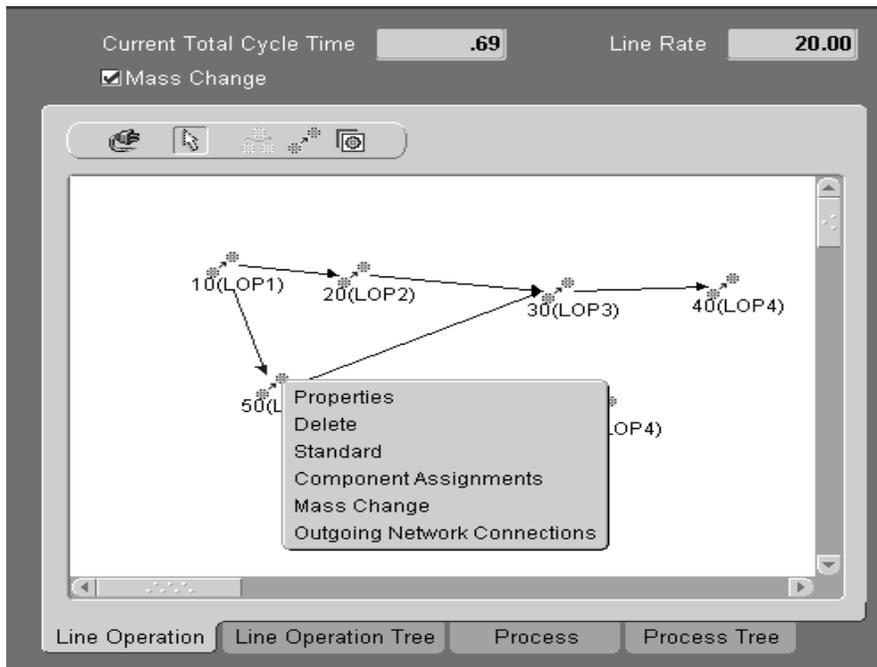
3. Select Mass Change to display the Operations window.

4. In the Change By region, enter applicable changes for the Value fields.

You can enter a new value in the Value field for User Machine Time, User Labor Time, and Yield.

Alternately, for the User Machine Time and User Labor Time columns, you can enter either a value or percentage to add or subtract from the current value. For example:

> If the Current Value for User Machine Time on operation LP50 is 1.26
> And you enter .4 in the +/- Value field
> The system adds .4 to 1.26, to equal 1.66

When you apply your change, the system updates the User Machine Time on operation LP50 to 1.66—in all instances where it occurs on the selection list of item routings.

5. Choose OK to display the Apply Changes window.

6. Select your edit list criteria.

    You can choose Retrieve to display the Retrieve Routings window for your search criteria; and use the Retrieve Only Applicable Items check box for eligible items. Choose Find to display your search on the Apply Changes window, and uncheck any items you do not want included in the mass update.

7. Choose Apply to update your changes.

    Eligible items are those with values in the applicable fields for the selected operation.

    > **Note:**   Even though you can display all routings, updates occur only on applicable routings.

▶ **To update outgoing network connections:**

1. Navigate to the Graphical Line Designer Workbench, and check the Mass Change check box.

2. Select a node on the graphical pane, and right-click with your mouse to display the pop-up menu.

3. Select Outgoing Network Connections to display the Network Connections window.
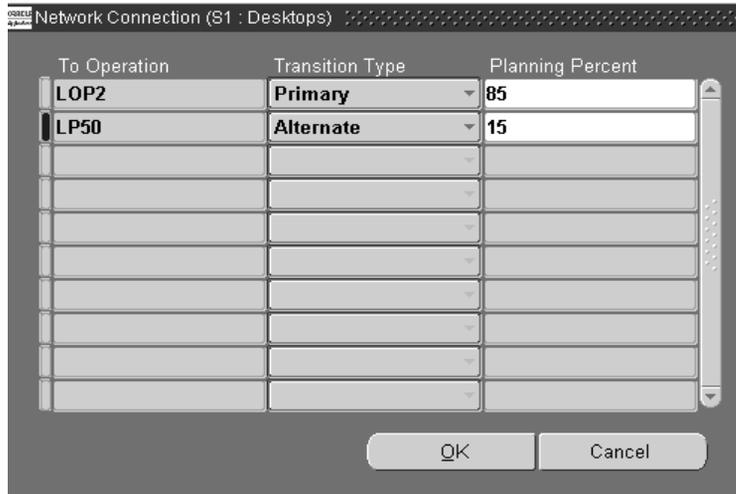
4. Enter changes in the Planning Percent fields.

Network planning percentage connections under 100 percent display on the detail pane of the graphical network. The total planning percent must equal 100 in order to update item routings.

5. Choose OK to display the Apply Changes window.

6. Select your edit list criteria.

You can choose Retrieve to display the Retrieve Routings window for your search criteria; and use the Retrieve Only Applicable Items check box for eligible items. Choose Find to display your search on the Apply Changes window, and uncheck any items you do not want included in the mass update.

7. Choose Apply to update your changes.

Eligible item routings are those with same the geometry match including:

- The same specified network connection

- The same outgoing network connections defined for the To Operation

- Transition type and destination must match the current item routing

■   If you check the Match Planning Percentage check box, the planning percents must match and not exceed 100

Note: Even though you can display all routings, updates occur only on applicable routings.

Component Assignments on the Bill of Material

You can associate the components on the bill of material with the routing events where the components are consumed. This association links one or more sub-inventory and locator combinations to line operations—and then automatically updates the material control portion of the parent bill of material.

These transactions are performed on the Update Components window. This window is accessed from the Graphical Line Designer Workbench by selecting the item routing in the hierarchical tree; or the line operation, process, or event in the graphical pane. A bill of material must exist for the selected routing in order to display this window.

▶ **To assign components to a bill of material:**

1.   Navigate to the Graphical Line Designer Workbench.

2.   Select either an item routing on the hierarchical tree; or a line operation, process, or event in the graphical pane.

3.   Right-click with your mouse to display the pop-up menu, and select Component Assignments.

The Update Component window displays.

Information defaults on the Components region of the window depending on your selection. For example, if you access the window from the line operation or process—the line operation and any associated events display. If you access the window from the event—the line operation and all instances of this event display. And if you select the item routing, all lines and events display.

4. You can also use the upper region of the window to enter criteria for a new query.

- In the Display Option field, choose the display mode, within the context of other specified parameters, for the Components region of the window. Your display choices are:

    Assigned—retrieves components assigned to any event for this specified routing.

    Unassigned—retrieves components that are not currently assigned to any event in this specified routing. This mode enables you to assign components to the routing.

    All—retrieves all components both assigned and unassigned.

- Optionally select a value, or range of values in the Line Operation field.

- Optionally select a value in the Event field.

- Optionally select an item number, or range of components in the Components field.

5. Choose Find to displays the results of your query. on the Components region.

6. Optionally, you can manually change the Event, Subinventory, and Locator values for any component listed.

   The component attributes are displayed for event, line operation, item sequence, component name, subinventory location, and locator.

7. Check the Mass Assignments check box if you want update the records in your query in mass update mode.

   Several different mass update transactions are available including:

   - Activates the Mass Assignment Selection check boxes for each component on the Components region. Select components by checking the Mass Assignment Selection check boxes in individual rows. This field is disabled when the Mass Assignments check box is not checked.

   - Choose Select All to activate all the records on the window.

   - Choose Unselect All to deactivate all the records on the window.

8. The Mass Assignments check box also enables the Mass Assignments region on the window. You can enter values in the Event, Subinventory, and Locator fields.

9. Check the records in the Components region you want to update.

10. Choose Assign to update the applicable records and fields on the Components region.

11. Choose OK to update the component assignment to the bill of material for the item routing selected

    All specified components on the window are updated on the item routings's bill of material. The Graphical Line Designer Workbench displays again.

    If you selected Mass Change on the Graphical Line Designer Workbench—the Apply Changes window displays. See: Mass Changes on Item Routings on page 4-43

12. Save your work.

13. Select Bills of Material from the Tools menu to view the update in the Bills of Material window.

Specifying Cost Rollup Resource Information

The Set Resource Cost Rollup window is used to specify if an event's resources are included in the cost rollup. If you include an event in the rollup, the checkbox on the Event's window is enabled. See: Creating the Graphical Network on page 4-29 This window provides a method for creating a mass change for events on a particular item routing.

To set resources for cost rolllup:

1. Navigate to the Graphical Line Designer Workbench.

2. Select an item routing on the hierarchical tree, and choose Set Resource Cost Rollup from the Tools menu.

   The Set Resource Cost Rollup window displays, showing all the events and line operations for this routing.
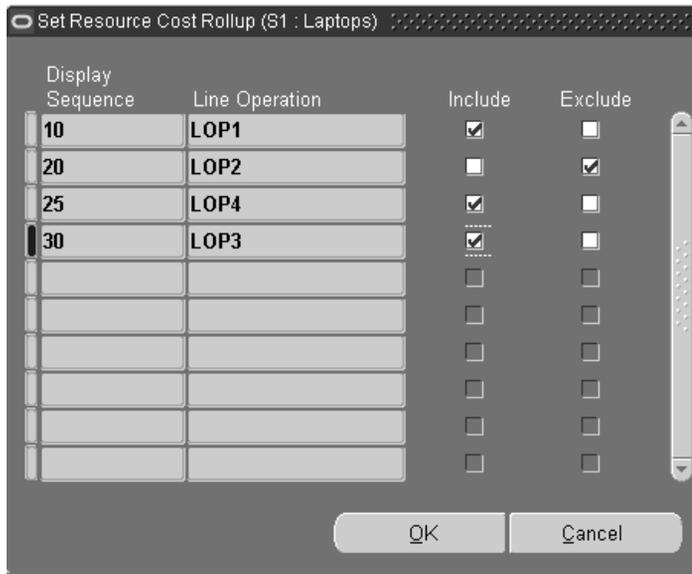
3. Enable the Include box for the event and line operations you want included in the cost rollup. Use the Exclude box for events you do not want calculated in the cost rollup.

4. Choose OK.

5. Save your work.

See Also

Rolling Up Supply Chain Costs, *Oracle Cost Management User's Guide*

5

Mixed Model Map Workbench

This chapter describes the features of the Mixed Model Map Workbench, a graphical interface used to balance your production lines. Topics include:

Overview of the Mixed Model Map Workbench

The Mixed Model Map Workbench is a graphical interface for monitoring line balancing—the process of defining production lines by including the products made, operations performed, and resources and materials consumed at each step. It is used to balance a line against specified demand—and calculate process volume, machine and labor requirements, TAKT times, and In-Process Kanban (IPK) requirements. The Mixed Model Map Workbench provides:

- A tree navigation graphical workbench displaying information at different detail levels for plans, lines, operations, resources.

- Detail panes for each node selected on the navigation tree.

- The ability to analyze and balance lines, or run simulations, considering both the assigned resources and the In Process Kanbans (IPK) available.

- Both a line operation and process view enabling the assignment and analysis of resource demand across multiple production lines.

- Support for multiple plans for simulation studies.

- Identification of resource usage and problem operations.

- The ability to use unscheduled planned orders and sales orders as a type of demand.

- An engine using demand as input to calculate the resource/IPK usage as needed for each resource, at each operation.

- Display and calculation of resource efficiency and resource total units for a plan.

- Display of line demand and line capacity in summary view.

- Update of item variable lead time using line TAKT.

The workbench displays a navigation tree, and a detail pane for each node selected on the tree. There are two tree tables enabling you to toggle between the Line Operation and Process regions. Both regions display a line and resource view:

- The Line Operation region displays operations specific to the line, as derived and defined during line balancing. This region shows the resulting line information after mixed model map calculations.

- The Process region displays the activities performed in defined processes on the line. This region shows the result of mixed model map runs for all the processes.

The Navigation tree contains three nodes—when a node is selected the corresponding detail pane displays:

- All Plans—All the plans defined in the organization selected.

- Resource Assignment—The total available units from applicable departments, and total assigned units to operations for a resource.

- IPK Assignment—In Process Kanbans assigned, a summary of all the IPK master assignments.
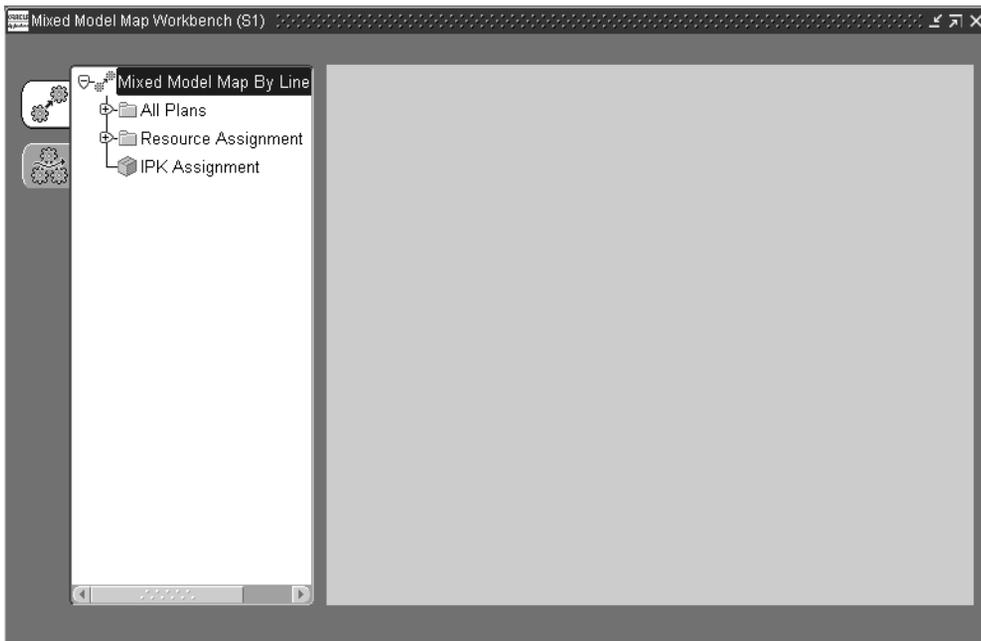
See Also

Viewing, Creating, and Updating Plans

The Plans node displays all the plans in the selected organization. This enables you to view multiple plans using different line balancing techniques. You can view the details of a specific plan by selecting the node in the navigation tree, the data displays in the canvas.

To view or update a plan:

1. Select the All Plans node, and expand the navigation tree to display the plans.

2. Select a plan to display the pane for this plan's definition.

3. Update the fields you want to change.
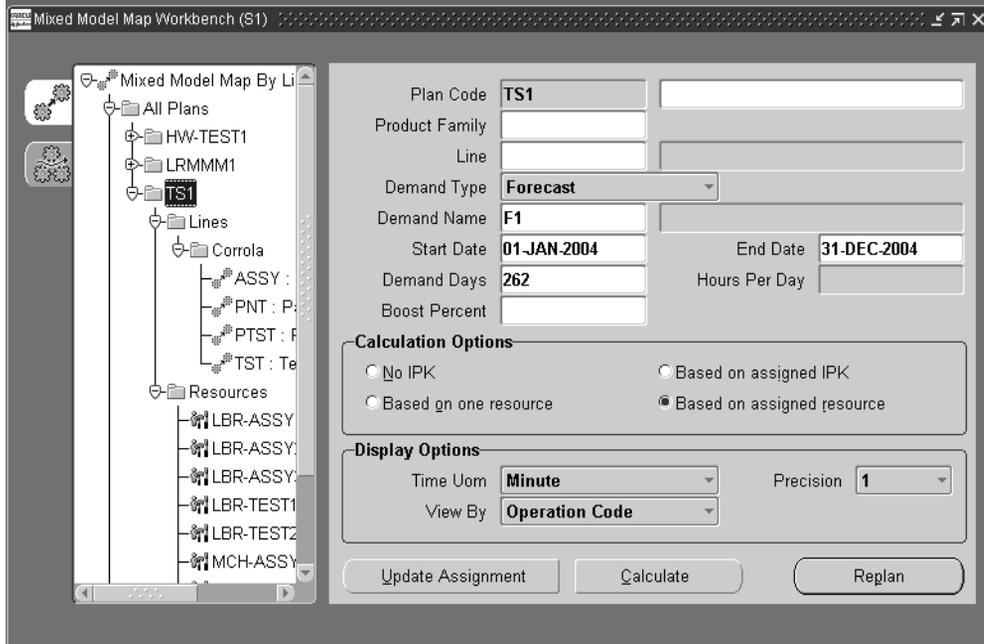
4. Choose Calculate or Replan

    If you choose Calculate, the mixed model map calculation is performed based on the parameters specified for this plan. Calculations use assigned values for resources, IPKs, and the demand values. A confirmation displays if the process is successful.

If you choose Replan, the current assigned values for recalculation. A confirmation displays if the process is successful.

5. Save your work.

To create a new plan:

1. Select the All Plans node, and right click to display the Menu.

2. Choose New to display the pane for entering your plan definition.

3. Enter a unique name in the Plan Code field, and optionally any description for this plan.

4. Optionally, you can select values in the Product Family, a group of products with similar characteristics, and product Line fields for this plan.

5. In the Demand Type field, select a value representing the source of this demand. Your choices are:

   - Forecast—an estimate of future demand

   - MDS—master demand schedule, the anticipated forecasted ship schedule

   - MPS—master production schedule, the anticipated forecasted build schedule

   - Actual Production—demand generated from existing Flow schedules

   - Sales Orders

   - Planned Orders

6. If the value in the Demand Type fields is Forecast, MDS, or MPS, you are required to select a Demand Name value.

7. The Start and End Date values are derived from the forecasted demand, and can be changed.

   Demand Days for this Demand Type display. Demand days are the number of working days in between specified demand start and end date.

8. The Hours Per Day field displays the working hours for this line. This value can be changed.

9. You can enter a Boost Percent value. This specifies an increase percentage of the demand in the plan.

10. Choose a Calculation Option. This region is used to select how operational cycle times, resource requests, and IPK values are calculated. Your choices are:

- No IPK—resource requirements are calculated using the IPK value as zero on the line operation.

- Based on one resource—the IPK needed on the line operation is calculated assuming one resource at each operation.

- Based on assigned IPK—resources are calculated using the assigned IPK at the line operation.

- Based on assigned resource—the IPK needed on the line operation is calculated using all the assigned resources.

11. The Display Options region is used for selecting viewing options for the generated mixed model map. Indicate how you want to display time in the Time Uom field. Your choices are Hour, Minute, or Second.

12. In the View By field, indicate the sort option, on the navigation tree, for this plan's process or line operation display. Your choices are Display Sequence, Operation Code, or Description.

13. The Precision field is the decimal setting for your calculation values. Your choices are 1,2,3, or 4 decimal places.

14. Choose Calculate to run the mixed model map calculation based on the parameters specified for this plan.

   Calculations are performed based upon assigned values for resources, IPKs, and the demand values. A confirmation displays if the process is successful.

15. Optionally, choose Replan to use the current assigned values for recalculation. A confirmation displays if the process is successful.

16. Optionally, choose Update Assignment to copy the assigned resources and IPKs in this plan to the master resource and IPK assignments. A confirmation displays if the process is successful.

17. Save your work.

   After you create or update information in this window, you can perform three processes.

Viewing Plan Production Line and Line Operation Information

Production line information is available on the workbench in summary, line detail and line operation, and graphical views. You can use the summary view to determine if there is an imbalance in the line, resource overload, or IPK assignment. You can then view the details of a specific line and line operation.

Line Operation views enable you to access resource and labor information.

The production line views enable you to copy the values that are required in the Needed fields to the Assigned fields. In the navigation tree, right click to display the menu, and choose. Select Copy Needed To Assigned.

You can also update item variable lead times by copying the line TAKT time. In the navigation tree, right click to display the menu, and choose Update Items Variable Lead Time. This function copies the value of the plan's:

(Line TAKT / Line hours per day) for each line to the corresponding Items' Variable Lead Time

See Also

Line Summary View

The Line Summary pane displays fields for Line name, Hours, Daily Demand, line TAKT time, Assigned TAKT time, Daily Capacity—and two regions—Resource Percentage and IPK Percentage. These regions display maximum Over and Under values for the line.

The Line Hours field can be updated. This is the continuous working hours for the line.

Line TAKT and Assigned TAKT fields display values so you can compare capacity. Line TAKT is the rate the line produces one item to fulfill demand. Assigned TAKT is the time per unit that each operation produces, given the number of resources assigned.

The Daily Capacity value is a statement of process capability. It is equal to the Assigned TAKT multiplied by the hours.

Color coding provides a visual display of these comparisons. See: Color Representation on the Mixed Model Map Workbench on page D-5

In the Resource Percentage region, Over signifies a resource overload. That is, the resource needed is greater than the resource assigned in the line. Under signifies that the resource is not sufficiently used.

In the IPK Percentage region, Over means that there is IPK overload. That is, the IPK needed is greater than the IPK assigned in any of the line operations or processes. Under signifies that IPK are not sufficiently used.

Detail information for these values and modifications created here is available in tabbed regions for Summary, IPK Table, and Graph.

Line Detail - Summary View

The Line Detail panes are view only windows. In the Line Detail view, the Summary tabbed region shows line operation detail information in a table format. The line name, line hours, and line TAKT display.

The table displays the operation information including Operation name, Operation TAKT, Operation TAKT as Assigned, Resource Capacity, and Process Efficiency. Both over-assigned and under-assigned resources display in the Resource Capacity

column. Process Efficiency is a statement of value-added activities. It is equal to the line operation efficiency multiplied by the demand.

Color coding provides a visual display for comparisons of values needed and exceeded. See: Color Representation on the Mixed Model Map Workbench on page D-5

You can filter or sort the data displayed in the table by choosing Filter/Sort. See: Filtering and Sorting Information on page 5-24

You can view item demand details of the line operation and operation TAKT for the line by choosing Item Details from the Summary tabbed region. See: Viewing Item Details for a Line on page 5-16

You can copy the values that are in the required in the Needed fields to the Assigned fields. In the navigation tree, right click to display the menu, and choose. Select Copy Needed To Assigned.

You can also update item variable lead times by copying the line TAKT time. In the navigation tree, right click to display the menu, and choose. Update Items Variable Lead Time.

Line Detail - Resource/IPK Table View

The Resource/IPK Table tabbed regions contain two table areas—Resources and In Process Kanbans regions.

The Resources region displays line resource details including fields for Resource, resource Type, resources Needed, and resources Assigned. You can filter or sort the data displayed in the table by choosing Filter/Sort. See: Filtering and Sorting Information on page 5-24

The In Process Kanban regions displays a table showing the line operation, and values needed and assigned.

The production line views enable you to copy the values that are in the needed fields to the assigned fields. In the navigation tree, right click to display the menu, and choose. Select Copy Needed To Assigned.

You can also update item variable lead times by copying the line TAKT time. In the navigation tree, right click to display the menu, and choose. Update Items Variable Lead Time.

Line Detail - Graphical View

The Graph tabbed region of the line detail displays a graphical view of the line resource and IPK values. In the View By field, you can change the graph information from percentage values or absolute values. There is a choice of three views including:

- Percentage Needed: the percentage difference between Assigned and Needed values—divided by the Needed value. Over-assigned and under-assigned resources display on this view.

- Percentage Assigned: the percentage difference between Assigned and Needed values—divided by the Assigned value. Over-assigned and under-assigned resources display on this view.

- Absolute Value: Needed and Assigned values display for comparison.

You can modify the display by filtering or sorting the data by choosing Filter/Sort. See: Filtering and Sorting Information on page 5-24

You can enlarge the graph by double-clicking on the graph. Double click again to return to the original view. You can also use the cursor to drag over a region to

enlarge a section of the graph. Use your cursor to rollover text details on the graph to display tooltip information.

Color coding provides a visual display for comparisons of values needed and exceeded. See: Color Representation on the Mixed Model Map Workbench on page D-5

Line Operation - Detail View

Line Operation Detail views display specific data for the operation node selected. The Detail tabbed region displays fields for this line operation for Operation TAKT, Line TAKT, IPK Needed and IPK Assigned.

There are two regions—Labor Resources and Machine Resources region. Both regions display fields for Resource name, Usage, Needed, and Assigned.

These fields enable you to compare and assign resource capacity values. Color coding provides a visual display for comparisons of values needed and exceeded. See: Color Representation on the Mixed Model Map Workbench on page D-5

You can view item demand details of the line operation and operation TAKT for the line operation choosing Item Details from the Summary tabbed region. See: Viewing Item Details for a Line on page 5-16

You can copy the values that are in the required in the Needed fields to the Assigned fields. In the navigation tree, right click to display the menu, and choose. Select Copy Needed To Assigned.

Values can be changed in the Assigned fields and recalculated for a line operation. Enter the value you want to change, and choose Recalculate. Resources are calculated and new values display in the usage and needed fields.

Line Operation - Graphical View

The Graph tabbed region of the line operation detail displays a graphical view of labor resources and machine resources.
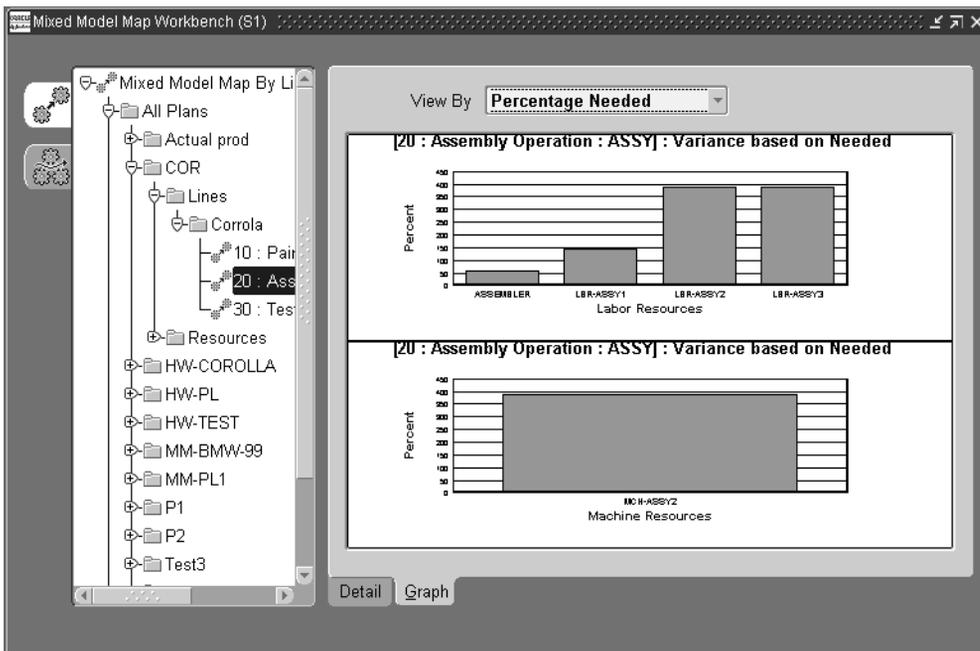
In the View By field, you can change the graph information from percentage values or absolute values. There is a choice of three views including:

- Percentage Needed: the percentage difference between Assigned and Needed values—divided by the Needed value. Over-assigned and under-assigned resources display on this view.

- Percentage Assigned: the percentage difference between Assigned and Needed values—divided by the Assigned value. Over-assigned and under-assigned resources display on this view.

- Absolute Value: Needed and Assigned values display for comparison.

You can copy the values that are in the required in the Needed fields to the Assigned fields. In the navigation tree, right click to display the menu, and choose. Select Copy Needed To Assigned.

You can enlarge the graph display by double-clicking on the graph. Double click again to return to the original view. You can also use the cursor to drag over a region to enlarge a section of the graph. Use your cursor to rollover text details on the graph to display tooltip information.

Color coding provides a visual display for comparisons of values needed and exceeded. See: Color Representation on the Mixed Model Map Workbench on page D-5

Viewing Item Details for a Line

The Item Details window display line operation and operation TAKT details for a specific line. This is a view only window that displays fields for Product, Process volume, Machine Time, labor time, and Elapsed Time. The Weighted Time values also display for the time fields.

This window is accessed from the Line Detail view, the Summary tabbed region—and the Line Operation Detail views by choosing Item Details.

Item Details (S1)				
Operation	**ASSY**	Product Family		
Operation TAKT	0.0274	Demand		
Product	Process Volume	Machine Time	Labor Time	Elapsed Time
C-LX-GRN	40.4077	0.1000	0.9000	0.8000
C-LX-WHT	40.4077	0.1000	0.6500	0.5500
C-LX-BLK	40.7310	0.1000	0.9000	0.8000
C-DX-BLK	81.1386	0.1000	0.6500	0.5500
C-DX-GRN	81.1386	0.1000	0.6500	0.5500
C-DX-WHT	81.1386	0.1000	0.6500	0.5500
Weighted Time		0.1000	0.7056	0.6056

Viewing Plan Resource Information

You can view resources needed and assigned for a particular plan—and filter and sort the displayed information. Resources are displayed in summary and individual resource detail views.

Resources Summary Views

The Resource Summary views are a view only panes displaying Summary and Graph regions. Updates can be made on the detail views.

The Summary tabbed region has two regions—Labor Resources and Machine Resources region. Both regions display fields for Resource name, Needed, Assigned, and Relocation Needed.

The Relocation Needed field signifies if resources are being allocated sufficiently. For example, some line operations have extra resources while others need resources. The values in this field are:

- Yes—there are extra resources assigned to this line operation, while other operations have less assigned resources than needed.

- No—there are no extra resources assigned to this line operation, and no other operations need this resource.

- Null—resources needed is greater than resources assigned

These fields enable you to compare resource capacity values. Color coding provides a visual display for comparisons of values needed and exceeded.See: Color Representation on the Mixed Model Map Workbench on page D-5

You can modify the display by filtering or sorting the data by choosing Filter/Sort. See: Filtering and Sorting Information on page 5-24

The Graph tabbed region displays Labor Resources and Machine Resources regions.

In the View By field, you can change the graph information from percentage values or absolute values. There is a choice of three views including:

- Percentage Needed: the percentage difference between Assigned and Needed values—divided by the Needed value. Over-assigned and under-assigned resources display on this view.

- Percentage Assigned: the percentage difference between Assigned and Needed values—divided by the Assigned value. Over-assigned and under-assigned resources display on this view.

- Absolute Value: Needed and Assigned values display for comparison.

You can enlarge the graph display by double-clicking on the graph. Double click again to return to the original view. You can also use the cursor to drag over a region to enlarge a section of the graph. Use your cursor to rollover text details on the graph to display tooltip information.

Color coding provides a visual display for comparison. See: Color Representation on the Mixed Model Map Workbench on page D-5

Resource Detail Views

The Resource Detail view shows the resource and IPK needed and assigned in the line operation across line operations.You can filter or sort the data displayed by choosing Filter/Sort. See: Filtering and Sorting Information on page 5-24

The resource Assigned can be modified and recalculated. Choose Recalculate to update resource and IPK values.

You can copy the values that are in the required in the Needed fields to the Assigned fields. In the navigation tree, right click to display the menu, and choose. Select Copy Needed To Assigned.

The Graph Resource view displays resource details in a graphical view. In the Absolute Value view, the graph displays the resource and IPK needed and assigned in the line operation—across line operations. You can filter or sort the data displayed by choosing Filter/Sort. See: Filtering and Sorting Information on page 5-24

In the View By field, you can change the graph information from percentage values or absolute values. There is a choice of three views including:

- Percentage Needed: the percentage difference between Assigned and Needed values—divided by the Needed value. Over-assigned and under-assigned resources display on this view.

- Percentage Assigned: the percentage difference between Assigned and Needed values—divided by the Assigned value. Over-assigned and under-assigned resources display on this view.

- Absolute Value: Needed and Assigned values display for comparison.

You can enlarge the graph display by double-clicking on the graph. Double click again to return to the original view. You can also use the cursor to drag over a region to enlarge a section of the graph. Use your cursor to rollover text details on the graph to display tooltip information.

Color coding provides a visual display for comparisons of values needed and exceeded. See:Color Representation on the Mixed Model Map Workbench on page D-5

Resource Assignment

The expanded Resource Assignment node enables you to view all your resources—and display the details for the line, line operation, department, and assigned values. This pane displays a detail of each line the resource is assigned to, a total Assigned value. There is Summary region on this window displaying the department, units, assigned, and totals.

You can update the Assigned field value, and choose Refresh to update the resource values.

In Process Kanban Assignment

The IPK Assignment pane displays a summary of all the IPK master assignments for your lines. It displays the IPK assignment for the line and line operation combination. This data is updated when you choose Update Assignment for a plan, or when you change values in the IPK Assignment field on this pane.

In Process Kanbans are designated as a work in process holding area for work in between operations. If the operation time for one operation is shorter in length than the next operation—the IPK is where the item is designated until the next operation is available. The outputs are used by the next operation to keep the line flowing. For example:

■   A Line with 2 working hours, consists of 2 continuous operations—Operation1 and Operation2

■   Operation1 and Operation2 use one resource each—R1 and R2

■   R1 completes an operation every 30 minutes, while R2 completes an operation every 15 minutes

In order for the line to produce items every 15 minutes, and fulfill 8 demands, IPK is needed for Operation1 because it takes more time than Operation2.

- R1 in Operation1 only produces 4 items in 2 working hours
- R2 needs 8 unfinished items from R1 to produce 8 final items

Therefore, extra items—or IPK—are needed at the end of R1 in Operation 1, so R2 in Operation 2 can keep producing at its capacity level. IPK can be fulfilled by using extra line operation resources at the operation.

In Process Kanban Calculation

IPKs are calculated as follows:

(elapsed weighted time - line takt time) * hours/day * time conversion factor divided by elapsed weighted time * line takt time

The Calculation Options setting in the Plan detail pane is used to select an operational cycle time setting for the number of resources assigned to the operation.

See Also

Viewing, Creating, and Updating Plans on page 5-4

Mixed Model Map Workbench Calculations on page D-2

Filtering and Sorting Information

You have the option to filter or sort table information in the Line Detail, Resource, and Resource Detail views. This enables you to use sort criteria and ordering information, or filter criteria to limit your display of records. You can filter and sort on the Summary, Resource IPK, and Graph tabbed regions.

To filter or sort line detail records:

1. On the Line Detail pane of the selected line, choose Filter/Sort.

   The Filter/Sort Criteria window displays.

2. In the Sort Criteria region, choose ordering options for line operation details. In the Order By field, your choices are Operation, or Operation TAKT.

3. In the Order field, choose the order of display for records—Ascending or Descending.
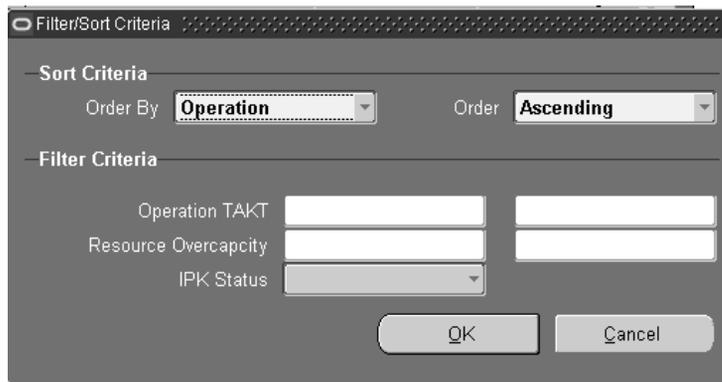
4. In the filter Criteria region, you have the option to enter values for filtering your records. You can enter a value, or range of values, in the Operation TAKT and Resource Overcapacity fields.

5. You can select an IPK Status value. Your choices are either Over or Under

6. Choose OK to filter and sort your records. The results display on the Line Detail views.

To filter or sort resource and resource detail records:

1. On the Resource or Resource Detail pane of the selected resource, choose Filter/Sort.

   The Filter/Sort Criteria window displays.

2. In the Sort Criteria region, choose ordering options for line operation details. In the Order By field, your choices are Resource or Overcapacity.

3. In the Order field, choose the order of display for records—Ascending or Descending.
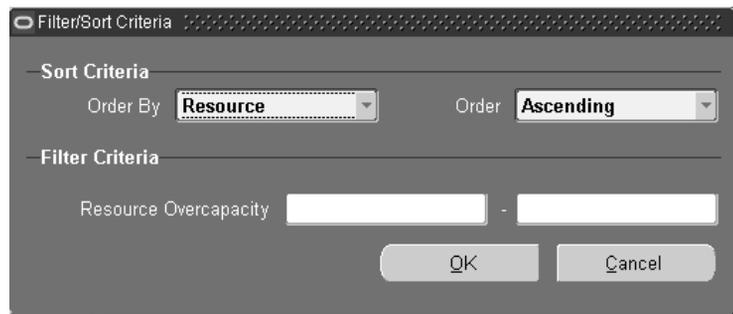
4. In the filter Criteria region, you have the option to enter a value, or range of values, in the Resource Overcapacity field.

5. Choose OK to filter and sort your records. The results display on the Resource and Resource Detail views.

6

Flow Sequencing

This chapter describes Flow sequencing, the process of determining when items are built on the production line to create Flow schedules. The following topics are included:

Overview of Flow Sequencing

Sequencing is the process of determining the order assembly items are built on a production line, in a time horizon. Flow manufacturing environments comprise a mixture of different assembly items, or mixed models, built on the same production line. The sequence assembly items are built determines the efficiency of the line, and the efficiency determines the productivity of the manufacturing organization. Flow Sequencing is a module for considering your demands and determining a sequence for building assembly items. You use attributes, constraints, and group them into rules for assigned production lines.

In sequencing tasks, constraints are used to decide the best sequence of production. Depending on the production mix—constraints are a combination of many factors including resources, components, and physical dimensions. The Flow Sequencing concurrent program takes the sequencing task as input, and creates Flow schedules to meet production demands. Flow sequencing process begins with the initial data setup. This includes setting up attributes and constraints into rules, and assigning to production lines. After the setup, the process consists of two tasks:

❑ Specifying parameters including:

■ Date horizon, schedule group, and source of data

■ Production lines

■ Demand

■ Viewing and adjusting demand

❑ Submitting the sequencing task

Flow Manufacturing Sequencing is setup, tasks created, and submitted in the Flow Manufacturing Sequencing and Execution pages. Attributes, constraints, rules, and production lines are set up in the Setup tabbed region. Tasks are created in the Sequencing Tasks tabbed region, and later submitted when your adjustments are finalized.You first select an organization in order to navigate to the other pages. The Home page enables you to:

■ View up to the last ten sequencing tasks generated. These are displayed in a table displaying showing the task Name, Phase, Status, Submission Date, and the Production Line assigned, and Organization. See: Viewing Sequencing Tasks on page 6-34

■ Navigate to the Task Summary detail page. See: Sequencing Task Summary on page 6-36

■ Create a new task. See: Creating Sequencing Tasks on page 6-22

Setting Up Flow Sequencing

The Setup tabbed region of the Flow Manufacturing Sequencing and Execution page is used to set up your attributes, constraints, rules, and assign them to production lines.

Attributes

Attributes are a characteristic of your demand. For example—on an automobile production line, you can specify an attribute type as Component, and name it Color.

Attribute types can be one of several classes including entity, property, and date attribute types.

Entities are their names such as Item or Line Operation—where the name of the item or line operation is the attribute type.

Property types require data attributes from the source table. For example, the Flow Schedule Property attribute requires an attribute from the Flow Schedule Property table—such as ALLOCATED_FLAG or DEMAND_CLASS.

Date types also require data attributes from the source table—the specific date type needed for the attribute. For example, the Sales Order Due Date attribute requires an attribute from the Sales Order table—such as PROMISE_DATE or REQUEST_DATE.

The types of attributes in Flow Sequencing are:

- Component
- Flow Schedule Property
- Item
- Item Category
- Item Customized
- Item Property
- Line Operation
- Model
- Planned Order Customized
- Planned order Due Date
- Planned Order Property

- Product Family

- Sales Order Customized

- Sales Order Due Date

- Sales Order Property

Constraints

A constraint is a restriction enforced on an attribute. For example—on an automobile production line, you have an attribute specified as Color. A constraint is created on the Color such as the required transition—first red is manufactured, then black.

Constraints have priorities attached to them, and the priority is unique within a rule. The sequencing process always attempts to honor constraints from the lowest to the highest priority.

> **Note:** It is good practice to define priorities in increments of 10.

A value of zero indicates a hard constraint. If these constraints are broken—or violated—Flow Sequencing stops.

> **Note:** Constraint types do not apply to every attribute type.

Constraints types are:

- Required Transition: For the constrained attribute, a certain value must be immediately followed by another certain value on production line. For example, on a product assembly line—constraint A must be followed by B; otherwise it is a violation.

- Forbidden Transition: For the constrained attribute, a certain value must not be followed by another certain value. For example, on a product assembly line—constraint A must not be followed by B; otherwise, it is a violation.

- Grouping: For the constrained attribute, a certain value is on the production line as a group of certain size (or multiple of that size).

    - Attribute-level grouping: If an attribute value is not specified, the constraint applies to every value of the constraint attribute.

- - Unlimited grouping: The group size is not specified, the constraint is a different value in one group.

- Spacing: For the constrained attribute, a certain value must be separated by other values and a specified distance.

    - Attribute-level spacing: if an attribute value is not specified, the constraint applies to every value of the constraint attribute. Spacing distance is always required.

- Capacity: Within any day, or the whole horizon, the number of occurrences of a certain attribute value cannot exceed a certain limit. There are three types of capacity constraints:

    - Daily limit – the limit is defined for each every day.

    - Horizon limit – the limit is defined for the whole sequencing horizon.

    - Component Availability – the limit is from checking ATP of a certain component. In this case, the attribute can only be component,

- Ordering: Within the sequencing horizon, the values of one or more attributes appear in either ascending, or descending, order. For example, constraint Order price descending, engine power ascending—will first order price in descending order, and engine power in ascending order.

- Due Date: All demands must be scheduled before the corresponding due date (for example, sales order promise date).

- Conditional Transition: For the constrained attribute, a certain value must be immediately followed by itself, or another certain value on production line. For example, constraint A must be followed by itself or B—means that on a production line—every A must be followed by a A or B assembly; otherwise it is a violation.

Rules

Rules are a grouping of prioritized constraints defined for the attributes. Rules are assigned to specific production lines. For example, Rule 1 consists of two prioritized constraints:

Priority	Constraint	Attribute	Description
10	Required Transition	Assembly Item	Assembly 1 must be followed by Assembly 2
20	Group	Assembly Item	Group assembly 3

On an automobile production line, you have an attribute specified as Color, a constraint created for the required transition. Then you can create another constraint for spacing— one of every 4 automobiles is red, the rest are black. Then group the constraints into a rule, and name it Rule 1.

Production Lines

A rule is a collection of constraints, and associated with one or more production lines.

For example, on an automobile production line, you have an attribute specified as Color, a constraint created for the required transition. Then you can create another constraint for spacing—one of every 4 automobiles is red, the rest are black. Then group the constraints into a rule, and named Rule 1—and associate it with a specific production line.

Viewing and Defining Sequencing Attributes

To view sequencing attributes:

1. In the Flow Manufacturing Sequencing and Execution Home page, select a value in the Organization field and choose Go.

2. Select the Setup tabbed region.

3. Select Sequencing Attributes to display the Sequencing Attributes page.
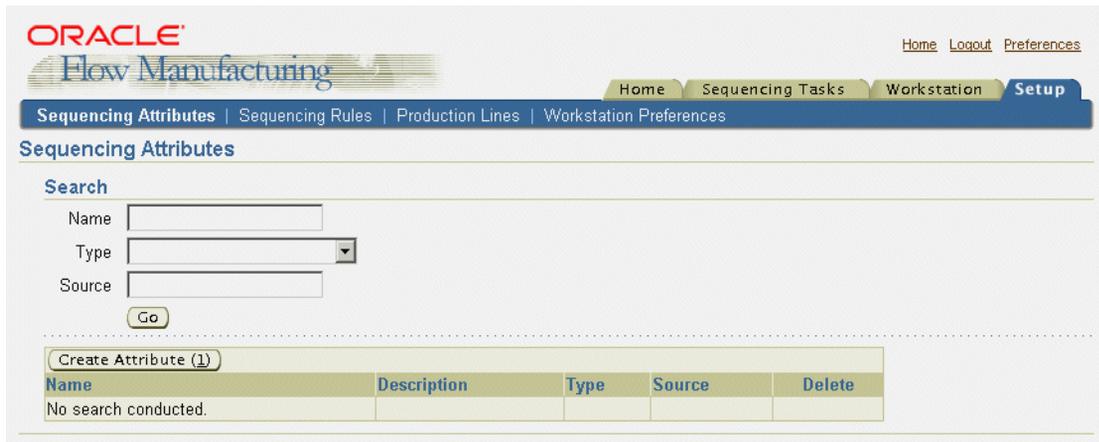
4. To view existing attributes, enter values in the Search region to filter your search, or leave these fields blank to display all defined attributes.

    You have the option to enter:

    ■   Name—a unique identifier for the attribute

    ■   Type—such as Item, Model, or Product Family. See: Attributes on page 6-4

    ■   Source—this is a table column field for property type attributes.

5. Choose Go to display the results of your search criteria.

To define sequencing attributes:

1. Choose Create Attribute to display the Create Attribute page.

2. In the Type field, select an attribute type.

    See: Attributes on page 6-4

3. Enter a unique Name, and optionally a Description for this attribute.

4. If you are creating more than one attribute, choose Create Another Attribute to define another record.

5. Choose Apply to save your work.

   A confirmation page displays when all your records are saved.

Viewing Sequencing Rules

To view sequencing rules:

1. In the Flow Manufacturing Sequencing and Execution Home page, select an organization in the Organization region, and choose Go.

2. Select the Setup tabbed region, and choose Sequencing Rules to display the Sequencing Rules page.

3. Enter values in the Search region to filter your search, or leave these fields blank to display all defined sequencing rules.

   You have the option to enter Name and Description values.

4. Choose Go to display the results of your search criteria.

This page displays a list of rules according to your search criteria. You can also view details of a rule, assign lines, and update the rule with new information. See: Assigning Production Lines and Rules on page 6-19, and Constraints on page 6-5

5. Select a rule in the Name field to display the Rule detail page.

This page displays the Constraints attached to the rule, and the assigned production lines. See: Rules

Defining Sequencing Rules and Constraints

Rules are a grouping of prioritized constraints, the constraints use priorities to determine the sequence of production.

To define a sequencing rule:

1. Choose Create Rule to display the Create Rule page.

2. Enter a unique value for this rule in the Name field, and optionally a description of this rule.

3. In the Constraints region, select constraint values from the Select Constraint type box.

4. Choose Create Constraint to display the Create Constraint page.

5. Enter a value in the Priority field, and select an attribute.

The lower the priority number indicates a high priority. A value of zero indicates a hard constraint that must not be violated. It is good practice to define priorities in increments of 10. See: Constraints on page 6-5

6. Choose Continue to display the Constraint Details page.

7. Select a component item number for this constraint.

8. Choose Finish to save your work.

The new constraint displays in the Constraints region of Create Rule page.

9. To modify constraints displayed in this list, select a constraint and choose Update. The Update Constraint for Rule page displays.

You have the option to modify the Priority and Attribute fields.

10. Choose Continue to display the Update Constraint Details page.

11. You have the option to change the item on this page.

12. Choose Finish to save your work. The updated constraint displays in the Constraints region of Create Rule page.

13. If you want to delete any of the constraints created for this rule, choose Delete for the selected rule.

14. Choose Apply to save your work

Viewing and Updating Production Lines

Flow manufacturing environments comprise a mixture of different items built on the same production line. You consider your demands and determining a build sequence. Rules are associated and assigned to one or more production lines.

To view production lines:

1. In the Flow Manufacturing Sequencing and Execution Home page, select a value in the Organization field and choose Go.

2. Select the Setup tabbed region.

3. Select Production Lines to display the Production Lines page.

4. You have the option to enter values in the Search region to filter your search. Enter values in the Name or Description fields. You can also leave these fields blank to display all defined production lines.

To update production line information:

1. Navigate to the Production Lines page.

2. Search for the record to update.

3. Select the production line and choose Update.

   The Update Production Line page displays.

4. In the Line Definition region, you are required to enter values in the Hourly Rate, Start Time, and Stop Time fields.

   Note: These values are defaulted from the Production Lines window.

5. In the Sequencing Default Values region, you can enter default values for when running the Sequencing Concurrent program for this line. In the Scheduling Direction box, you have the option to change the scheduling from Forward or Backward.

6. The Connect Sequence field is used to connect this sequencing task to a previous sequencing task. Your choices are Yes or No.

   This option enables you to sequence between days within the horizon, and gives you the option to connect the sequences with existing sequences without violating constraints.

7. The Combine Schedules field is used to combine similar concurrent demand into one schedule. Your choices are Yes or No.

8. The Fix Sequence field is used to prevent the resequencing of existing Flow schedule when new demand is added to the schedules, or a portion of the schedules are resequenced. Your choices are:

   - None—Indicates all existing schedules are resequenced.

- Time—Existing schedules with a completion time less than or equal to this value are not resequenced.

- Quantity—Flow schedules up to the specified quantity are not resequnced.

9. In the Assigned Rules region, you can update rule information for this production line. If you want to change the default rule, select the rule in the table, and choose Set as Default. The default symbol displays in the Default field.

10. To delete a rule assigned to this line, select the rule and choose Delete.

11. To assign another rule to this production line, choose Assign Rule.

   The Assign Rule to Production Line page displays. See: Assigning Production Lines and Rules on page 6-19

12. Choose Apply to save your work.

Assigning Production Lines and Rules

Rules are used for calculating the best sequence for schedule creation. You can assign production lines to specific rules, or assign rules to production lines.

To assign a rules to a production line:

1. Navigate to the Production Lines page, and Search for the record to update.

   See: Viewing and Updating Production Lines on page 6-16

2. Select the production line, choose Update. to display the Update Production Line page.

3. In the Assigned Rules region, choose Assign Rule.

   Assign Rule to Production Line page displays.

4. Enter a search string in the Rule Name field and choose Search.

   The Search and Select page displays with the results of your search.

5. Select a record. The record displays on the Assign Rule to Production Line page.

6. Choose Apply to assign this rule to your production line.

   The rule displays in the Assigned Rules region of the Update Production Line page.

7. Choose Apply to save your work.

To assign production lines to a rule:

1. In the Flow Manufacturing Sequencing and Execution Home page, select a value in the Organization field and choose Go.

2. Select the Setup tabbed region.

3. Choose Sequencing Rules.

4. Display the appropriate rules. See: Viewing Sequencing Rules on page 6-10

5. Choose Assign Lines to display the Assign Production Lines to Rule page.

   In the Rule region, the name and description of the rule displays.

6. In the Assign Production Lines region, select production lines from the Available box, and move them to the Assigned box.

   You can move all the production lines, remove lines, or remove all the production lines in the Assigned box.

7. Choose Apply to save your work.

Creating Sequencing Tasks

The Sequencing Task pages display a chronology of steps, or a train, showing where you are in the process. The train displays Enter Parameters, Select Lines, Filter Demands, and Adjust and Submit:

- The first step is to enter parameters for the sequencing run. You create a name for the task, and specify the horizon dates, any applicable schedule group, and data used to create new schedules—or if the task is resequencing existing schedules.

- The next step is to select the production lines used in this run.

- In the Filter Demands step, you specify demand dates. The Filter Demands page has two regions—the first is for selecting demand date. The Optional region is used to add additional filter information such as assembly, customer, and attribute. For example, you may want to consider all sales orders of a specific due date, and then specify the particular customer and assembly number. This page is not used if you are resequencing existing schedules.

- The Adjust and Submit Sequencing page enables you to view the relevant production lines and sales orders, along with the remaining capacity and quantity to sequence. You can update information, and delete production line demand attached to this task. The last step is submitting the task. The sequencing concurrent request is triggered when a task is submitted and Flow schedules are generated.

Results of the sequencing run display on the Flow Manufacturing Sequencing and Execution Home, Task Summary, and Task Detail pages.

> **Note:** Flow schedules are viewable on the Line Scheduling Workbench.

See Also

Entering Sequencing Task Parameters

The Sequencing Task pages display the train of steps to complete. When you navigate to the Entering Sequencing Task Parameters page, Enter Parameters is highlighted. This page is used to specify information needed to create a unique task. You can also select a previous task's parameters on the Sequencing Task summary page, rename the task, and create a new submission. See: Viewing Sequencing Tasks on page 6-34

To enter sequencing task parameters:

1. Navigate to the Entering Sequencing Task Parameters page.

2. Select a Name for this sequencing task.

This must be a unique value, the default value is User Name and the sequential number following the last task created.

3. Select values in the Schedule Date To and From fields.

4. Optionally, you can enter a Schedule Group

5. In the Type region, choose whether you are Creating New Schedules, or Resequencing Existing Schedules.

   If you are creating new schedules, select the data used to create new schedules. Your choices are either Sales Order or Planned Order.

6. Choose Next to display the Select Production Lines page.

Selecting Production Lines for a Task

When you navigate to the Enter Production Lines page, Select Lines is highlighted in the step train.

To select production lines for a sequencing task:

1. Navigate to the Enter Production Lines page by choosing Next from the Enter Parameters page.

2. Select lines from the Available box, and move to the Selected box.

   You can move all the production lines, remove lines, or remove all the production lines in the Assigned box.

3. Choose Next to display the Filter Demands page.

Filtering Demands for a Sequencing Task

You specify demands dates for creating Flow schedules, and any other criteria used for this task. This can include assembly part numbers, customer, and sales order attributes.

> **Note:** This page is not used if you are resequencing existing schedules because that information was previously entered.

To filter demands for a sequencing task:

1. Navigate to the Filter Demands page by choosing Next from the Enter Production Lines page.

2. If you want to display sales order information on the Adjust and Submit Sequencing Task page, enable the Adjust Detail Demands box.

3. Select dates in the Demand Date From and To fields.

4. In the Optional Filter Criteria region, you can select additional sales order attributes with a formula operator. The operator values are Equals or Between. In the Add Criteria region, select the attributes in the Attribute box, and the operator in the Operator box.

5. Choose Add to display these sales order attributes on this page.

   For example, you can select the attribute, Assembly Part Number, and the operator Between. This enables you to list a range of assembly part numbers in your filter criteria.

   Or you can select the attribute, Customer, and the operator Equals. This enables you to add a specific Customer's sales orders.

Viewing Results and Submitting a Sequencing Task

The Adjust and Submit Sequencing page is used to view the remaining capacity and demand for this sequencing task. If you enabled the Adjust Detail Demands box, on the Filter Demands page, demand data displays in the Selected Orders.

This page enables you to update task parameter lines, delete production line demand from this sequencing task, and update sales order demand information. You can also delete, move, or split the sales orders attached to this task.

To edit sequencing task results:

1. Navigate to the Adjust and Submit Sequencing Task page by choosing Next from the Select Production Lines or Filter Demands pages.

   > **Note:** If you are resequencing existing schedules, the Filter Demands page is not used, and this page displays after the Select Production Lines page.

The Production Lines region displays Production Line, Description, Remaining Capacity, and Quantity to Sequence fields:

- Remaining capacity is the capacity for the line. The value is calculated from the existing Flow schedules and the line capacity total.

- The Quantity to Sequence value is calculated from the filter criteria you selected.

2. To update line task parameters, select a production line. Then choose Update to display the Update Line Task Parameters page.

   See: Updating Line Task Parameters on page 6-28

3. To delete a production line from this task, select a production line and choose Delete.

4. In the Select Sales Order region, you have the option to delete, move, update, or split sales orders that are attached to the task. To remove a sales order from consideration, select the order number and choose Delete.

5. To move a sales order to another production line, select the order number and choose Move. See: Moving Demand on page 6-31

6. To update the sales order demand or change the routing, select the order number and choose Update. See: Updating Demands on page 6-32

7. To divide the demand between multiple Flow schedules and other production lines, choose Split. See: Splitting Demands on page 6-33

8. To submit this sequencing task to create Flow schedules, choose Submit.

   The sequencing engine concurrent request is triggered when a task is submitted. See: Sequencing Concurrent Program on page 6-28

Sequencing Concurrent Program

The last step is submitting the task. The sequencing engine is a concurrent request. The request takes all information specified in the sequencing task, and generates Flow schedules.

The result of the sequencing is a series of Flow schedules—build sequences indicate the order of production.

Updating Line Task Parameters

After you enter sequencing task information, and view information on the Adjust and Submit Sequencing Task page—you have the option to change the original parameters. You can modify the time, rate, default sequencing direction, and constraints on this page.You can also choose to combine schedules, and to connect with existing schedules.

To update line task parameters:

1. On the Adjust and Submit Sequencing Task page, in the Production Lines region, select a line.

2. Choose Update to display the Update Line Task Parameters page.

3. Enter a Start and Stop Time range. These fields are required.

4. Enter the Hourly Rate of this line. This field is required.

5. In the Scheduling Direction box, you have the option to change the scheduling from Forward or Backward.

6. The Connect Sequence field is used to connect this sequencing task to a previous sequencing task. Your choices are Yes or No.

   This option enables you to sequence between days within the horizon. When sequencing for a specified horizon, this flag gives you the option to connect the sequences with existing sequences without violating constraints.

7. The Combine Schedules field is used to combine similar concurrent demand into one schedule. Your choices are Yes or No.

8. The Fix Sequence field is used to prevent the resequencing of existing Flow schedule when new demand is added to the schedules, or a portion of the schedules are resequenced. Your choices are:

   ■ None—Indicates all existing schedules are resequenced.

   ■ Quantity—Flow schedules up to the specified quantity are not resequenced.

   ■ Time—Existing schedules with a completion time less than or equal to this value are not resequenced.

- Build Sequence—Flow schedules up to the specified build sequence are not resequenced.

9. Choose Apply to save your work.

10. In the Rules and Constraints region, you can use the Copy Constraint from Rule box to select a rule, and use that rule's constraints. Choose Copy to copy the constraints to your current process.

   The copied constraint displays in the Constraints region. The Constraints region displays all constraints in the current sequencing task. You can change priority—and create, modify, or delete constraints.

Rule and Constraints

To copy constraints of the rule to be used for the current sequencing process, select the rule from the Copy Constraint pulldown list.

Copy Constraint from Rule [R-BMW99 ▾] (Copy)

Constraints

All constraints displayed will be used by the current sequencing process. They can be added, modified, or deleted.

Select Constraint Type [Component Availability ▾] (Create Constraint)   ⊘ Previous [1-10 of 14 ▾] Next 4 ⊘

*Priority	Type	Attribute	Definition	Update	Delete
10	Spacing	Car Type	Separate PF-BMW7-99 by 2	✎	🗑
20	Daily Limit	Car Type	Daily limit of PF-BMW5-99 is 30	✎	🗑
30	Forbidden Transition	Car Color	CMP-PAINT-BLK-99 can not be followed by CMP-PAINT-WHT-99	✎	🗑
40	Daily Limit	Car Color	Daily limit of CMP-PAINT-BLK-99 is 15	✎	🗑
50	Ordering	Assembly	Order Assembly descending	✎	🗑
60	Spacing	Car Type	Separate PF-BMW7-99 by 2	✎	🗑
10	Required Transition	Assembly	MC24713 must be followed by MC97160	✎	🗑

Select Constraint Type [Component Availability ▾] (Create Constraint)   ⊘ Previous [. ▾] Next 4 ⊘

(Cancel) (Apply)

11. To change the priority level of the constraint, enter the new priority value in the Priority field. Choose Apply to save your changes.

12. To create a new constraint for this task, choose Create Constraint to display the Update Constraint page. See: Defining Sequencing Rules and Constraints on page 6-13

13. To delete a constraint, select the constraint and choose Delete.

14. To update a constraint listed on this page, choose Update. See: Defining Sequencing Rules and Constraints on page 6-13

Moving Demand

You may want to move demand to another production line. You can only move demand to an alternate routing, for a production line selected, when you created the sequencing task. See: Selecting Production Lines for a Task on page 6-24

To move demands on a sales order:

1. On the Adjust and Submit Sequencing Task page, in the Order region, select an order.

2. Choose Move to display the Move Demands page.

This page displays the sales order information including fields for Order Number, Line Number, Assembly number, Assembly Description, and the Current Line for this demand.

3. In the Move to Production Line box, select the production line where you want to move this line.

4. Choose Apply to save your work.

You will return to the Adjust and Submit Sequencing Task page displaying the updated information.

Updating Demands

Demand is based on the assembly's primary routing. The Update Demands page enables you to change either one or both of the values for the quantity to sequence, and the routing. The alternate routing must exist for the same line as the primary routing.

To update demand and routing information:

1. On the Adjust and Submit Sequencing Task page, in the Order region, select an order.

2. Choose Update to display the Update Demands page.

   This page displays the order information including fields for Order Number, Line Number, Assembly number, Assembly Description, Open Quantity, and Other Quantity to Sequence.

3. To change the demand for this order, enter a new value in the Quantity to Sequence field.

4. To change the routing to an alternate routing, select a value in the Alternate Designator field.

5. Choose Apply to save your work.

   You will return to the Adjust and Submit Sequencing Task page displaying the updated information.

Splitting Demands

You can optimize production by dividing sales order line quantities to create multiple schedule, or splitting a quantity and moving it to another production line. You can only split demand to an alternate routing, for a production line selected, when you created the sequencing task. See: Selecting Production Lines for a Task on page 6-24

To split demands on a sales order:

1. On the Adjust and Submit Sequencing Task page, in the Order region, select an order.

2. Choose Split to display the Split Demands page.

   This page displays the sales order information including Order Number, Line Number, Assembly number, Assembly Description, and Quantity to Sequence fields.

3. In the Split Quantity box, enter the quantity you want to put on a new Flow schedule.

4. In the Split to Production Line, you have the option to select another production line for this new Flow schedule.

   The alternate routing must exist first to change the routing path

5. Choose Apply to save your work.

   You will return to the Adjust and Submit Sequencing Task page displaying the updated information.

Resequencing Tasks

The sequencing concurrent program considers existing flow schedules within the specified sequencing horizon—the From Start Date Time to the To End Date Time—and re-sequences them. The resequencing of existing schedules is used in the following situations:

- Correct existing schedules to modify the number of hours in production, or the quantity.

- Relieve overloaded Flow schedules.

Flow schedules with scheduled Completion Date equal to the Start Date Time are not considered to be within the horizon. A Flow schedule is within the horizon if the Completion Date is greater than horizon Start Date Time, and no later than horizon End Date Time.

You should not resequence if the concurrent program for that schedule is still running, the broadcast sequence is sent, the traveler is printed, or the feeder line has started.

Viewing Sequencing Tasks

The Sequencing Tasks Search page displays a table with the last ten sequencing tasks from the Home page, for the organization selected. This page enables you to filter your search, and access pages to create a new task or delete a task. You can navigate to the summary and detail pages for the search results.

To search for sequencing tasks:

1. Navigate to the Sequencing Tasks Search page.

2. Select search criteria to filter your search.

   You can select criteria in the following fields: sequencing task Name, Submission Dates From and To, concurrent request Status, concurrent request Phase, Production Line, and User Name.

3. Choose Go to display the results of your search.

   If you do not select any criteria, all sequencing task records display. Records display in a table view.

4. Choose Create Sequencing Task to create a new task. See: Creating Sequencing Tasks on page 6-22.

5. You can select a task in the Sequencing Task Name field to view the summary information of the task. See: Sequencing Task Summary on page 6-36. The summary page navigates to the details page, see: Sequencing Task Details and Results on page 6-37

6. If you want to create a task using some or all of the parameters of an existing sequencing task, choose Create Similar Task.

   This navigates to the Entering Sequencing Tasks Parameter page. The default name displays, you can modify the necessary information. See: Entering Sequencing Task Parameters on page 6-23

Sequencing Task Summary

The Task Summary page displays summary data for an individual task and
production line—including the available capacity for the line, the quantity
fulfilled—and the percentage of resequencing, demand, and constraint
accomplished. Choose View to see the details, see: Sequencing Task Details and
Results on page 6-37

Sequencing Task Details and Results

The Task Detail page is a view only, printable page displaying the results from your sequencing run. This page contains regions for:

- Sequencing Task Parameters
- Constraints
- Results Summary
- Unfulfilled Demand
- Violated constraints
- Violated Flow Schedules
- Other Exceptions

The Sequencing Task Parameters region displays setup details for the production line, and parameters entered for the task. This includes production line, daily rate,

rule, constraints, demand type, and dates for demand and schedule ranges. The Constraints region displays a list of constraints for this rule and can be used in comparing results in the Violated Constraints list.

The Results Summary region provides a view of production line actual capacity considered on this specific run. It excludes the capacity fixed. For example, if the option is to fix schedules starting at the time 10:00 am, and the line time is 8:00 am to 4:00 pm, it considers the capacity from 10:00 am to 4:00 pm.

The Constraint Satisfaction percentage displays. For example, 80 percent signifies that of a total of 100 lines, the Flow schedules created on the first 80 lines do not have any violations.

The Unfulfilled Demand region provides the details for the Demand Satisfaction listed in the summary view. For example, 80 percent signifies that out of 100 quantity demands, 80 of them are scheduled.

▼ Unfulfilled Demands

Order Number	Line Number	Assembly	Assembly Description	Customer	Requested Quantity	Sequenced Quantity
54712	3	MC24713	Plastic Base - Black	Computer Service and Rentals	168	100
54714	1	MC24713	Plastic Base - Black	Total Internet	15	0
54715	1	MC24713	Plastic Base - Black	A. C. Networks	10	0
54715	2	MC24713	Plastic Base - Black	A. C. Networks	20	0
54716	4	MC24713	Plastic Base - Black	Computer Service and Consulting	3	0

▼ Violated Constraints

Priority	Type	Attribute	Definition	Fulfilled Up to Quantity	Violations
0	Daily Limit	Assembly	Daily limit of MC24713 is 100	470	1

▼ Violated Flow Schedules

Schedule Number	Build Sequence	Number of Violated Constraints	Violated Constraint Priorities
No data exists.			

▼ Other Exceptions

Description
No data exists.

The Violated Constraints region lists the constraints broken in this sequencing run. Constraint violations are pushed to the end of the sequencing horizon.

The Violated Flow Schedule region displays a list of schedule numbers, their build sequences, the number of constraints violated, and the priorities of the constraints. The sequencing program fails when a hard constraint is violated on any newly created schedules. Violations are ignored on existing schedules. The priority level designates if the constraint is classified as a hard constraint—a constraints that must be fulfilled. If these constraints are broken—or violated—Flow Sequencing stops. A value of zero indicates a hard constraint.

▼ Violated Flow Schedules

| | | | ⊖ Previous 1-25 ▼ Next 25 ⊗ |
Schedule Number	Build Sequence	Number of Violated Constraints	Violated Constraint Priorities
123116	1681	2	30, 50
123117	1682	2	30, 50
123118	1683	2	30, 50
123119	1684	2	30, 50
123120	1685	2	30, 50
123121	1686	2	30, 50
123122	1687	2	30, 50
123123	1688	2	30, 50
123124	1689	2	30, 50
123125	1690	2	30, 50

The Other Exceptions region displays any other explanations for Flow schedules not created. For example, the exception message of Invalid Build Sequence Range indicates that no build sequences available in order to create Flow schedules.

7

Line Scheduling Workbench

This chapter describes all the elements available in the Line Scheduling Workbench – the sequencing and scheduling interface for Oracle Flow Manufacturing. The following topics are discussed in this chapter.

- Overview of Line Scheduling Workbench in Flow Manufacturing on page 7-2

- Defining Scheduling Rules on page 7-3

- Line Scheduling Workbench Options Window on page 7-8

- Viewing Unscheduled Orders on page 7-10

- Viewing, Creating, and Modifying Flow Schedules on page 7-14

- How Scheduling is Calculated on page 7-23

- Line Scheduling Workbench Tools Menu on page 7-25

- Other Features on page 7-32

Overview of Line Scheduling Workbench in Flow Manufacturing

Line scheduling is the process of sequencing and scheduling the work to be done on your balanced flow lines. You create flow schedules to represent the volume and mix of products to be produced. The objective of line scheduling is to synchronize production as tightly as possible to customer demand, as well as establishing an achievable pace and consistent flow of products throughout the production process and supply chain.

The Line Scheduling Workbench is used by schedulers to create and manage flow schedules. You can simulate the assignment of work to production lines, and schedule work on specific lines. While you can view all scheduled orders (such as discrete jobs, repetitive schedules, and flow schedules) through the workbench windows, the only type of work you can create and schedule in the workbench is a flow schedule.

The Line Scheduling Workbench Options window is the interface to the other planning windows in line scheduling. The functions available through the workbench are:

- Viewing Unscheduled Orders

  You can view unscheduled orders in the Line Scheduling Workbench Unscheduled Orders window. You have the option to display the unscheduled planned orders or sales orders. These unscheduled orders can be converted into flow schedules.

- Creating and Maintaining Flow Schedules

  You can create and modify schedule quantities and dates of flow schedules.

- Prioritizing and Sequencing Flow Schedules

  You can schedule your flow schedules either by using the scheduling rules provided, or ones that you have defined.

- Flow Schedule Completion

  You can perform completion transactions for scheduled flow schedules when production is finished.

- Mixed Model Map

  The Mixed Model Map window can be accessed from the workbench. This window is used to monitor your line design by balancing a line against a specified statement of demand.

- Roll Flow Schedules

  You can roll flow schedules forward, based on undercompletions and overcompletions, in order to adjust future production.

- Deleting Flow Schedules

  You can delete flow schedules in order to provide a clean slate for new schedule generation.

- Checking the Availability of Components

  You can access the ATP Results window to view component availability.

- Viewing Resource Load in Relationship to Available Capacity

  You can view a graphical representation of the required load of the line and its associated resources.

Defining Scheduling Rules

A scheduling rule determines the logic used to set the timing of the flow schedules. The rule is comprised of an algorithm and the criteria used in sequencing the flow schedules. Oracle Flow Manufacturing provides several types of scheduling rule options. Pre-defined scheduling rules combine a system algorithm with sequencing criteria. In addition, there are two methods to create your own rules.

Scheduling Rule Options

- Pre-Defined Rules

  Pre-defined scheduling rules combine a system algorithm and one sequencing criteria. Five pre-defined rules are provided.

- System-Defined Rules

  User-defined scheduling rules allow you to combine a system algorithm with one or more of the system provided criteria.

- User-Defined

  You can also create your own rules defined by modifying the custom line scheduling procedure that is executed at the time of scheduling flow lines.

Scheduling Algorithms

Three algorithms are provided for line scheduling:

No Level Loading

Flow schedules are sequenced according to criteria, and the demand is placed in the days of the scheduling horizon. Starting with the first available day, demand is scheduled until capacity is reached.

Criteria Order is used to determine the sequence of the flow schedules. Beginning with the demand with lowest sequence (or highest priority), demand scheduled in ascending order.

Level Daily Rates

Flow schedules on each day are sequenced based on the demand ratio. In this algorithm the production rate for each item is calculated for each day. Therefore, items with higher demand have a higher production rate. That rate is then used on each day of the scheduling horizon.

Production rate for an item on a particular day is determined by multiplying the available capacity on that day by the demand ratio for the item.

Mixed Models

In this algorithm the production rate for different items is calculated in order to establish a production rule pattern for a mix of items. The rule pattern is repeated within a day and across the scheduling horizon.

Sequencing Criteria

You can sequence flow schedules using one or more of the following values:

- Order Entry Date
- Order Priority
- Order Promise Date
- Order Request Date
- Order Schedule Date
- Production Sequence Forward
- Production Sequence Reverse

The criteria is listed in the order of priority. For example, you can sequence by Order Request Date and Order Entry Date. The Order Request Date has priority 1, the Order Entry Date has priority 2. If two different flow schedules have the same order request date, then the order with the earliest order entry date is scheduled first.

Criteria are only applied to unscheduled sales orders. For unscheduled planned orders, the generated Planned Order Due Date value is the only criteria used for sequencing.

See Also

Define Scheduling Rules Window on page 7-5

Define Scheduling Rules Window

You can view scheduling rules and sequencing criteria, as well as define your own custom rules in this window.

To view existing scheduling rules:

1. Navigate to the Define Scheduling Rules window.

2. From the Query menu choose Enter, and then choose Run.

   Use the Arrow keys to page through the list of scheduling rules.

To define system-defined or user-defined scheduling rules:

1. Navigate to the Define Scheduling Rules window.

2. Enter the name of the scheduling rule in the Name field.

   If you are creating a custom rule, this value is user-defined. The following rules are provided in the system:

   - Mixed Model - mixed model by order request date

   - Level Daily Rate- level daily rate by order request date

   - Request Date- order request date with no leveling

   - Schedule Date - order schedule date with no leveling

   - Promise Date - order promise date with no leveling

   - Production Sequence Forward - order schedule date, order production date sequence in ascending order with no level loading

   - Production Sequence Reverse - order schedule date, order production date sequence in descending order with no level loading

3. Enter the description of the rule in the Description field.

   For rules you create, it is beneficial to have the name and description reflect the algorithm being used.

4. Uncheck the Enabled check box if you are disabling an existing rule, otherwise leave it marked.

   This is a Yes/No flag indicating whether this rule is currently in use.

5. Select the Default check box if this rule is to be your default scheduling rule.

   This is Yes/No flag indicating if this is the default rule. The default rule is used unless it is overridden; there can only be one default rule for scheduling.

6. If this is a system-defined rule, choose the System Defined option button. Otherwise, if this rule is to be defined by a user procedure, proceed to Step 9.

This option button enables the region for rules using system provided algorithms and sequencing criteria.

7. Select an algorithm in the Leveling box.

   The system algorithm values in this box are:

   - No Level Loading–sequencing is calculated only by priority criteria

   - Level Daily Rate–the calculation is the ratio of total demand for each item, multiplied by the line rate

   - Mixed Model–daily demand is calculated from different products and different lot sizes

8. In the Criteria Name box, select criteria values from the list of values.

   Enter one or more values in order of priority. For example, if you select Order Request Date first, and then Order Entry Date–the order with the earliest request date and earliest order entry date is scheduled first.

   - Order Entry Date

   - Order Priority

   - Order Promise Date

   - Order Request Date

   - Order Schedule Date

   - Production Sequence Forward

   - Production Sequence Reverse

9. For user procedures, choose the User Defined option button.

   This option button sets the rule to user-defined. To add custom line scheduling logic, modify the Custom_Schedule procedure (MRPPCLSS.pls/MRPPCLSB.pls).

10. Save your work.

Line Scheduling Workbench Options Window

The Line Scheduling Workbench Options window is the starting window from which to access line scheduling options. From this window you can access the other windows to view unscheduled orders, create flow schedules, view and modify existing schedules.

To view unscheduled orders, create flow schedules, or modify existing schedules:

1. Navigate to the Line Scheduling Workbench Options window by selecting an organization and production line.

   The Line Scheduling Workbench Options window displays information on the selected line. You can access the other windows using the defaulted information, or you can enter other values.

The Daily Production Rate is information for this production line. It is the calculation of the Hourly Production Rate multiplied by the number of work hours for this line. See: Set Up Steps, *Oracle Work in Processing User's Guide*

2. Optionally select a Schedule Group value.

The Schedule Group is defined in Work in Process. The value entered here is used as a default for any schedules created.

3. In the Unscheduled Orders region, select the Type and Order Date ranges for unscheduled orders.

You can select Sales Orders or Planned Orders. Sales orders are created from Order Management transactions; Planned Orders are created from all production MPS, MRP, and DRP plans.

TThe Order Dates range determines which orders are displayed on the Unscheduled Orders window; and signifies the period of time to consider demand for scheduling.

> **Note:** If you create multiple plans marked as production – the Production flag is checked on the Master Production Schedules window or the MRP Names window– you can create duplicate flow schedules.

TThe Order Dates range determines which orders are displayed on the Unscheduled Orders window; and signifies the period of time to consider demand for scheduling.

> **Note:** Flow schedules are created from planned orders in the Line Scheduling Workbench—not releases from the Planner Workbench.

The Order Dates range determines which orders are displayed on the Unscheduled Orders window, and signifies the period of time to consider demand for scheduling. It refers to either schedule ship date of sales orders, or due dates of planned orders.

4. In the Scheduling region select a scheduling rule.

5. Select beginning and ending date values.

Flow schedules are created for the date ranges that you select. See: How Scheduling is Calculated on page 7-23

6. Check the Flex Tolerances check box if you want to enable flexible tolerance fences in your scheduling calculations.

Flexible tolerance fences provide temporary increases to capacity to handle increases in orders. The line rate is adjusted by the tolerance fence percentage before scheduling rules are applied. Tolerance fences are set up when creating

line definition. See: Defining Tolerance Fences, *Oracle Work in Process User's Guide*.

7. Choose one of the following for line scheduling functions:

   ■ *Unscheduled Orders:* Displays the Unscheduled Orders window showing all demand that has not been converted into Flow schedules. See: Viewing Unscheduled Orders on page 7-10

   ■ *All Flow Schedule Details:* Displays the Flow Schedule Details window enabling you to view and modify flow schedules at the detail level of the assembly. This function displays all open Flow schedules without regard to the schedule dates. See: Flow Schedule Details Window on page 7-20

   ■ *Create Flow Schedules:* Creates new Flow schedules using the values selected on the Line Scheduling Workbench Options window. See: How Scheduling is Calculated on page 7-23

   ■ *Flow Schedule Summary:* Displays the Flow Schedule Summary window for viewing existing schedules. See:Flow Schedule Summary Window on page 7-18

Viewing Unscheduled Orders

The Unscheduled Orders window is used to view unscheduled demand - demand that has not been converted into Flow schedules. You can change certain values and create Flow schedules directly from this window. You can also use criteria to filter your unscheduled orders, and create Flow schedules according to that criteria. See: How Scheduling is Calculated on page 7-23.

To view unscheduled orders:

1. Navigate to the Line Scheduling Workbench Options window and enter values, or use the default information.

2. Choose Unscheduled Orders to display the Find Unscheduled Orders window.

3. Enter search criteria, or leave all fields blank to retrieve all records that fit the criteria set in the Line Scheduling Options window.

4. To filter your search, enter a search string by selecting Field values and an operator in the Condition field.

You can use one string or several strings.

You can also select the Folder menu to customize your display and save your Find criteria.

See: Customizing the Presentation of Data in a Folder, *Oracle Applications User's Guide*, and Using Query Operators, *Oracle Applications User's Guide*

5. Choose Find.

   The Unscheduled Orders window shows all orders for the selected order type,
   date range, and filter criteria.

This window displays fields for assembly number, order date, the unscheduled
quantity, the quantity available to schedule, sales order number, and
corresponding sales order lines.

6. Choose Link to link Flow schedules to sales order lines. .See: Linking Sales
   Orders to Schedules on page 7-13

7. Choose Schedule to create schedules for records selected. The Flow Schedule
   Summary window displays to view schedule information of planned and
   completed quantities at an aggregate level. This method enables you to create
   Flow schedules according to filtering criteria, schedule rule, and line capacity.

8. Choose Implement to create schedules for all unscheduled orders selected.
   These orders are scheduled without regard to the line capacity or scheduling
   rules. See: How Scheduling is Calculated on page 7-23

Linking Sales Orders to Schedules

Flow schedules are created from sales order demand, planned order demand, or created manually. Manually created schedules or schedules that have had the demand type removed do not reference a sales order. The linking functionality enables you to establish a reference to sales orders during Flow schedule creation - if one does not already exist, or if it is linked to a planned order. This functionality is accessed from the Unscheduled Orders window.
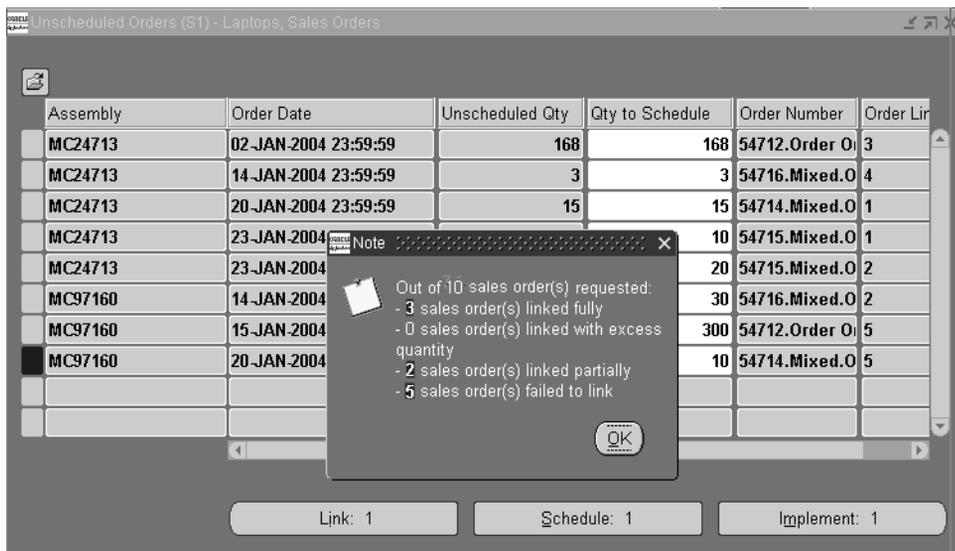
When you choose Link from the Unscheduled Orders window, sales order quantities are matched to selected schedule quantities that fall within the date range specified. A Note window displays the linking results:

- Sales orders linked fully

  The quantity in the sales order line matches total quantity in the Flow schedules.

- Sales orders linked with excess quantity

  The quantity in the sales order line is less than the total quantity in the Flow schedules.

- Sales orders linked partially

The quantity in the sales order line is greater than the total quantity in the Flow schedules. Flow schedules fulfill partial quantity of the sales order line.

- Sales orders failed to link

Sales order is not linked to any Flow schedule.

For example, you may have sales order and unscheduled order quantities as demonstrated in the following table. The linking process matches sales order demand with unscheduled demand resulting in some linked orders, and others not linked.

Unscheduled Sales Order Demand	Flow Schedule Quantities not Linked	Matched Quantities
Order1, 6 each	FS1, 2 each	Order1, FS1. 2
-	FS2, 2 each	Order1, FS2, 2
-	FS3, 3 each	Order1, FS3, 3
Order2, 4 each	FS4, 2 each	Order2, FS4, 2
-	FS5, 2 each	Order2, FS5, 2
Order3, 6 each	FS6, 2 each	Order3, FS6, 2
Order4, 8 each	-	Order4, 0
Order1, 6 each	FS1, 2 each	Order1, FS1. 2

In this example, the Note window displays these results:

- 1 sales order linked fully (Order2)
- 1 sales order inked with excess quantity (Order1)
- 1 sales order linked partially (Order3)
- 1 sales order failed to link (Order4)

Viewing, Creating, and Modifying Flow Schedules

You access both flow schedule summary and detail information from the Line Scheduling Workbench Options window. This allows you to view, create, and change flow schedules. The Flow Schedule Summary window shows schedule information grouped by assembly and date, showing the planned and completed

quantities at an aggregate level. You can then navigate to the Flow Schedule Details window for more information on the assembly and its components.

> **Note:**   Oracle Project Manufacturing feature of model/unit effectivity is supported in the Line Scheduling Workbench. If this feature is enabled, the Unit Number field is visible when viewing unscheduled orders and passed on to new flow schedules created. See: Model/Unit Effectivity, *Oracle Project Manufacturing Implementation Manual.*

See Also

Creating Flow Schedules

You can create flow schedules the following ways:

- Use the Create Flow Schedules button on the Line Scheduling Workbench Options window. When you choose this button flow schedules are created for all unscheduled orders that fall within the date ranges if the capacity is adequate.

    > **Note:** If the scheduling rule is set to Do Not Schedule, unscheduled orders are converted to flow schedules according to order dates. All unscheduled orders in the specified date range are converted to flow schedules – schedule dates, capacity, and sequencing criteria are ignored.

- Use the Implement button on the Unscheduled Orders window. Flow schedules are created for all unscheduled orders that you have selected on this window. These orders are scheduled without regard to the line capacity or scheduling rules.

- Choose Schedule on the Unscheduled Orders window. This method enables you to create Flow schedules according to filter criteria.

- Modify the schedule on the Flow Schedules Summary window. If a schedule quantity is added to a day that does not already have a flow schedule, one is created.

- You can add a new record on the Flow Schedules Details window.

To create flow schedules from the Line Scheduling Workbench Options window:

1. Navigate to the Line Scheduling Workbench Options window.

2. You can use the default information on this window, or enter values. See: Line Scheduling Workbench Options Window on page 7-8.

   Flow schedules for a given line are sequenced within a Schedule Group, schedules without a schedule group are sequenced together.

   The Order Date ranges are used for the period of time to consider demand for scheduling. Flow schedules are created for unscheduled orders that fall within this date range – if the capacity is adequate.

3. Choose Create Flow Schedules.

   Flow schedules are created from unscheduled orders by considering the following elements:

   - The demand for the order type within the specified date range in the Unscheduled Orders window.

   - The orders topmost in priority, based on sequencing criteria

   - The line capacity for the date range. If there is not enough capacity, the order remains unscheduled.

   The results of this process are shown in the Flow Schedule Summary window.

   If you choose Unscheduled Orders, you can see the orders that were not converted into flow schedules.

4. Save your work.

To convert unscheduled orders to flow schedules:

1. Navigate to the Unscheduled Orders window.

2. Select the records to implement into flow schedules.

You can make any modifications or adjustments to the details of your records. You can select multiple assemblies on this window for viewing on the detail window. See: Selecting Multiple Records, *Oracle Applications User's Guide*.

Flow schedules are created for all unscheduled orders that you have selected on this window. These orders are scheduled without regard to the line capacity or scheduling rules

3. Choose Implement.

4. Choose OK. Otherwise, to cancel this transaction, choose Cancel.

5. Choose Yes to view the Flow Schedule Details window with the new schedule record. Choose No to view the Unscheduled Orders window.

   After the new schedule is created, the demand does not appear on the Unscheduled Orders window.

6. Save your work.

7. Choose Schedule to create schedules for records selected. The Flow Schedule Summary window displays to view schedule information of planned and completed quantities at an aggregate level. This method enables you to create Flow schedules according to filtering criteria, schedule rule, and line capacity.

To create flow schedules by modifying information on the Flow Schedules Summary window:

1. Navigate to the Flow Schedules Summary window.

   Only schedules without details (such as schedule group, project, or task) can be modified at the summary level. If details exist, the Flow Schedule Details window appears.

2. Enter the new planned quantity, or scroll to the date you to modify and update quantity. You can only modify the Total Planned Quantity, not the completed or variance value.

3. Save your new record.

   If a schedule quantity is added to a day that does not already have a flow schedule, a new record is created for that day.

   Attention: If the quantity is changed to 0, the flow schedule is deleted – but you cannot delete flow schedules with partial or full completion status.

To create flow schedules by adding a new record on the Flow Schedule Details window:

1. Navigate to the Flow Schedule Details window.

2. Enter the record information and save your record.

   You can add flow schedules only for the line you have specified on the Line Scheduling Workbench Options window.

Flow Schedule Summary Window

The Flow Schedule Summary window is used to view and manage flow schedules at an aggregate level. This window shows all flow schedules, discrete jobs, and repetitive schedules at a summary level.

Note: Only flow schedules can be maintained through this window. Repetitive schedules and discrete jobs are displayed but cannot be modified.

To view or modify flow schedules at a summary level:

1. Navigate to the Line Scheduling Workbench Options window.

2. You can use the default information on this window, or enter values. See: Line Scheduling Workbench Options Window on page 7-8.

   Schedule quantities can be modified in both the summary and detail windows. However, only schedules that do not have details (such as schedule group, project, or task) can be modified at the summary level.

3. Choose Flow Schedule Summary

   The Flow Schedule Summary window shows schedules, in a bucketed format, from the start dates selected on the Line Scheduling Workbench Options window. You can scroll back or forward in this window.

Three types of order information can be viewed. You can select the types displayed on this window through Preferences in the Tools Menu. See:

- Planned quantity is calculated when the flow schedule is created, this amount can be changed.

- Completed quantity is updated when you perform a completion on this schedule.

- Variance is the difference between Planned and Completed quantities.

4. To modify a flow schedule quantity, change the Planned quantity in the date column selected. However, only schedules that do not have details (such as schedule group, project, or task) can be modified at the summary level.

The Total and Total Planned Quantity for this assembly reflect the changes you just made.

This window offers the feature of spreading weekly quantities across the valid workdays. Enter a value in the Total field, and choose Tab.

The new total quantity will spread even across all the workdays and display in the window.

5. Save your work.

6. You can access the following windows:

   - *Unscheduled Orders:* Displays the Unscheduled Orders window. See: Viewing Unscheduled Orders on page 7-10

   - *Details:* Displays the Flow Schedule Details window for the assemblies and dates selected. The number after the word *Detail* indicates how many records are selected. You can select multiple assemblies on this window for viewing on the detail window. See: Selecting Multiple Records, *Oracle Applications User's Guide*, and Flow Schedule Details Window on page 7-20

Flow Schedule Details Window

The Flow Schedule Details window enables you to view and modify Flow schedules at the detail level of the assembly. You can access this window from the Line Scheduling Options or Flow Schedule Summary windows. If you are navigating from the Line Scheduling Options window, you can filter your search by entering field and operator values. All details within criteria specified display on the Flow Schedule Details window. If you are accessing this window from the Flow Schedule Summary window, only the schedules selected display.

> **Note:** Only flow schedules can be maintained through this window. Repetitive schedules and discrete jobs are displayed but cannot be modified.

To view or modify flow schedule details:

1. Navigate to the Line Scheduling Workbench Options window.

2. Enter values, and choose All Flow Schedule Details. See: Line Scheduling Workbench Options Window on page 7-8

   The Find Flow Schedule Details window displays.

3. Enter search criteria, or leave all fields blank to retrieve all records.

4. To filter your search, enter a search string by selecting Field values and an operator in the Condition field

   You can use one string or several strings.

You can also select the Folder menu to customize your display and save your Find criteria.

See: Customizing the Presentation of Data in a Folder, *Oracle Applications User's Guide*, and Using Query Operators, *Oracle Applications User's Guide*

5. Choose Find.

The Flow Schedule Details window displays information according to your search criteria.

To select specific Flow schedule details from the summary window:

1. Navigate to the Flow Schedule Summary window, select one or more assemblies.

2. Choose Details.

The Flow Schedule Details window displays information on the assemblies selected in the summary window.

To view or modify Flow schedule details:

1. Navigate to the Flow Schedule Details window.

This window displays fields for Assembly, Build Sequence, Completion Date, Quantity, Completed Quantity, Order Number, Order Line, Order Requested Date, and Unit Number.

2. You can modify some values including Build Sequence, Completion Date, and Quantity fields.

3. Save your work.

4. You can access the following windows:

   ■ *Unscheduled Orders*: Displays the Unscheduled Orders window. See:
     Viewing Unscheduled Orders on page 7-10

   ■ *Component Availability*: Displays the ATP Results window to show the status
     of material used on your lines. See: Component Availability on page 7-32

     Component availability checking is permitted only for items with the Check
     ATP item attribute set to Yes. See: Order Management Attribute Group,
     Oracle Inventory User's Guide

How Scheduling is Calculated

Scheduling rules determine the timing of the flow schedules. using the following logic in the calculation routine:

- Sequence is determined by the criteria in the rule.

  Demand is sequenced using the criteria in the scheduling rule. The priority of each criteria determines the order in which it is applied.

- The first flow schedule created goes to the first available date in the scheduling horizon.

  Flow schedules are created for orders starting with the first available due date that has capacity. Flow schedules are not created for orders than cannot be scheduled within the scheduling horizon.

- This process of attaining the line rate for each day continues until the end of the scheduling horizon.

  Capacity is calculated for the day using the line rate, subtracting the existing workload (flow schedules, discrete jobs, repetitive schedules) for that day. When available capacity for the day is attained, schedules are slated for the next day until the end of the scheduling horizon.

- If you are using flexible tolerance fences, scheduling begins after the last day indicated from the Days in Advance value.

  Tolerance fences provide temporary increases to capacity above their normal operating rate to handle rises in orders.

Algorithms

The scheduling rule is comprised of an algorithm and the criteria used in sequencing the flow schedules. Oracle Flow Manufacturing provides three algorithms described here.

- No Level Loading

  If you select a scheduling rule that has no level loading, the criteria defined in the scheduling rule is used to prioritize and sequence the orders. Orders are scheduled with capacity considerations beginning with the first available date of the scheduling date range. If the entire quantity of the sales order cannot be satisfied on a date, the remaining quantity is scheduled on subsequent days where capacity is available.

- Level Daily Rate

If you choose to schedule for each day using the level daily rate, each item is scheduled at a rate in regard to the demand ratio of the item. The demand ratio of an item equals the total demand of the item divided by the grand total demand.

- Mixed Model

    This algorithm establishes a pattern to manufacture items in order to meet demand. The pattern distributes units according to the demand of each item for each day.

Line Scheduling Workbench Tools Menu

The following are functions available in the Tools Menu for maintaining flow schedules. This menu is available through any of the windows in the Line Scheduling Workbench.

- Completions

- Mixed Model Map

- Roll Flow Schedules

- Delete Flow Schedules

- Preferences

Completion of Flow Schedules

You can complete flow schedules through the Work Order-less Completions window. Choose Completions from the Tools menu to display the window. The details of the schedules you selected are defaulted in the Work Order-less Completions window.

See Also

Performing Work Order-less Completions, *Oracle Work in Process User's Guide*

Mixed Model Map

You can access the Mixed Model Workbench from the Tools menu. The Mixed Model Map Workbench helps you to create and monitor your line design by balancing a line against a specified forecast.

You can use the Mixed Model Map to compare line information with demand requirements. This provides information to adjust resources on the line to meet the demand. The output of the Mixed Model Map will give you the line rate.

Roll Flow Schedules

You must maintain flow schedules so that production schedule information is accurate; and planning information such as Available-To-Promise and demand for components is current. The Roll Flow Schedules program is designed to allow you to adjust future schedules based on actual performance in the past. You adjust the quantity on future production schedules based on the completion quantities and

past production. You can change schedules for a line, a range of lines, or for all lines at once.

> **Attention:** MRP calculations does not consider flow schedules with past due dates. Use the Roll Flow Schedules window to update your flow schedules in order to keep your MRP accurate.

> **Note:** The Feeder Line Synchronization program ignores flow schedules created from the Roll Flow Schedules program. You must roll schedules on both the parent and feeder lines.

Three options are available for adjusting schedules:

Close All Past Schedules

This option closes all open past due schedules.

> **Note:** Schedules are automatically closed when the completion quantity is greater than or equal to the planned quantity.

Closed flow schedules cannot be changed or rolled with details, and they are denoted with gray fields. You can close individual or a group of schedules. For example, a customer might reduce the order quantity because a delivery date can not be made. The original schedule is closed and the program does not roll the excess quantity no longer needed.

Roll With Details

This option rolls any open schedules within the specified date range to a single date. The new schedules maintain the original schedule details including the order information, build sequence, and alternate bill of material or routing information. The rolled schedules are scheduled at specific times if no schedules exist on the rolled to date.

> **Note:** The original schedules are closed after the roll. Therefore the same schedule number cannot be rolled multiple times, nor can you change the original schedule once it has been rolled.

Spread Evenly Without Details

You can spread schedules without order information evenly across multiple days, for use in a repetitive environment, allowing you to:

- Calculate variance and roll by line and item

- Consider both the planned quantity and the completed quantity when rolling over-completions

- Schedule specific times for the rolled schedules if no schedules exist on the specific rolled day

> **Attention:** When rolling flow schedules with out details, if you roll the same flow schedules multiple times, it is possible to create excess supply.

To roll flow schedules forward:

1. Select Roll Flow Schedules from the Tools menu.

   The Roll Flow Schedules Parameters window appears.

2. Select an Option.

   Your choices are:

   Close All Past Due Schedules

   Roll with Details

   Spread Evenly Without Details

3. Select an Output option.

   The values for Output are:

   Report Only creates a report but does not update your flow schedules. This could be used to simulate the effects on your schedule.

   Report and Update creates a report and rolls the dates forward on your schedules.

4. Select a range of Start and End Dates From.

Flow schedules that do not have completion dates within this range are not rolled forward. You cannot enter a date in the From Start Date greater than today.
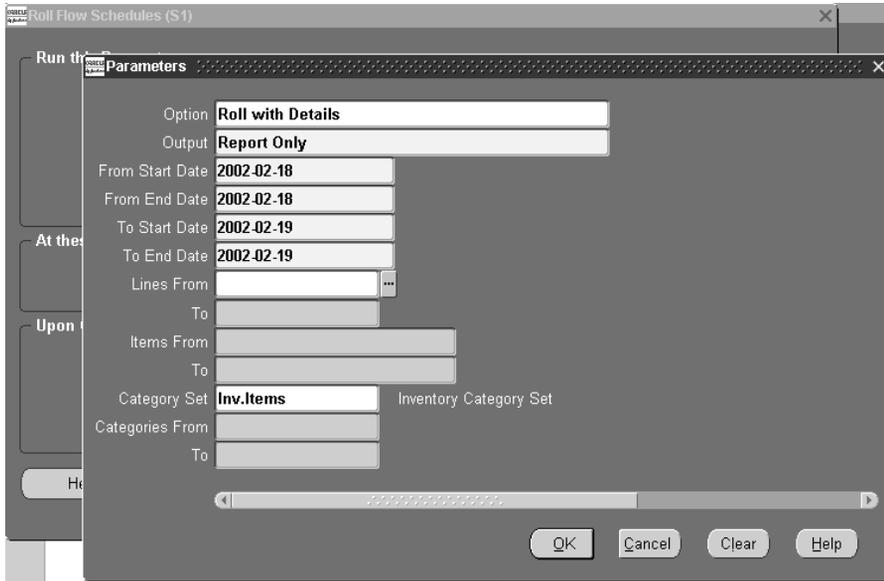
5. Select a range of Start and End Dates To.

6. You can select a range of flow schedule lines to consider in the Lines From and To fields.

> **Attention:** If you do not specify lines, item numbers, or categories all flow schedules that fall within the specified date ranges are rolled forward.

7. Select a range of assembly items to consider in the Items From and To fields.

8. Select a range of Category Sets From and To.

9. Choose OK.

10. Choose Submit Request.

See Also

Submitting a Request, *Oracle Applications User's Guide*

Deleting Flow Schedules

You can delete flow schedules in order to provide a clean slate for new schedule generation. Flow schedules can be deleted as long as the following conditions are true:

- There has been no completion performed, that is, the quantity completed must equal 0.

- The schedule is open.

- There is no pending completion against it in Material Transactions Interface.

If the deleted flow schedule is associated with a sales order, then that portion of the sales order is again considered as an unscheduled sales order.

To delete flow schedules:

1. Select records on the Detail or Summary windows, and choose Delete.

2. 2.You can also select Delete Flow Schedules from the Tools menu.

The Delete Flow Schedules Parameters window appears.

3. Select a range of Dates Start and From.

Flow schedules that do not fall within this range of dates are not deleted.

4. Optionally, select a range of Lines From and To.

Note: If you do not specify lines, item numbers, or categories all eligible flow schedules that fall within your specified date ranges are deleted.

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5. Optionally, select a range of Items From and To.

6. To delete flow schedules by category, select a value in the Category Set field, and enter a range of categories Category From and To.

7. Choose OK.

8. Choose Submit Request.

See Also

Submitting a Request, *Oracle Applications User's Guide*

Defining Category Sets, *Oracle Inventory User's Guide*

Preferences

The Preferences window is used to change the quantity types that show on the Flow Schedule Summary window.

The Planned quantity is originally calculated when the flow schedule is created using the rule and available capacity. The Completed quantity is updated when you perform a completion on this schedule. The Variance is the difference between Planned and Completed quantities.
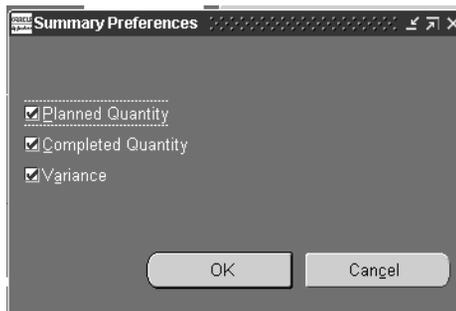
Other Features

Component Availability

You can access Available To Promise information through the ATP Results window and view the status of material used on your flow schedules. Component availability checking is permitted only for items with the Check ATP item attribute set to Yes. See: Order Management Attribute Group, *Oracle Inventory User's Guide*

To display the ATP Results window:

1. Navigate to the Flow Schedule Details window.

2. Select assemblies for viewing component information.

3. Choose Component Availability.

The ATP Results window appears. The components for each flow schedule are listed individually on separate rows. See: Viewing ATP Results, *Oracle Inventory User's Guide*
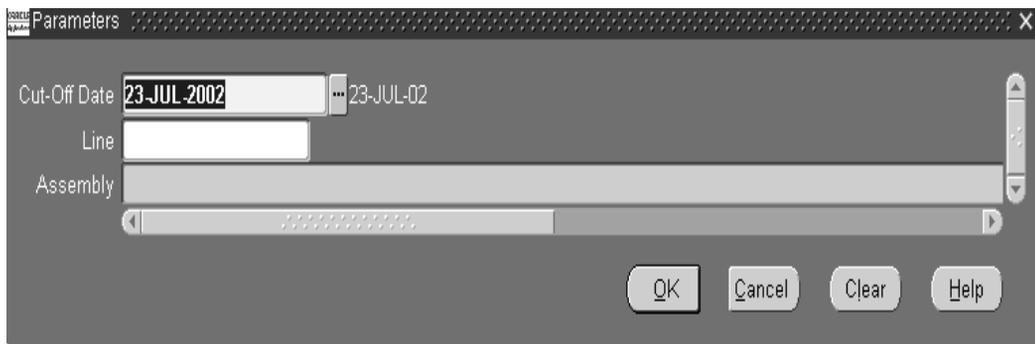
Purging Flow Schedules

Closed flow schedules should be purged on a periodic basis to remove unneeded records and maintain database performance. A concurrent program purges according to parameters specified.

Flow schedules are purged if they meet the following criteria:

- Status of the flow schedule is closed

- Scheduled completion date of the flow schedule is in a closed accounting period

- All material transactions have been purged

To purge flow schedules:

1. Navigate to the Purge Flow Schedules window.

   The Parameters window displays.

2. Select the effective date to use for purging schedules in the Cut-Off Date field.

   Flow schedules with a completion date prior to the cutoff date are purged.

3. Optionally, you can select a value in the Line field to purge specific flow lines.

4. You can also select a specific assembly in your purging criteria.

5. Choose OK to display the Purge Flow Schedule request window.

6. Choose Submit to create this request.

8

Feeder Line Synchronization

This chapter describes the feeder line synchronization process.

Feeder Line Synchronization

In manufacturing environments where many types of items are produced, the total amount for different configurations of a product may not be sufficient to support a Kanban replenishment system. Oracle Flow Manufacturing resolves this situation by enabling you to create schedules for lines that are directly derived from parent assembly line schedules. These feeder lines use sequence information from the parent assembly schedules so that you can synchronize the higher and sub-assembly material with production.

The feeder line synchronization program calculates the date and time the subassembly is delivered to the particular line operation. This date is then be used as the completion date for the subassembly line. The completion date of the feeder line flow schedule is calculated as the difference between the parent assembly's scheduled completion date and the sum of the operation times. This is the sum of the operation times from the consuming operation to the end of the parent line.

The start time for the subassembly is calculated by subtracting the lead time from the completion date and time. Lead time is obtained from fixed lead time and variable lead time on the organization item. This allows you to synchronize subassembly lines to deliver product exactly when needed by the main line.

You cannot create new synchronized schedules if corresponding schedules already exist on the feeder line. You also cannot re-synchronize rolled schedules. This eliminates potentially creating over production of the subassembly.

Prerequisites

❏ Create flow routings and routing networks for both the parent and subassembly items.

❏ Define the operation sequence for the subassembly on the bill of material of the parent item. This must be equal to the event sequence on the parent routing of the event consuming the subassembly.

❏ Define the variable lead time on the organization item master for each item to equal the TAKT time of each line, respectively.

❏ Define the fixed lead time on the organization item master for each item to equal the total product cycle time (TPCT) or the TAKT time of the line multiplied by the number of operations along the longest primary path of the line.

❑ Define the maximum hourly rate on the line definition for both the parent and feeder line the same as the standard daily running rate for each line, respectively.

To create flow schedules that synchronize feeder lines with parent assembly lines:

1. Navigate to the Feeder Line Synchronization window.

   The Parameters window appears.

2. Select a parent line or range of Lines From and To.
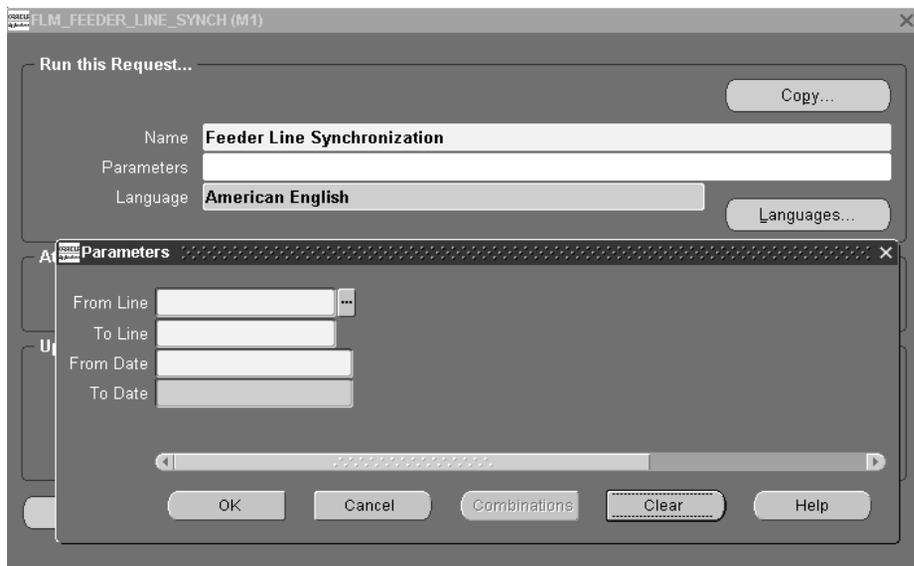
3. Select a range of Dates From and To.

   This is the date range of the start dates of the parent assembly schedule; it is used to determine which parent schedules are synchronized.

4. Choose OK.

5. Choose Submit Request.

9

Outbound Broadcast Sequencing

This chapter describes Outbound Broadcast Sequencing—a process that enables the creation of replenishment signals on a Flow line where the supplier has special requirements, preferences, or conditions.Topics include:

Overview of Outbound Broadcast Sequencing

Outbound Broadcast Sequencing is a process that enables the creation of replenishment signals to supply components for scheduled assemblies, dependent on the production sequence of the respective parent assembly. Although generally associated with supplier components, this process works with all methods of kanban supply.

Kanban signals control the replenishment of component material to a Flow line. Kanban planning has calculated container sizes, or quantity based on a predictable cycle, ensuring the availability of all necessary components. In some business processes the predictability of components is not possible, or the schedule of assemblies determines the component requirements. Outbound Broadcast Sequencing provides a method for sourcing components. For these components, the purchase requisition is generated based on firm Flow schedules. This functionality is implemented when you set up pull sequences with the Auto Request flag enabled.

A concurrent program is used to calculate kanban requirements and generate kanban cards by specifying production lines, date ranges, and other criteria. The Outbound Broadcast Sequencing process sends the appropriate date for creation of the purchase requisition for the relevant components, depending upon the Source type specified in the item's pull sequence.

See Also

Overview of Kanban Replenishment, *Oracle Inventory User's Guide*.

Defining Kanban Pull Sequences, *Oracle Inventory User's Guide*

Setting Up Outbound Broadcast Sequencing on page 9-2

Process Flow on page 9-3

Setting Up Outbound Broadcast Sequencing

Outbound Broadcast Sequencing functionality is set up when you create your pull sequences.

❏ Pull Sequence window

Enable the Auto Request box, this is used to identify this type of pull sequence replenishment.

> **Note:** The size and number of kanban cards are not used for kanban calculation, if the Auto Request box is enabled.

See Also

Modifying and Creating Pull Sequences on the Graphical Network on page 11-10

Pull Sequence Window on page 11-12

Defining Kanban Pull Sequences, *Oracle Inventory User's Guide*.

Process Flow

The following steps are performed when Outbound Broadcast Sequencing kanbans program is initiated:

- Retrieves Flow schedules in the date range specified.

- Selects Flow schedules not previously processed.

- Considers schedules with components flagged as Item Attribute--Release Time Fence, Kanban Item--Do Not Plan, and Supply Type—Pull.

- Considers pull sequences where item and point of use matches the bill of material, component, location, and the Auto Request flag is enabled.

- Calculates required date of the components based on the Flow schedule completion date and the routing where the component is used. Minimum order quantity data is not used.

- Creates nonreplenishable kanban cards for the components using the pull sequence information.

- For kanban card supply type Supplier, the purchase requisition is created with the reference to the Flow schedule information. For other supply types—

See Also

Changing and Viewing Kanban Details on page 11-25.

Viewing Kanban Demands on page 11-25

Using the Kanban Calculation Program, *Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide*.

Defining Kanban Cards, *Oracle Inventory User's Guide*

10

Flow Execution Workstation

This chapter describes the Flow Execution Workstation—used to track the flow of shop floor work, view schedule and line operation information, and complete schedules. The following topics are included:

- Overview of the Flow Execution Workstation on page 10-2

- Setting Your Preferences on page 10-2

- Initializing the Flow Execution Workstation on page 10-8

- Viewing Schedule Information on page 10-13

- Viewing Event Information on page 10-15

- Completing Line Operations on page 10-16

- Completing Schedules on page 10-19

- Viewing Resources on page 10-20

- Attaching and Viewing Instructions on page 10-21

- Viewing Detail Properties on page 10-25

- Viewing Components and Replenishing Kanban Cards on page 10-26

- Integration with Oracle Quality on page 10-27

- Customized Properties Region on page 10-28

- Engineering Change Order Alerts on page 10-28

Overview of the Flow Execution Workstation

The Flow Execution Workstation is a web based workstation providing a comprehensive set of features for tracking the flow of work, completing assemblies, and viewing details of component and resource information. The workstation has regions for schedules, events, component details, property information, and instructions. The features include the ability to:

- View current shop floor manufacturing work

- View a line operation's open schedules and events

- View detailed information on the components and resources required for line operations and events

- View kanban information for components and request replenishment

- View operating instructions, diagrams, and other information attached to assemblies and events

- Complete line operations and schedules

- Specify alternate or rework routing paths while performing completions

- Customize personal display of information

- Check eligible Oracle Bills of Material engineering change orders (ECOs) for line operation or event component changes

- Create a region to display your own customized parameters not included in the workstation pages.

- Access Oracle Quality collection plans

Setting Your Preferences

Data display on the workstation is controlled by preferences selected in the Edit Preferences page. Preferences and corresponding behavior are defined for organization, production line, or line operation. The preference for a parameter setting determines the data entry mode, the display of regions and fields on your pages, ECO checking, and the ability to enable other workstation locations.

When you enter parameters in the Flow Execution Workstation, the system first searches for records with the most detail specified at the line operation level. If the operation level parameter is not defined, it searches one level up at the line level. If production line is not specified, the system uses the organization level defaults.

To set or view preferences in the Flow Execution Workstation:

1. In the Flow Manufacturing Sequencing and Execution Home page, select the Setup tabbed region.

2. Select Workstation Preferences to display the Select Preferences page.

3. Specify preference parameters.

   You are required to select an organization, line and operation are optional:

   - Organization: If only organization is specified, the data preference is defined at the organization level only.

   - Production Line: If organization and line are specified, the data preference is defined for a specific organization and production line combination.

   - Line Operation: If organization, production line, and line operation are specified; the data preference is defined for a specific organization, line, and line operation combination.

4. Choose Edit to display the Edit Preferences page.

   If the parameter or parameter combination specified does not exist as a preference, a new one is created using default values. You can change the values for either new or existing preferences on the Edit Preferences page.

5. Set your preference for the Workstation Enabled box.

This parameter specifies if the workstation is used at this particular organization, line, or operation. If set to:

- Enabled: The workstation displays applicable Flow schedules and the operator is required to choose Line Operation Completion.

- Disabled: A workstation is not used at this specific organization, line, or operation.
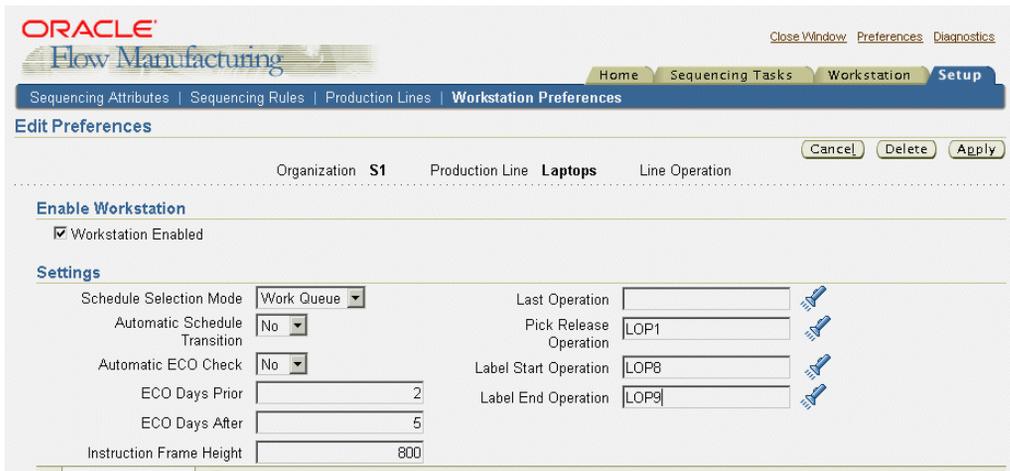
6. In the Settings region, Schedule Selection Mode, select how schedules display on the workstation. Your choices are:

- Work Queue: You can provide search criteria, and display the resulting list of schedules and their corresponding events.

- User Entered: You can search, enter, or scan (using a mobile device) a specific schedule number to open the Line Operation page.

7. If the Schedule Selection Mode is set for Work Queue mode, set the Automatic Schedule Transition field.

Used to specify navigation options for line operations. Your choices are:

- Yes—after choosing Complete Line Operation, the next available schedule displays on the page.

- No—after choosing Complete Line Operation, the Work Queue page displays listing the available schedules for the next transaction.

  Note: The Used Entered mode does not use this setting because the next available schedule is always user specified.

8. In the Automatic ECO Check, indicate if you want the system to automatically check for eligible Engineering Change Orders. Otherwise, you can check for ECOs manually. Select Yes or No.

9. When you check for ECOs. you can indicate a range of days to check before and after the ECO Effective Date. In the ECO Days Prior and ECO Days After, enter the number of days.

   Only Implemented ECOs in the date range are considered. See: Engineering Change Order Alerts on page 10-28

10. In the Instruction Frame Height field, set the view size of attachments on the pages. Enter a pixel value to increase or decrease the size of the display. See: Attaching and Viewing Instructions on page 10-21

11. If this preference is defined at the line level, you can define specific transactions performed at line operation completion. These fields are available only at the line level preference.

    - Pick Release Operation: Operation where the Pick Release process is called. See: Component Pick Release, *Oracle Work in Process User's Guide*.

    - Label Start and End Operation: Label printing capabilities are available at the time of completion for various types of manufacturing information. If you have defined label types at the Flow line Start or Flow line operation, labels are printed. See: Compliance Labeling Setup, *Oracle Warehouse Management User's Guide*.

12. In the Line Operation and Event tabbed regions—select how you want the page regions, tabbed regions, and instructions to display on the pages. In Page Regions, choose the regions that display on the Line Operation and Event pages.

Select categories from the Available box—and move to the Selected box. For example:

- In the Line Operation tabbed region, if the Events and Tabs are in the Selected box—the Line Operation page displays an Events region, and tabbed region.

- If the Events, Instructions, and Tabs are in the Selected box—the Line Operation page displays the Events region, the Instruction region, and tabbed region.

- In the Event tabbed region, if the Components and Tabs are in the Selected box—the Event page displays a Components region, and tabbed region.

See: Viewing Schedule Information on page 10-13 and Viewing Event Information on page 10-15
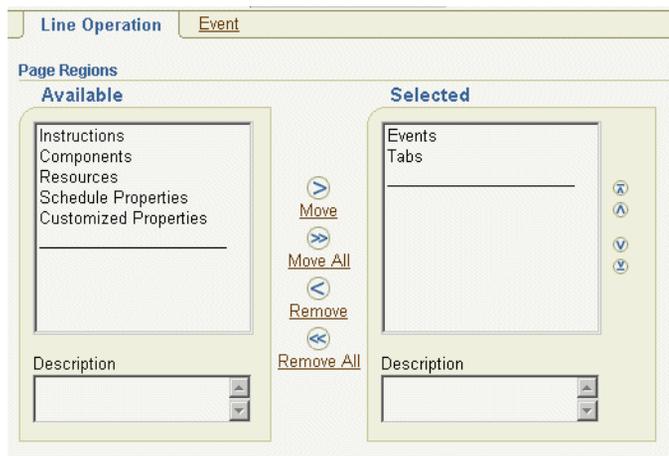
The regions available for line operations and events page regions are Instructions, Components, Resources, Schedule Properties, and Customized Properties, Tabs, and Events (for Line Operation only). The order listed in the Selected box, is the order they display on the page. Use the Arrow tool to change the order.

Regions are displayed only in one mode. That is, a region is only displayed either as a region on a page, or a region on a tabbed region. It is not diaplayed in both areas.

13. In Tab Regions, choose the regions to display on the Line Operation and Event pages.

Select fregions from the Available box—and move to the Selected box. The order listed in the Selected box, is the order they display on the tabbed region. Use the Arrow tool to change the order.

14. In the Instructions boxes, select entity attachments to automatically display in the Instructions region.

Select attachment sources from the Available box—and move to the Selected box. The order listed in the Selected box, is the order they display on the page. Use the Arrow tool to change the order. See: Attaching and Viewing Instructions on page 10-21, and Attachments, *Oracle Applications User's Guide*

> **Note:** All Available attachments are viewable. The Selected attachments automatically display.
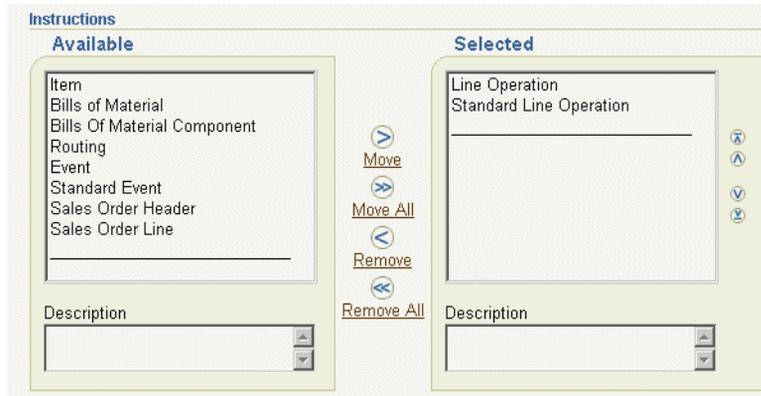
15. Choose Apply to save your work.

Initializing the Flow Execution Workstation

The Flow Execution Workstation is initialized by selecting an organization, production line, and line operation. The preference determines if the workstation displays a listing of Flow schedules (the Work Queue)—or you manually enter or scan information (the User Entered mode). See: Setting Your Preferences on page 10-2

The Work Queue mode opens the Work Queue Search page where you can select search criteria. From these results, select a schedule from the Work Queue list to access the Line Operation page. The User Entered mode navigates directly to the Line Operation page for the line and operation entered.

The Line Operation page enables you to view individual schedules, operations, events, and instructions. You can complete schedules and line operations, and enter quality results.

To view and enter Flow schedule details in the Workstation:

1. Navigate to the Flow Execution Workstation.

The Flow Execution Workstation Startup page displays for selecting schedule parameters.

2. Select parameters for Organization, Production Line, and Line Operation.

   The Workstation preference for the organization, line, and operation determines the entry mode: If the mode is:

   - Work Queue: You can provide search criteria, and display the resulting list of schedules and corresponding events. See: Work Queue Mode on page 10-10

   - User Entered: You can search, enter, or scan a specific schedule number to open the Line Operation page. See: User Entered Mode on page 10-12

Work Queue Mode

To access Flow Execution Workstation pages in Work Queue mode:

1. Navigate to the Flow Execution Workstation, and select parameters to display the Flow Execution Workstation Startup page.

2. The Work Queue Criteria page displays. Select any criteria for filtering your flow schedule search.

   You can define your search by selecting values, or a range, in the following fields—Completion Date, Assembly, Schedule Group, and Build Sequence.

3. Choose Start to display the Work Queue page.

   The work queue consists of a list of schedules and events for a selected schedule. You can perform completions of line operations and schedules from the work queue.

In the Flow Schedules region, this page displays Schedule Number, Assembly Part Number, Build Sequence, Planned Quantity, and Completion Date.

- Planned Quantity field value is the quantity created when the schedule is created; it does not change.

- Completion Date field value is the scheduled completion date of the flow schedule; it does not change with the actual completion of line operation or flow schedule.

The fields in the Events region are Event Sequence, Operation Code, Event Description, and Department. See: Viewing Event Information on page 10-15

4. To navigate to the Line Operation page, select a schedule by enabling the radio button in the Select column—and choose Get Schedule.

You can also select the schedule number. See: Viewing Schedule Information on page 10-13

5. To navigate to the Event page, select a schedule by enabling the radio button in the Select column—and choose Get Event

You can also select an event sequence. See: Viewing Event Information on page 10-15

6. To complete schedules or line operations from this page, choose either Complete Schedule or Complete Operation in the row for the selected schedule number.

When a schedule is completed, it is no longer shown on the work queue. See: Completing Line Operations on page 10-16, and Completing Schedules on page 10-19

User Entered Mode

To access Flow Execution Workstation pages in User Entered mode:

1. Navigate to the Flow Execution Workstation, and select parameters to display the Flow Execution Workstation Startup page.

2. Choose Start to display the Enter Schedule page.

3. In the Schedule Number field, search, enter, or scan a specific schedule number.

4. Choose either Get Schedule or Get Event to access the schedules and events for this Flow schedule.

See: Viewing Schedule Information on page 10-13 and Viewing Event Information on page 10-15

Viewing Schedule Information

The Line Operation page displays schedule information in the General region. This includes fields for Schedule Number, Build Sequence, Assembly Item, And Scheduled Quantity.

Other information is displayed as a region or tab, depending on the preference setting. This includes events, instructions, components, resources, detail properties, and customized properties. See: Setting Your Preferences on page 10-2

The Line Operation page enables you view and perform transactions for Flow schedules including:

- View the schedules corresponding event information. See: Viewing Event Information on page 10-15

- View details of resources attached to events, for this line operation and schedule. See: Viewing Resources on page 10-20

- View detail information about the line schedule. See: Viewing Detail Properties on page 10-25

- View and replenish components using Kanban cards See: Viewing Components and Replenishing Kanban Cards on page 10-26

- Complete schedules and line operations. See: Completing Line Operations on page 10-16, and Completing Schedules on page 10-19

- Enter quality data results for mandatory or optional collection plans, at specific points on a routing. See: Integration with Oracle Quality on page 10-27

- Check ECOs to insure you have the correct changes for work as it progresses. See: Engineering Change Order Alerts on page 10-28.

- Display a table of all attached instructions and documents pertaining to the assembly and schedule. You can then view each individual document. See: Attaching and Viewing Instructions on page 10-21

- View a region of custom parameters created to fit your business needs. See: Customized Properties Region on page 10-28

Viewing Event Information

The Event page displays the event sequence information in the General region. This includes the corresponding Flow schedule, the item assembly number, build sequence, and schedule quantity.

Other information is displayed as a region or tab, depending on the preference setting. This includes instructions, components, resources, detail properties, and customized properties. See: Setting Your Preferences on page 10-2

The Event page enables you view and perform transactions for Flow schedules. Navigate between consecutive events by choosing Next. This enables you to display sequential events in order performed, until the line operation is completed.

- View details of resources attached to events, for this line operation and schedule. See: Viewing Resources on page 10-20

- View detail information about the line schedule. See: Viewing Detail Properties on page 10-25

- View and replenish components using Kanban cards. See: Viewing Components and Replenishing Kanban Cards on page 10-26

- View a region of custom parameters created to fit your business needs. See: Customized Properties Region on page 10-28

- Complete schedules and line operations. See: Completing Line Operations on page 10-16, and Completing Schedules on page 10-19

- Enter quality data results for mandatory or optional collection plans, at specific points on a routing. See: Integration with Oracle Quality on page 10-27

- Check ECOs to insure you have the correct changes for work as it progresses. See: Engineering Change Order Alerts on page 10-28.

- Display a table of all attached instructions and documents pertaining to the production line. You can then view each individual document. See: Attaching and Viewing Instructions on page 10-21

Completing Line Operations

You can perform line operation completions from either the Work Queue, Line Operation, or Event pages.

Line operations with one destination, and no existing mandatory Oracle Quality plans, those completions are performed automatically when you choose Complete Operation. If the line operation has a network of possible choices—that is primary, alternate, and rework operations—the Line Operation Completion page displays to select the path. This page also displays if Quality plan data needs to be entered for the operation. You can then access the Enter Quality Results window to enter data.

To perform a completion for a line operation:

1. Navigate to the Flow Execution Workstation.

   - If your preference is Work Queue mode, you can complete line operations from the Work Queue page. the Line Operation page, or Event page. Select a record for completion.

   - If your preference is in the User Entered mode, completions are performed in the Line Operation or Event page.

2. Choose Complete Line Operation.

   For line operations with one destination and no existing Quality plans, the completion transaction is performed.The Work Queue mode no longer displays the completed line operation. A confirmation message displays.

   For line operations with several routing options or existing Quality plans, the Line Operation Completion page displays.

3. If Quality information needs to be entered, a message displays. Choose Enter Quality Results to access the Quality Results window.

   You can add data results for mandatory or optional collection plans, at specific points on a routing. See: Integration with Oracle Quality on page 10-27, and Entering Quality Results Directly, *Oracle Quality User's Guide*.

4. If this line operation has a choice of destinations, choose the destination.

Options are primary, alternate, and rework operations.

5. Choose Apply to save your work.

A confirmation message displays when the line operation is completed.

See Also

Completing Schedules on page 10-19

Completing Schedules

You can perform schedule completions from either the Work Queue or the Line Operation page. The Work Order-less Completions window is accessed where you can enter details, and navigate to any existing quality plans for the schedule.

To perform a completion for a schedule:

1. Navigate to the Flow Execution Workstation.

   - If your preference is Work Queue mode, you can complete schedules from the Work Queue, Line Operation, or Event pages. Select a record for completion.

   - If your preference is in the User Entered mode, completions are performed in the Line Operation or Event pages.

2. Choose Complete Schedule.

   The Work Order-less Completions window displays, enter the appropriate data. See: Work Order-less Completions, *Oracle Work in Process User's Guide*

See Also

Completing Line Operations on page 10-16

Viewing Resources

The Resources region provides the details of resources attached to events for a selected schedule. Resources include employees, machines, outside processing services, and physical space. A list of resources is displayed in view-only mode and includes information for event sequence, resource sequence, type, code, description, basis, usage, and availability.

This feature enables you to track what is actually being used at the line operation, and to view the time an assembly spends at an operation. The information is derived from the Resources and Operation Resources windows in Oracle Bills of Material.

See Also:

Defining a Resource, *Oracle Bills of Material User's Guide*

Assigning Operation Resources, *Oracle Bills of Material User's Guide*

Attaching and Viewing Instructions

The Flow Execution Workstation provides the ability to display attached instructions and documents pertaining to your production. This can include procedures, diagrams, and assembly instructions. Instructions are viewable from the Schedule and Event pages. The attachment displays in a frame, the size can be changed in the Edit Preferences page. If more than one attachment exists, documents are displayed in a table format.You can specify the order of display in the table.

Instructions and documents are attached to entities in their specific product application. For example, an instruction for an item is attached in the Master Item window in Oracle Inventory. Instructions for a standard line operation are attached in the Standard Line Operation window in Oracle Bills of Material. See: Attachments, *Oracle Applications User's Guide*

Setup

In specific product applications, attach the instructions and documents.

You can attach instructions to the following entities for display in the Flow Execution Workstation:

- Item
- Bills of Material
- Bills Of Material Component
- Routing
- Event
- Standard Event
- Sales Order Header
- Sales Order Line
- Line Operation
- Standard Line Operation

See: System Items, *Oracle Applications User's Guide*

To set up instruction views in the Flow Execution Workstation:

1. In the Flow Execution Workstation, navigate to the Edit Preferences page for the parameter preference. See: Setting Your Preferences on page 10-2

2. In the Instruction Frame Height field, you have the option to change the size of the view. This is a pixel value.

3. In the Instructions boxes, select where to display the instructions and attachments.

   Select attachment source from the Available box—and move to the Selected box. The order listed in the Selected box, is the order they display on the page. Use the Arrow tool to change the order. This enables you to specify the priority view of the attachments. For example, at the line operation level, you can set your display at that line operation, but also all the documents attached to the events under that line operation.
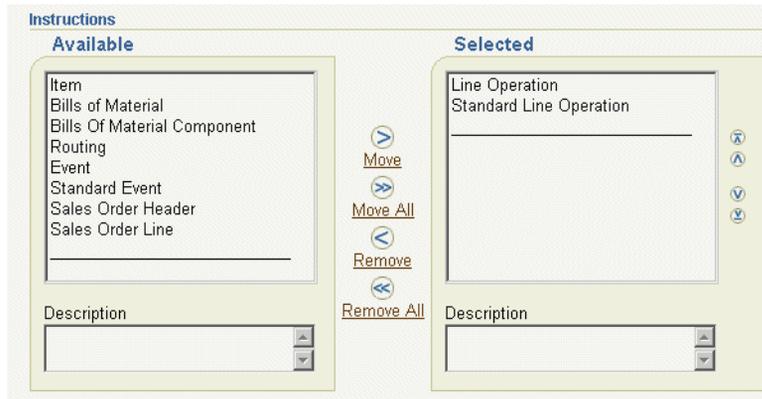
4. Choose Apply to save your work.

To view instructions:

❏ Navigate to the Schedule or Event page.

If only one instruction attachment exists at the schedule or event level, it is shown in a frame automatically on the page.

If more than one attachment exists, a table displays the list of instructions. Select a record to navigate to the instruction frame.

Select View All Instructions to display a list of all instructions attached to a schedule.

Viewing Detail Properties

The Detail Properties region displays all the line, schedule, bill of material, and assembly information about a particular Flow schedule. The information in this region is derived from the data created when the Flow schedule is created.

Existing descriptive item flexfield data also displays. You can use the System Items Flexfield for reporting item information. See: System Items, *Oracle Inventory User's Guide*

Viewing Components and Replenishing Kanban Cards

You can view and replenish components in the Components region. This region displays field information for Event Sequence, Item Sequence, Component Description, Reference, Revision, Unit of Measure, Quantity, Effectivity Date, and Disable Date. You can access the Replenish Kanban Card page for a specific component by selecting the Kanban Cards Exist icon. the Replenish Kanban Card page displays both eligible and ineligible kanban cards defined for a particular component.

Instructions		Components	Resources	Detail Properties	Customized Properties				
Event Seq	Item Seq	Component	Description	Ref	Revision	UOM	Qty	Effectivity Date	Disable Date	Kanban
1010	10	CM00033	600MB Internal 24X CD-ROM Drive		A	Ea	1	2004.Apr.18 11:31:33	2086.Jun.10 11:31:33	
1010	20	CM00034	600MB Internal 32X CD-ROM Drive	A101	A	Ea	1	2004.Apr.18 11:31:33	2086.Jun.10 11:31:33	
1010	30	CM00035	12GB 4mm Tape Drive		A	Ea	1	2004.Apr.18 11:31:33	2086.Jun.10 11:31:33	
1010	40	CM93501	Mounting Bracket Left Hand		A	Ea	1	2004.Apr.18 11:31:33	2086.Jun.10 11:31:33	
1010	70	AT-35T-F-ASY	Flywheel Assy		A	Ea	1	2004.Apr.18 11:31:33	2086.Jun.10 11:31:33	
1010	80	CM23597	Formed Sheet Metal Shell Bottom		A	Ea	1	2004.Apr.18 11:31:33	2086.Jun.10 11:31:33	
1020	50	CM00036	7GB 8mm Tape Drive		A	Ea	1	2004.Apr.18 11:31:33	2086.Jun.10 11:31:33	
1020	60	CM00037	CD Writer		A	Ea	1	2004.Apr.18 11:31:33	2086.Jun.10 11:31:33	

Instructions	Components	Resources	Detail Properties	Customized Properties

To replenish Kanban cards:

1. Navigate to the Components region, select the component for replenishing by choosing the Kanban Cards Exist icon.

   The Replenish Kanban Cards page displays.

2. In the Cards Available for Replenishment region, select components by checking the Select box for the card numbers you want to replenish.

3. Choose Replenish.

When you transaction is performed, the record you selected displays in the Cards Currently Not Available for Replenishment Region.

Integration with Oracle Quality

If collection plans exist for line operations, you can access Oracle Quality to enter quality data. You can enter results for mandatory collection plans, or optional collection plans, at specific points on a routing. Line operations cannot be completed if there are remaining mandatory collections plans. If the collection plan is mandatory, the Line Operation Completion page displays when you choose Complete Schedule or Complete Operation. Choose Enter Quality Results to enter the quality data.

When the collection plan data is entered, and the completion transaction is saved, the quality data is also saved. See: Entering Quality Results Directly, *Oracle Quality User's Guide*.

> **Note:** The Enter Quality Results button is enabled when Oracle Quality is enabled for the organization, and a collection plan exists for the line operation.

Customized Properties Region

You can create a region of new parameters, customized to fit your business needs. These are fields that do not already exist on the Schedule and Detail Properties pages, and parameters not delivered with the Flow Execution Workstation.

This region has Name and Value fields. For example, you may want to add a Name designated as Priority, with a corresponding Value as specified as High Priority.

The custom parameters are added using an applications program interface (API)—Flow Manufacturing, Execution Utility.

Engineering Change Order Alerts

You can check for engineering change orders (ECOs) related to your assembly. Changes include adding, changing, or disabling components. The information is accessed from the Schedule and Event pages. The ECOs that are eligible for display include:

- Bill of Material ECOs, not routing ECOs
- Status is Implemented
- Components are used at current line operation or event only

This functionality is set up in the Automatic ECO Check field in the Workstation Preferences page. See: Setting Your Preferences on page 10-2

Eligible ECOs can be flagged for a range of dates. This enables you to have the correct changes for work as it progresses on the shop floor.For example, if you have a value of 2 in the ECO Days Prior field, and a value of 3 in and ECO Days After field—the system considers ECOs in a range of 5 days. This is 2 days before today's date, and 3 days after the scheduled completion date.

11

Graphical Kanban Workbench

This chapter describes the functionality in the Graphical Kanban Workbench including:

Overview of the Graphical Kanban Workbench

The Graphical Kanban Workbench combines kanban setup, kanban planning, pull sequence definition, and planning simulation in one interface. The graphical interface includes the following features:

- Graphical view the pull sequence network

- Graphical view the demand pattern for monitoring requirements

- You can define pull sequence, and have the capability to mass add pull sequences for items

- You can add items under locator control and specify point of use, point of supply, or both as locator sources

- You can perform simulation replans and updates to production

- You can view comparison of kanbans by variances in size, or the number of cards between the two kanban plans being analyzed

See: Overview of Kanban Replenishment, *Oracle Inventory User's Guide*.

Navigating on the Graphical Kanban Workbench

The Graphical Kanban Workbench is comprised of two panes. The left pane is the tree hierarchy. There are two tree tabs located to the left of the tree hierarchy that allow you to toggle between the Production and Planning views. The View By list box enables you to change the way you view data in the tree.

The right pane displays the Production or Planning regions in a graphical view of the kanban network. The right pane contains the data that is associated with the selected item on the tree. Or it displays the template windows used for creating templates for your kanban network.

Color Representation

The arrow on the replenishment chain canvas represents the pull sequence between point of use and a point of supply. One or more cards are generated for a pull sequence. A color on the arrow is used to easily identify the card status on the pull sequence. This information is also viewable on the View Kanban Demands and Compare Kanban Plans windows.The following values are used in the graphical replenishment network in the right pane:

- *Black*: Cards have not been generated for the pull sequence

- *Green*: There are cards in the pull sequence that are in the active status

- *Blue*: Some cards in this pull sequence are on hold, and none are active

- *Red*: All of the cards are canceled

Workbench Toolbar

The right pane canvas displays a toolbar when you are in the Production region. It contains icons used for creating and modifying your graphical network.

This toolbar contains icons for:

- *Connector*: Enables you to create links between entities on the canvas

- *Pointer*: Enables you to move existing entities on the canvas

- *Organization*: A point of supply that is in another organization

- *Supplier*: A point of supply that is a supplier

- *Subinventory*: A point of user or point of supply that is a subinventory

- *Production*: A point of supply that is a flow line, repetitive line, or discrete production area

Tools Menu and Pop-up Menus

The Graphical Kanban Workbench enables you to access other manufacturing functionality. These options are available, depending upon the currently active window and other conditions, in the Tools menu and pop-up menus.

Tools Menu

Pull Sequence: Accesses the Pull Sequences Summary window to view, update, and define the source of replenishment for a kanban item, see: Defining Kanban Pull Sequences, *Oracle Inventory User's Guide*.

Kanban Cards: Accesses the Kanban Cards Summary window to view, define, and update kanban cards, see: Defining Kanban Cards, *Oracle Inventory User's Guide*.

Print Kanban Cards - Accesses the request window for printing kanban cards for a specific item or for all items. see: Printing Kanban Cards, *Oracle Inventory User's Guide*

Generate Kanban Cards: Accesses the Generate Kanban Cards window, see: Generating Kanban Cards, *Oracle Inventory User's Guide*

Forecast/Schedule: Accesses the Item Forecast Entries window where you can review information for items in a forecast set. See: Defining a Forecast, *Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide*

Launch Kanban Plan: Accesses the Kanban Planner request window for entering plan information for kanban calculations. See: Launching a Kanban Plan, on page 11-34, and Using the Kanban Calculation Program, *Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide*

Update Production: Accesses the Kanban Details or Update Production Kanbans window, depending on whether a plan or item is selected on the navigation tree. These windows enable you to review adjustments to your replenishment chain, and update the changes in production plans and kanban cards. See: Defining a Forecast, *Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide*

Pop-up Menus

You can access windows and functions in the pop-up menus by right-clicking on an icon in the right pane, or a detail in the tree hierarchy.

These options are available, depending upon the currently active window and where your cursor is located when you right-click in the right pane:

- *Location:* Accesses the Location window for the replenishment source for a kanban location

- *Delete Location*: Enables you to remove unconnected locations

- *New*: Enables you to add a new items' replenishment chain, see: Adding an Item to the Tree, on page 11-9

- *Pull Sequence*: Accesses the Pull Sequences Summary window to view, update, and define the source of replenishment for a kanban item.

- *Kanban Cards*: Accesses the Kanban Cards Summary window to view, define, and update kanban cards.

- *Print Kanban Cards* - Accesses the request window for printing kanban cards for a specific item or for all items.

- *Generate Kanban Cards:* Accesses the Generate Kanban Cards window.

- *Delete Pull Sequence*: Enables you to remove the pull sequence; a pull sequence can only be deleted if the color is black, signifying that there are no cards associated with it

- *Place Kanban Cards On Hold*: Enables you to change the kanban cards to inactive by changing the status to hold

- *Activate Kanban Cards*: Enables you to change the status of kanban cards from hold back to active

- *Cancel Kanban Cards:* Cancels all the cards associated with a pull sequence; items can be received using the card but not replenished

- *Delete Kanban Cards:* Deletes all the kanban cards associated with a pull sequence, this option is only available if all cards have been canceled indicated by the color red of the link

- *Forecast/Schedule*: Accesses the Item Forecast Entries window where you can review information for items in a forecast set.

- *Launch Kanban Plan*: Accesses the Kanban Planner request window for entering plan information for kanban calculations.

- *Update Production*: Accesses the Kanban Details or Update Production Kanbans window, depending on whether a plan or item is selected on the navigation tree. These windows enable you to review adjustments to your replenishment chain, and update the changes in production plans and kanban cards.

Accessing the Production Region

The Production region tree displays all the items that already have pull sequences defined, and the right pane consists of the detail kanban chain diagram.

This graphical detail view shows the replenishment chain. The replenishment chain for an item shows all pull sequences that belong to that item.

To view kanban production information on the Graphical Kanban Workbench:

1. Select Graphical Kanban Workbench on the Flow menu.

2. In the View By list box, select viewing criteria for the kanban data.

   Your choices are: Category, Buyer Code, Planner Code, Supplier, Location, Line Operation, and Process. In the View by Line Operation or Process mode, the hierarchical tree displays all flow lines and you can expand the tree to see line

operations and processes on the selected line. In the line operation view, an Unreplenished node at the Line level provides a listing of bill of material components without defined pull sequences.

3. Select the Production tree tab.

   In the initial view, the workbench displays the Template window used for creating new kanban networks. See: Using a Template to Create a Pull Sequence on page 11-14

   In the All Items by node, you can search for records using the Search Results node, or view all the records in the All Items node.

4. If you want to find a specific record, or range of records, select the Search Results node and right-click with your mouse to display the pull-down menu. Select the Search menu option.
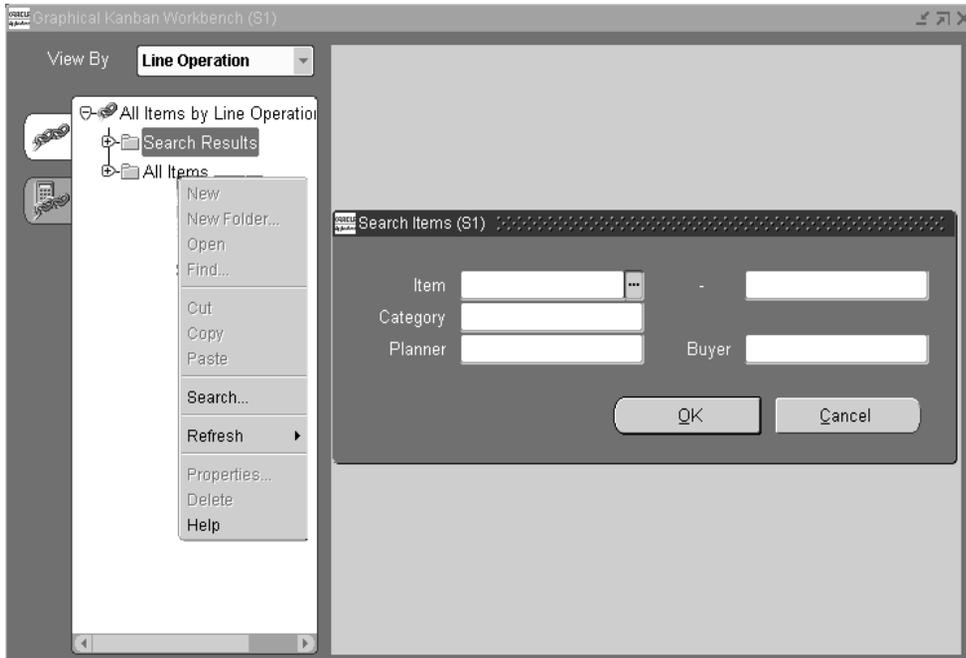
5. Enter search criteria; you can search by item, category, planner, buyer, or any combination of these values.

6. Choose OK to display the results of your query under the Search Results node.
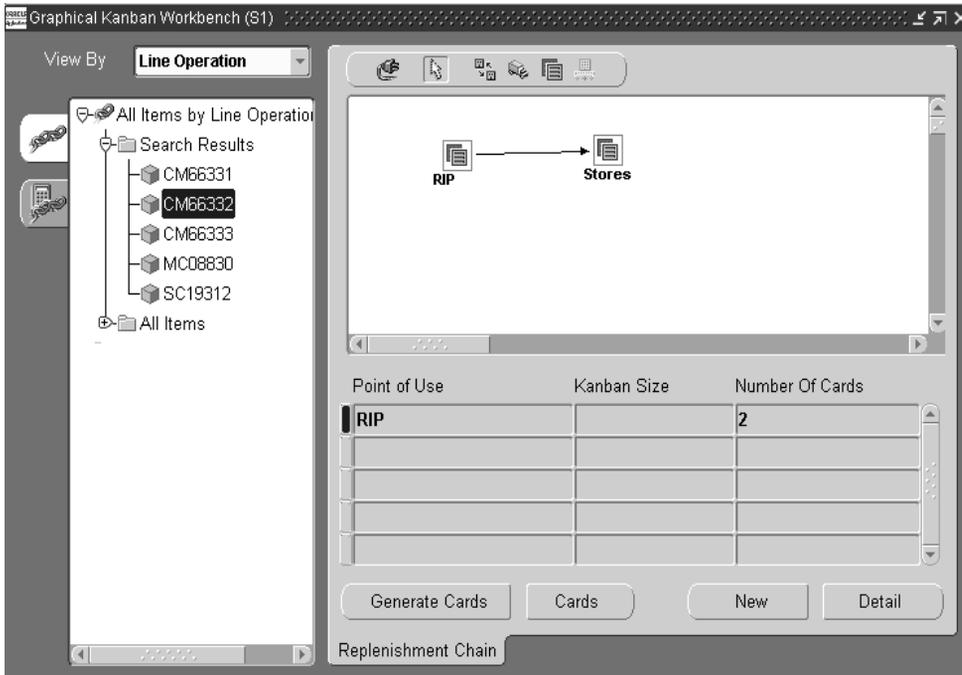
7. Select a node detail on the tree.

    The tree displays all the items that have the pull sequence defined for the specified plan. The graphical view the pull sequence network displays in the right pane.

    You can add, change, delete, or move the icons in the graphical network. See: Modifying and Creating Pull Sequences on the Graphical Network on page 11-10

8. There are four buttons on this window that enable you to navigate to other kanban windows.

    ■   *Generate Cards*: Accesses the Generate Kanban Cards window, see: Generating Kanban Cards, *Oracle Inventory User's Guide*.

    ■   *Cards*: Accesses the Kanban Cards Summary window to view, define, and update kanban cards, see: Defining Kanban Cards, *Oracle Inventory User's Guide*.

- New--Accesses the Pull Sequence window to fill in fields to create a new pull sequence, see: Pull Sequence Window on page 11-12

- Detail: Accesses the Pull Sequence window to view, update, and define this pull sequence, see: Pull Sequence Window on page 11-12.

Adding an Item to the Tree

The tree hierarchy displays all the items that have a replenishment chain. You can add new items using the Item window.

To add an item to the replenishment chain:

1. On the tree hierarchy, select the top level node where you want to add another item.

2. Right click with you mouse on your selection to display the pop-up menu.

3. Select New.

   The Item window displays.

4. Enter an item, or select from the list of values.

5. Choose OK

   The item appears at the bottom of the list for the top level item, the right canvas is blank.

Modifying and Creating Pull Sequences on the Graphical Network

Pull Sequences are used to view, update, and define the source of replenishment for a kanban planned item in a kanban location. You can use the Graphical Kanban Workbench to create, move, and delete pull sequences.

To create pull sequences for items defined on the tree:

1. Select a node detail on the tree.

   The tree hierarchy only displays items that already have pull sequences defined. The replenishment chain displays in the right pane.

2. Select a kanban source type icon from the toolbar, and select a location to place the pull sequence on the right pane canvas See: Workbench Toolbar on page 11-3

   The Location window displays with different fields, depending on your replenishment source:

   ■ If you select Organization, select the source organization and subinventory. If the organization, subinventory, or item is under locator control, you must also enter a stock locator. See: Assigning a Completion Subinventory and Locator, *Oracle Bills of Material User's Guide.*
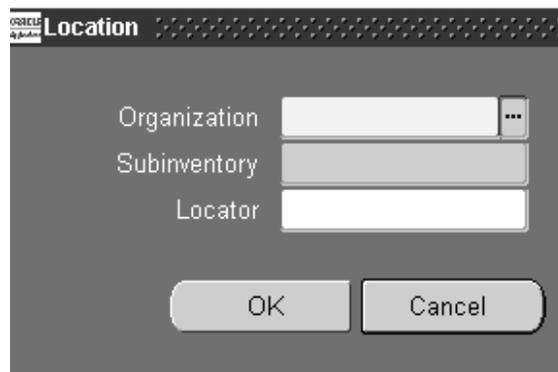
   ■ If you select Supplier, you can optionally select the supplier and supplier site. If you do not select a supplier, Oracle Purchasing will choose the supplier based on sourcing rules when it creates a purchase order/blanket release.

- If you select Subinventory, select the source subinventory, and stock locator if applicable.
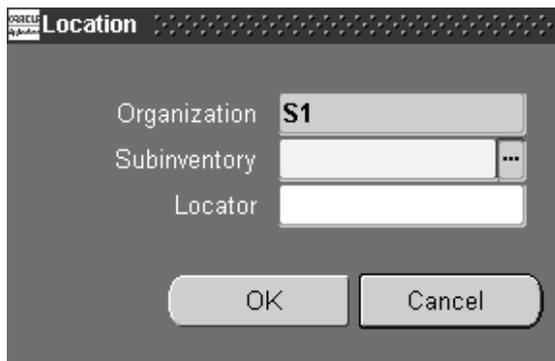
- If you select Production, optionally enter the line code.
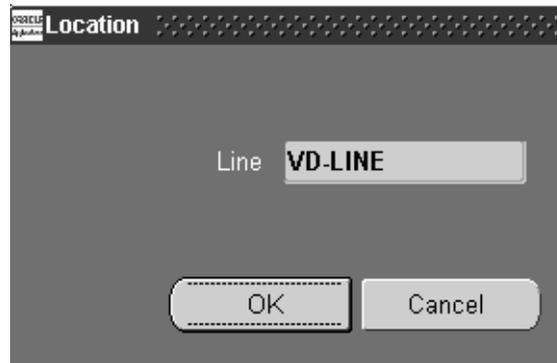
3. Select the Connector icon to join the objects together to form a replenishment chain. Select the location and drag from the point of supply to the point of use.

Connect the objects together—starting with the sub-inventory/locator closest to your production. When you create the link, the Pull Sequence window appears. Enter details about the Point of Use and in the Point of Supply. See: Pull Sequence Window on page 11-12.

4. Save your work.

Pull Sequence Window

Use the Pull Sequence window to view, update, and define the source of replenishment for a kanban item in a kanban location. A pull sequence groups information for an item defining a kanban location, source information, and planning parameters. An item can have multiple pull sequences that make up a replenishment chain. The kanban calculation program determines the optimal number of kanban cards or size according to the values you enter in the Pull Sequence window for size, cards, demand, lead time to replenish. See: Defining Kanban Pull Sequences, *Oracle Inventory User's Guide*.

To view and modify pull sequence detail information:

1. Navigate to the Pull Sequence window.

2. Select a value in the Point of Use Subinventory field and a Locator, if applicable.

This is the location where material is used.

3. In the Point of Supply region, indicate the type of pull sequence and the source.

   Depending on the source type indicated in the Type field, you must supply information in the following fields for, Supplier, Site, Organization, Subinventory, and Line Code. See: Changing and Viewing Kanban Details on page 11-25

4. The Kanban region is used to select parameters for kanban creation. The Planning Only box is used if you want the program to perform the kanban calculations, but you will use a manual system to execute the kanbans.

5. The Auto Request box is used to indicate if this kanban record is flagged for the Outbound Broadcast Sequencing functionality. See: Overview of Outbound Broadcast Sequencing on page 9-2

6. The Calculate, Number of Cards, Size, and Minimum Order Qty fields are used to define kanban card calculations. See: Defining Kanban Pull Sequences, *Oracle Inventory User's Guide*

7. In the Planning region, enter the Lead Time for this location, and optionally enter Lot Multiplier, and number of Safety Stock Days.

8. Choose Generate Cards if you want to create kanban cards for this pull sequence. See: Generating Kanban Cards, *Oracle Inventory User's Guide*.

9. Save your work.

Using a Template to Create a Pull Sequence

Templates enable you to mass add pull sequences for many items. There are several options available when creating pull sequences from templates— you can use an existing template and assign other items, create an entirely new template and assign items, or you can change the details of an existing template. After creation, the templates are accessible on the Production region of the Graphical Kanban Workbench when adding a new pull sequence.

Locator Control

You can add items under locator control when retrieving items for the pull sequences. When retrieving items you can specify point of use, point of supply, or both as locator sources in your criteria. Locator records can be retrieved either from the Bill of Material or from the Pull Sequences.

◗ **To create pull sequences for items using an existing template:**

1. Navigate to the Graphical Kanban Workbench.

2. Select All Items in the Tree Hierarchy.

The right pane displays the Template window. This window displays any existing template information in a multiple row format including:

Template: The name of the existing template

Point of Use: The subinventory where material is used

Point of Supply—Type and Name: Point of Supply stock areas, from material stores, a supplier, a production area, or another organization.

3. Select the template you want to use in the multi row table.

4. To add items to this template, choose Assign.

The Template Assignment window displays.

5. Enter Item number, Locator information, and description. See: Defining Kanban Pull Sequences, *Oracle Inventory User's Guide*.

6. To add multiple items, choose Retrieve.

Add Items Criteria window displays. This window restricts your search for items according to your specifications.

7. Select your search criteria.

You can search by any combination of values including product family, parent assembly, component, backflush subinventory, or category

In the Item Attributes region, you also have the option to use item attributes in your search criteria including buyer code, planner code, make or buy status, or release time fence.

8. Select values in the Locator region if you want to use locator records in the selection criteria.

Point of Use is where the item is used on the flow line. Your choices are:

- Bill Of Material

- Pull Sequence

- Default—the search uses both bill of material and pull sequence records after using the other selection criteria entered on the window

Point of Supply is the stock location. You can search for locator records by the row, rack, bin, project, or task.

9. Choose Find.

The items that met your criteria appear in the Template Assignment window. You can deselect items by unchecking the check box. Optionally, you can add a Point of Use Locator or Point of Supply Locator
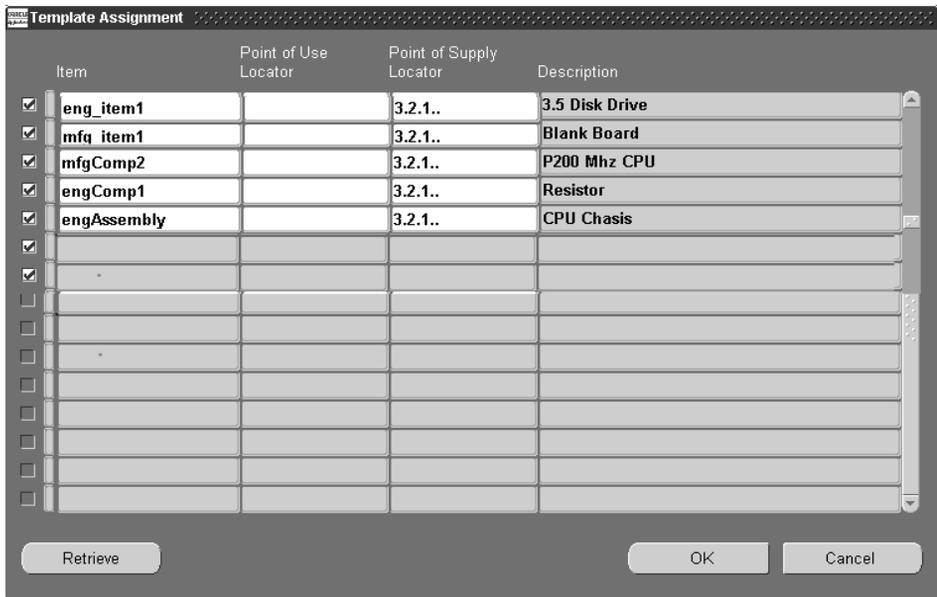
10. Choose OK to save this retrieval.

The Template window displays again.

◗ To create a new template and assign items:

1. Navigate to the Graphical Kanban Workbench.

2. Select All Items in the Tree Hierarchy.

The right pane displays the Template window. This window displays any existing template information in a multiple row format.

3. Choose New

The Pull Sequence template window displays.

4. Enter a unique value in the Template name field.

5. Add information to the fields on this window, see: Pull Sequence Window on page 11-12

6. Save your work.

   The Template window displays again.

7. Assign items to this template, see: Pull Sequence Window on page 11-12.

▶ **To change the details of an existing template:**

1. Navigate to the Graphical Kanban Workbench.

2. Select All Items in the Tree Hierarchy.

3. Select the template in the multi row table, and choose Detail.

   The Pull Sequence template window displays with the name of this template in the Template name field.

   You can change any of the fields on this window, see: Pull Sequence Window on page 11-12.

4. Save your work.

   The Template window displays again.

Accessing the Planning Region

The Planning region is used for kanban planning. The tree hierarchy displays the kanban plan and all the items that already have pull sequences defined and demand from this plan. The right pane displays detailed information for the specified plan. In this region you can view kanban demands, compare kanbans, perform simulation replans, add, and delete pull sequences or icons on the graphical network.

To create a new plan:

1. Select the Planning tree tab on Graphical Kanban Workbench on the Flow menu.

2. In the View By list box, select viewing criteria for the kanban data.

   Your choices are: Category, Buyer Code, Planner Code, Supplier, and Location.

3. To create a new plan, select the Item node and right-click to display the popup menu. Choose New.

   The Kanban Plan window displays.

4. Enter a unique value in the Plan Name field, and choose OK.

   The plan Detail pane displays.
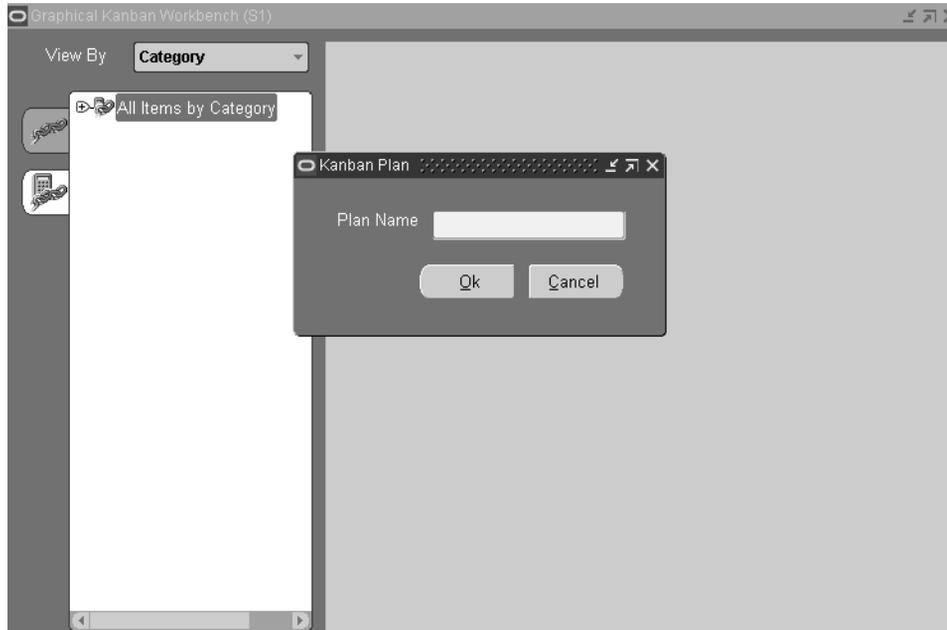
5. Optionally, enter a description of this plan in the Description field.

6. In the Demand Type field, select the demand source. Your choices are Forecast, MDS, MPS, or Actual Production.

7. In the Forecast/Schedule field select the name of the specific forecast or schedule you want to use.

8. Optionally, you can enter a date in the Inactive On field to indicate when this plan will not be active.

9. Save your work.

To view plan detail information:

1. Select the Planning tree tab on Graphical Kanban Workbench, and select a plan node on the tree.

    The plan Detail pane displays with the specific information for this plan including plan name, demand type, forecast/schedule, and Inactive On date, and demand dates. If this plan is completed, a value displays in the Completion Date field.
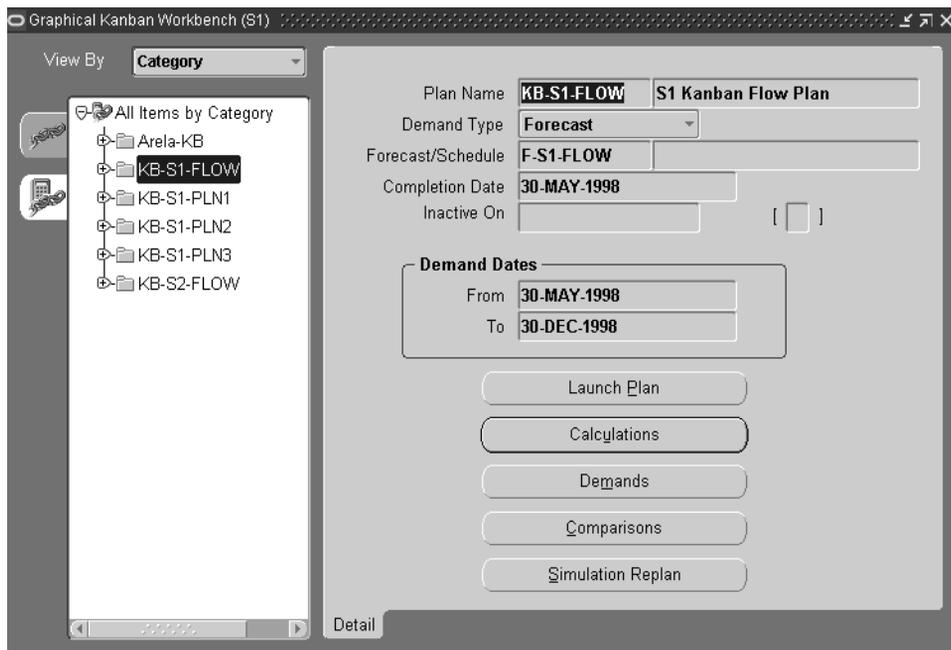
2. Choose Launch Plan to access the kanban calculation concurrent program to determine the number of kanban cards or sizes according to your parameters. See: Launching a Kanban Plan, on page 11-34, and Using the Kanban Calculation Program, *Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide*

3. Choose Calculations to access the Kanban Details window to view the pull sequences that resulted from the calculations performed in the plan.

4. Choose Demands to access the View Kanban Demand window, see: Viewing Kanban Demands on page 11-14

5. Choose Comparisons to access the Compare Kanban Plans window, see: Viewing and Updating Kanban Calculations, Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide

6. Choose Simulation Replan to submit a request to the kanban calculation program to generate a new simulation plan based on the new values entered.

◗ **To view plan replenishment information on the Graphical Kanban Workbench:**

1. Select the Planning tree tab.
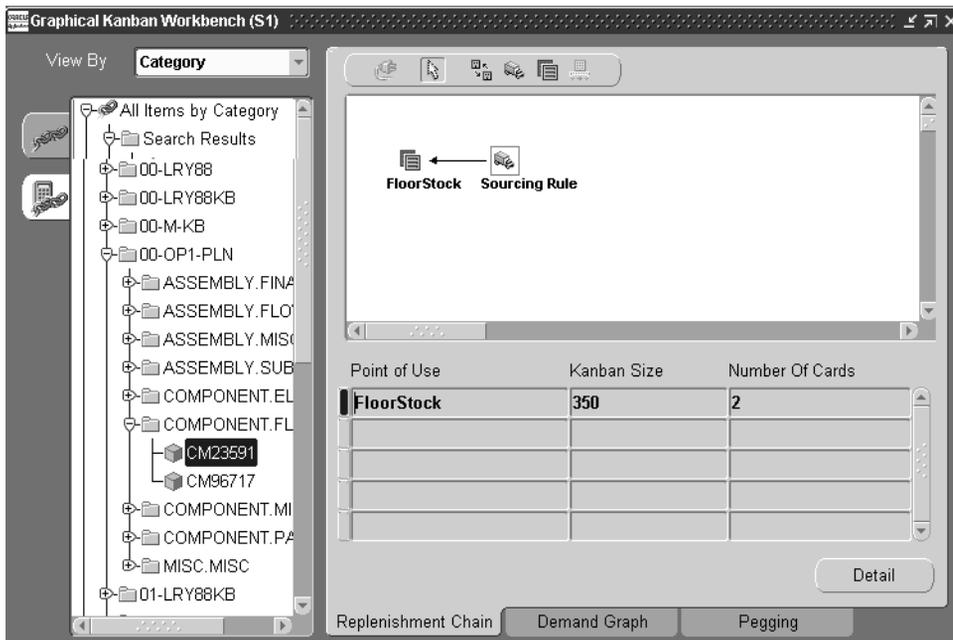
2. In the View By list box, select viewing criteria for the kanban data.

Your choices are: Category, Buyer Code, Planner Code, Supplier, and Location.

3. Select a node detail on the tree.

The tree displays all the items that have the planning pull sequence for the specified plan.

The Replenishment Chain tab displays. This is a graphical view the replenishment chain for the specified plan selected on the tree. The table displays the calculated size and the number of cards to each pull sequence. See: Calculation Formula, *Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide*.

4. You can modify pull sequence information in this pane by Choosing Detail.

   See: Pull Sequence Window on page 11-12.

5. Select the Demand Graph tab.

   The graphical view of the demand pattern of a simulation kanban item displays. This can be used to monitor increases in demand.
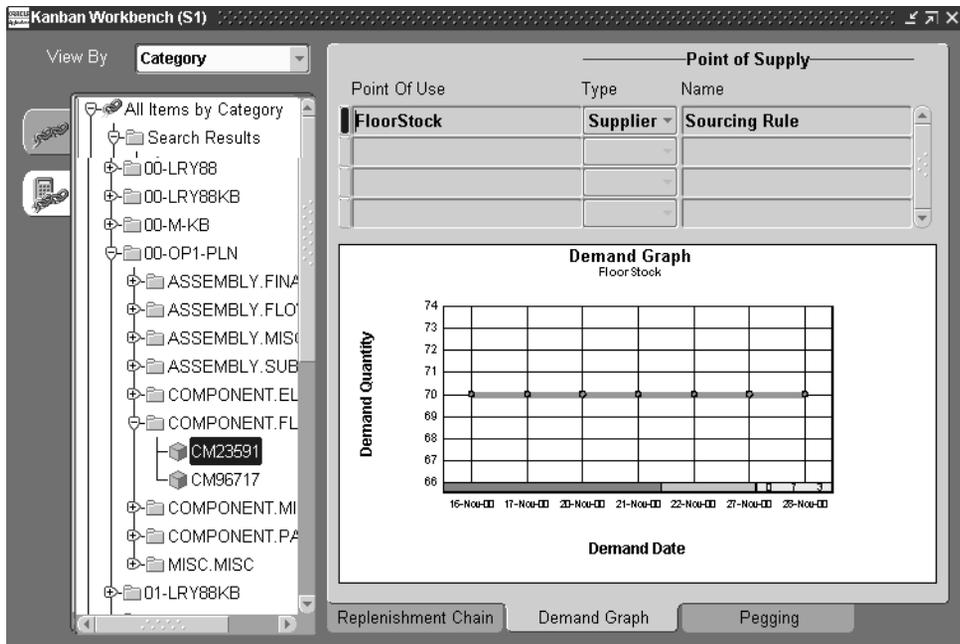
6. Select the Pegging tab.

You can use the graphical pegging feature to analyze the impact of changing a supply or demand order at any level of your bill of material. Pegging traces supply information for an item to its corresponding end demand details.
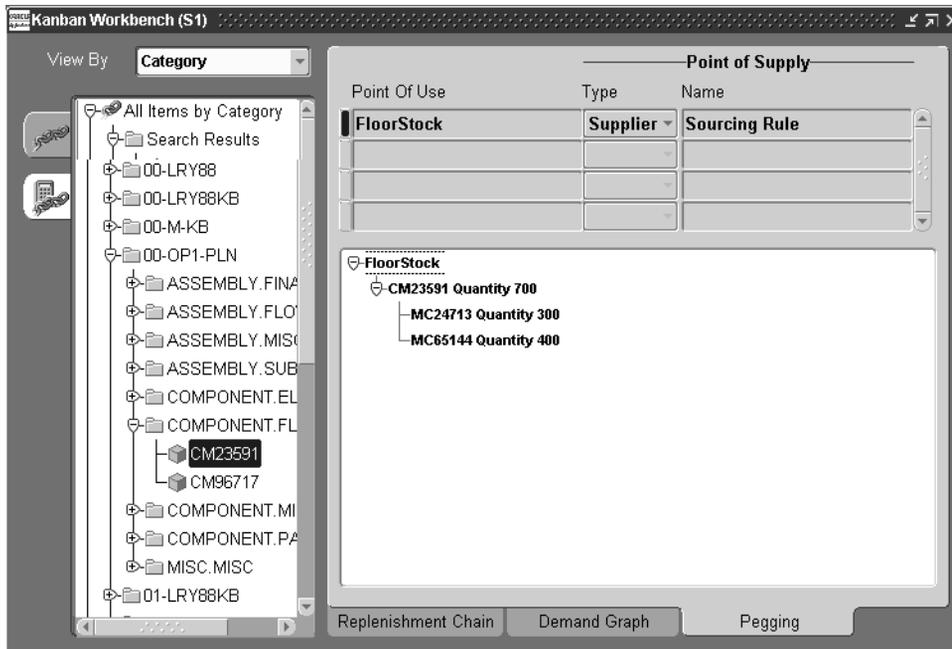
Viewing Kanban Demands

The View Kanban Demand window displays the demand distribution for the specified plan. This window is accessed from the Plan Detail window, displaying the detail information pertaining to the chosen plan. You can also view this information in a graphical format in the Demand Graph tab of the Graphical Kanban Workbench.

Changing and Viewing Kanban Details

The Kanban Detail window enables you to view and update source, quantity and size, and planning information. You can also change or view pull sequence information in a graphical format on the Kanban Graphical Workbench.

▶ **To edit or view kanban detail information**

1. Navigate to the Kanban Detail window.

   The Kanban Detail window displays, initially in the Source tab view.

2. Select a pull sequence.

   You can change subinventory, location, description, and source type.

If the subinventory or item is under locator control, you must also enter a stock locator.
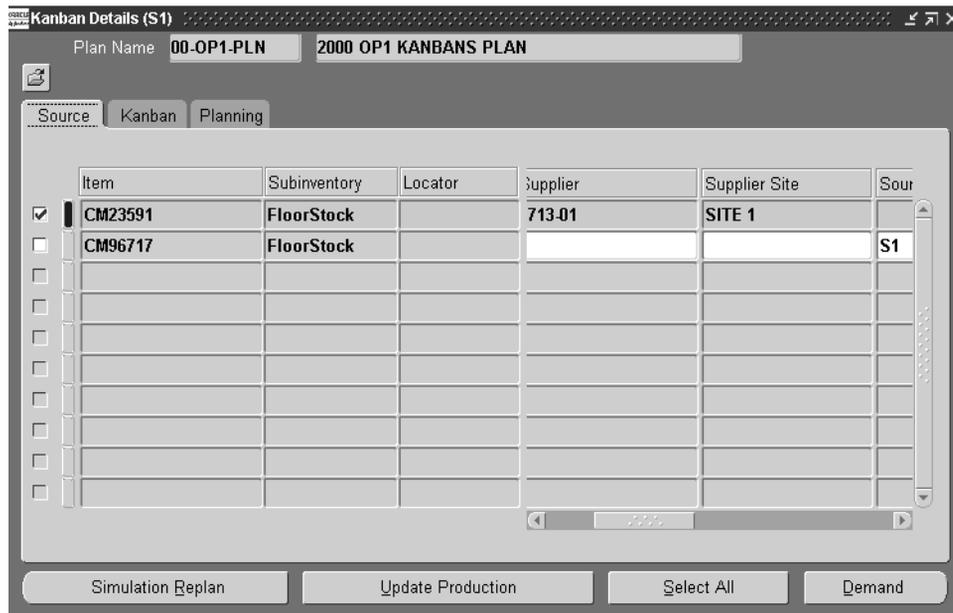
The replenishment source type for a kanban location can be:

- Inter-Org is replenished by another another kanban location.

- Intra-Org is replenished by a kanban location in the same organization, select the source organization and the subinventory for this source type.

- Production is replenished by a production line, you can optionally enter the line code.

- Supplier is replenished by an external source, you can optionally select the supplier and supplier site. If you do not select a supplier, Oracle Purchasing will choose the supplier based on sourcing rules.

See: Overview of Kanban Replenishment, *Oracle Inventory User's Guide*.

3. In the Kanban tabbed region, the calculation method displays. You can change this value.

If you select Do Not Calculate, enter a value in the Size and Number of Cards fields.

If you select Kanban Size, enter a value in the Number of Cards field and optionally enter a value in the Minimum Order Qty field.

If you select Number of Cards, enter a value in the Size field, and optionally enter a value in the Minimum Order Qty field.
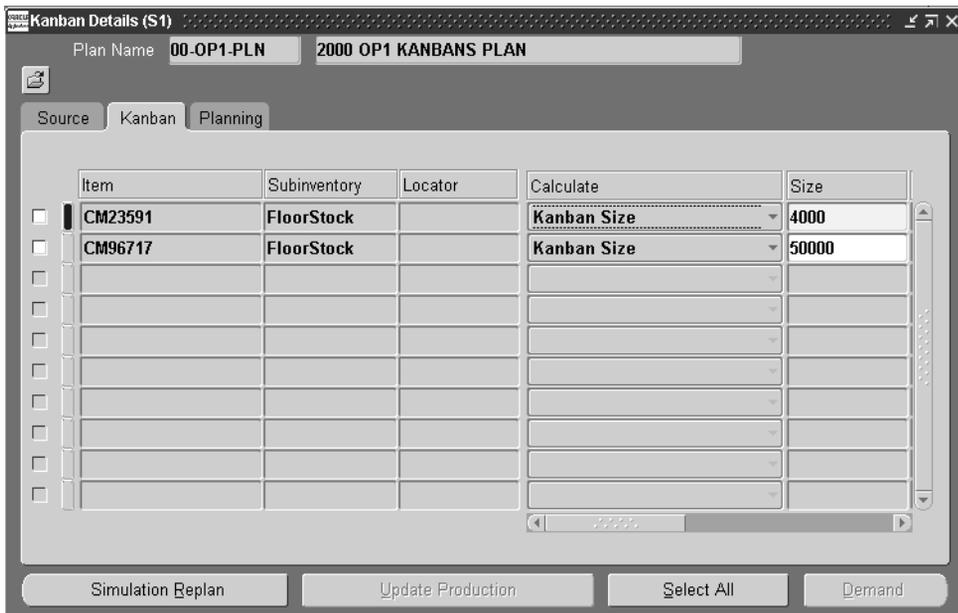
4. In the Planning tabbed region, the Lead Time for this location displays. Optionally enter information in the Allocation Percent, Fixed Lot Multiplier, and Number Of Safety Stock Days fields.
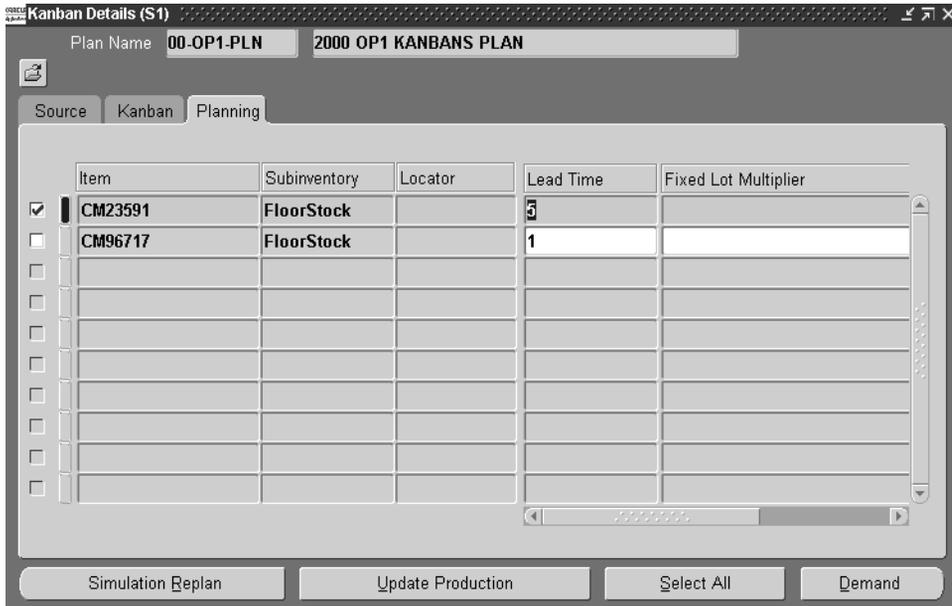
5. Save your work.

6. There are four buttons on this window that enable you to do the following:

    ■   *Simulation Replan* submits a request for kanban replanning.

    ■   *Demand* displays the View Kanban Demand window, see: Viewing Kanban Demands on page 11-14.

    ■   *Update Production* updates your production information with this kanban.

    ■   *Select All* selects all the details on this window.

Viewing and Changing Summary Pull Sequences

You have the ability to view a summary of all pull sequences of the item numbers assigned to planners, suppliers, subinventory locations, or buyers. The Pull Sequence Summary window groups pull sequences and displays the Point of Use, Point of Supply, and Average Lead Time. This enables you to navigate to windows to view the number of pull sequences for the selected criteria, make changes or delete multiple pull sequences simultaneously.

The summary pull sequence view is available both in the Production and the Planning areas. In the Planning Area you can add and delete mass pull sequences. However, in the Production area, changes are not allowed to pull sequences that have released or canceled cards.

To view, delete, or modify summary pull sequence information:

1. Navigate to the Graphical Kanban Workbench, and select viewing criteria in the View by list box.

2. In the View By list box, select viewing criteria for the kanban data.

3. The pulls sequence summary view is available for are: Buyer Code, Planner Code, Supplier, Location.
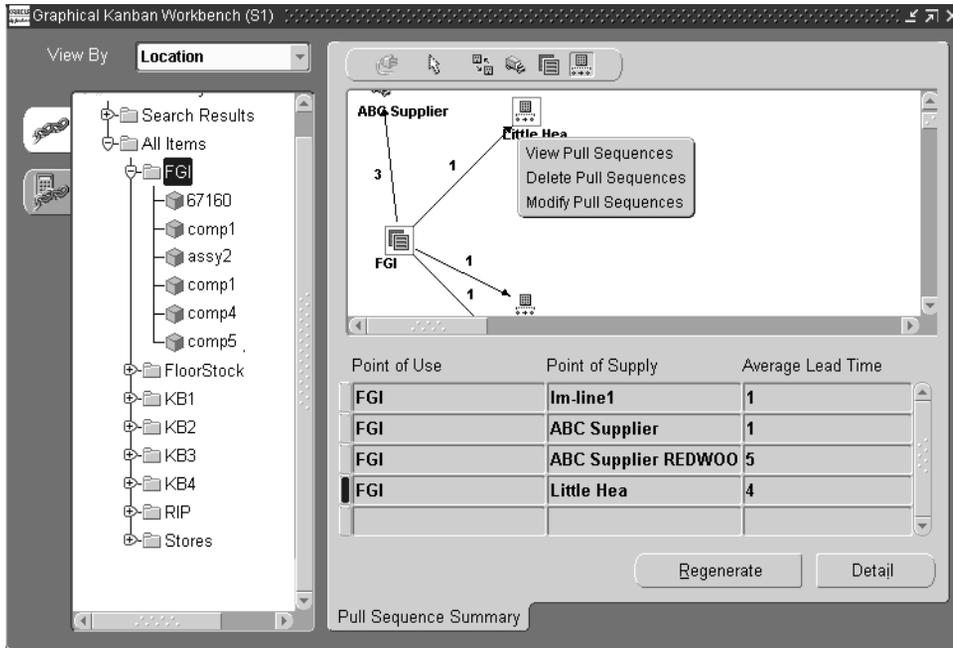
4. Select a record on the hierarchal tree to display the pull sequences on the graphical pane.

5. Select a pull sequence on the graphical pane, right-click with your mouse to display the pop-up menu.

   The number next to the pull sequence indicates how many records are in the summary view. The menu choices enable you to view, delete, or modify pull sequences.

6. Select View Pull Sequences to display all pull sequences the view you selected.

The Pull Sequences window displays.

The Point of Use and Point of Supply Subinventory display. The multi-row region of the window displays all items used in the pull sequence, their associated point of use and point of supply subinventory locators, the number of kanban cards for each item, and the kanban card size.

7. Choose OK to close this window and return to the Graphical Kanban Workbench.

8. Select Delete Pull Sequences to display the Pull Sequences window.

The multi-row region of the window displays all items used in the pull sequence, their associated point of use and point of supply subinventory locators, the number of kanban cards for each item, and the kanban card size.

9. Mark the check box next to the items you want to delete.

10. Choose Delete.

11. Select Modify Pull Sequences.

    The Change Pull Sequences window displays. This window has six tabbed regions including Kanban Size, Number of Cards, Minimum Order, Lead Time, Lot Multiplier, and Safety Stock. The multi-row region of the window displays all items used in the pull sequence, the corresponding subinventory, and the calculation method.

12. For each item you are changing, ensure that the check box next to it is marked.

13. Select the tabbed region needed for the specific changes.

    Each tabbed region contains a Current and New field for the corresponding changed values. For example, if you are viewing the Kanban Size tab, the number in the Current field is the kanban size. Similarly, if you are in the Number of Cards tab, the value in the Current field is the number of kanban cards for this item in the pull sequence.

14. Enter the new value for the modification you are creating.

15. Optionally, in the Changes region, you can enter a global change for all records on the window by adding a value or percentage the current value. Mark the Percentage, Value, or Constant radio button.

16. Enter the value you want to add or subject to the current value.

    The value you enter adds or subtracts to the current value. If you mark Percentage, a percent is added. If you mark Value, that number is added. And if you mark Constant, the value is changed to the new number.

For example, the value in the Current field for Safety Stock is 3 for the first item, and 2 for the second item. If you mark the Value radio button, and enter 3—when you apply your modification, the first item changes to 6 and the second item changes to 5.

17. Choose Apply to create your global change on this window.

18. Choose OK to save this record.

Launching a Kanban Plan

The kanban calculation program determines the optimal number of kanban cards or size according to the values entered in the Pull Sequence window. The calculation program uses the launch parameters entered including the plan name and demand date ranges. The kanban calculation program is launched from the Planning region. After you select a plan in the navigation tree, you can choose Launch Kanban Plan from the Tools or popup menu. You can also choose Launch Plan from the Plan Detail window on the workbench.

> **Note:** Kanban calculation does not support independent demand for components.

See: Using the Kanban Calculation Program, *Oracle Master Scheduling/MRP and Oracle Supply Chain Planning User's Guide*.

Updating Production

Once you have made adjustments to your replenishment chain in the planning region, you need to update production to reflect the changes in your production plans and kanban cards.

If you select a plan on the navigation tree, the Kanban Details window is accessed. You can review kanban data for records in the plan by Source, Kanban, and Planning detail views.

If you select an item on the navigation tree, the Update Production Kanbans window is accessed. You can review all items kanban data for a particular plan.

To update production with replenishment information:

1. Navigate to the Graphical Kanban Workbench and select the record you want to update on the tree,

2. Right click to display the popup menu. Choose Update Production.

    You can also select Update Production from the:

    - Tools menu

    - Compare Kanban Plans window

    - Kanban Details window
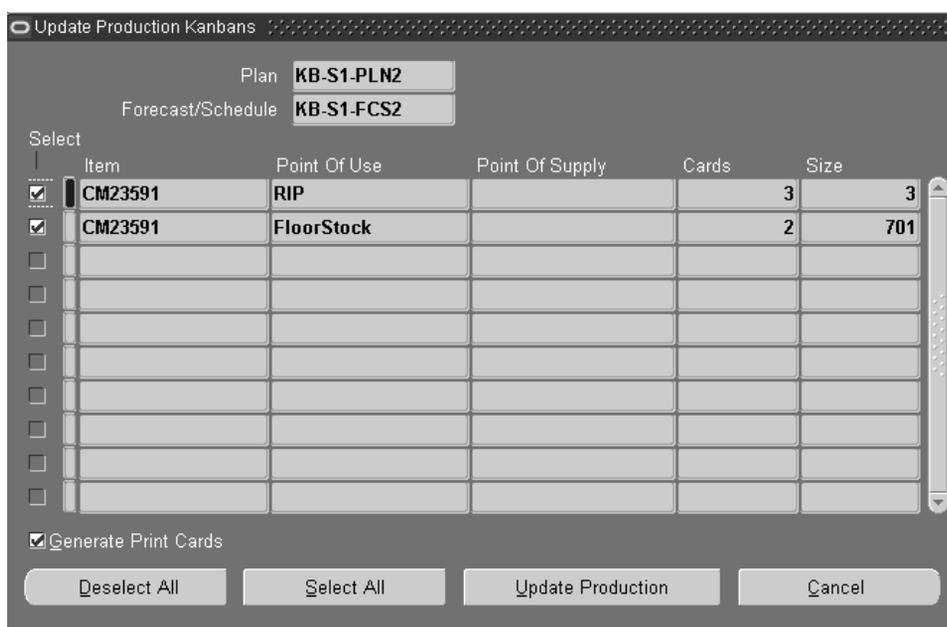
3. If a plan was selected on the navigation tree, the Find Kanban Details window displays. Enter search criteria and choose Find to display the Kanban Details window.

    You can review kanban data for records in the plan by Source, Kanban, and Planning detail views.

    See: Changing and Viewing Kanban Details on page 11-25.

4. If an item was selected on the navigation tree, the Update Production Kanbans window displays.

   This window displays eligible records for the plan, and the applicable forecast or schedule.

5. Select the items you want to update on either the Kanban Details or Update Production Kanbans window.

6. If you are accessing the Update Production Kanbans window, you have the option to print new kanban cards after you update production. Enable the Generate Print Cards box for this print option. See: Printing Kanban Cards, *Oracle Inventory User's Guide*.

7. Choose Update Production.

   If there are no conflicting pull sequences, a message displays with the number of kanbans to be updated.

8. Choose Yes to update production.

   The Graphical Kanban Workbench displays.

To resolve pull sequence conflicts:

1. If there is a discrepancy with conflicting pull sequences, the Conflict Resolution window displays when you choose Update Production on the Kanban Details or Update Production Kanbans windows.

   This window has two regions, New Pull Sequences and Deleted Pull Sequences. Both regions display fields for Part Number, Description, Point of Use, a Planning Area and Production Area. The Planning and Production areas display Point of Supply, Cards, and Size. Conflicts or mismatches with pull sequences result when:

   - In the New Planning Sequence region, if the Point of Supply is different for the pull sequence in the Planning Area and Production Area.

   - In the Deleted Pull Sequence region, if the corresponding planning sequence has an active kanban.

   You can verify these conditions in the Replenishment tab detail page.

2. Enable the Resolve Conflict box to proceed with updating production.

3. Choose Proceed.

   A message displays with the number of kanbans to be updated.

4. Choose Yes to update production.

   This Production pull sequence is deleted with its corresponding kanban cards, and the second Production pull sequence is updated.

   The Graphical Kanban Workbench displays.

Purging Kanban Cards and Pull Sequences

Kanban cards are created based on the information of the corresponding pull sequence. Over time, unused cards and pull sequences can accumulate in your database and may affect the performance of the kanban system. You can purge unused pull sequences and kanban cards by submitting a concurrent program. The

concurrent function purges according to the parameters specified, and creates a report.

◗ **To purge kanban cards and pull sequences:**

1. Navigate to the Purge Pull Sequences window.

   The Parameters window displays.

2. In the Type field, select whether you want a summary or detailed report generated.

   Both formats of the report list the number of cards, the number of pull sequences deleted, and exception messages. The detailed version also lists locator, item, and the number of cards deleted per category.

3. In the Item From and To fields, you can select a range of pull sequence item numbers.

4. In the Subinventory From and To fields, you can select a range of point of use subinventories for the pull sequences you want to purge.

5. In the Source Type field, select the source type of the pull sequence.

   You choices are inter-organization, supplier, intra-organization, and production.

6. Optionally, you can add more search criteria for the source type selected.

    This information includes:

    ■   Flow line for production pull sequences

    ■   Supplier for supplier pull sequences

    ■   Organization for inter-organization pull sequences

    ■   Subinventory for both inter-org and intra-org pull sequences

7. Select a kanban card delete option in the Delete Cards field.

    Your choices are Canceled cards only to delete all cancelled kanban cards. Or Canceled and Active-New cards to delete any card with a status of active and a supply status of new.

8. Choose OK to display the Purge Pull Sequence request window.

9. Choose Submit to create this request.

    All the pull sequences and kanban cards that satisfy the criteria are deleted and the total number of records purged is displayed on the report

    Pull sequences are deleted if:

    ■   The point of use subinventory and locator defined on the pull sequence does not exist on any bill of material or WIP Supply location in the organization item attributes (unreferenced pull sequences). Pull sequences that are unreferenced are printed as exceptions on the report.

    ■   The point of use subinventory and locator defined on the pull sequence does not exist as the point of supply on any other pull sequence.

    ■   Kanban cards do not exist for the pull sequence.

12

Reports and Processes

This chapter tells you what you need to know about Oracle Flow Manufacturing Reports and Processes, including:

- Schedule Report on page 12-2
- Linearity Report on page 12-4

Schedule Report

The Schedule Report displays the scheduled production of all assemblies for a line within a given date range. The purpose of the schedule report is to provide personnel on the shop floor ready access to the production plan and sequence of assemblies.

The report includes line name, scheduled completion date, build sequence, assembly name, UOM, quantity, schedule group, schedule number, order number, order line, and order requested date.

Setting the Display BOM to Yes explodes the Bills of Material and shows the following for all components of each assembly: operation sequence, component number, component UOM, quantity per revision, ECO number, and whether the component is optional. The Display Optional Items Only parameter is linked with the Display BOM parameter. Setting the Display Optional Items Only to Yes results in the report displaying only optional components for the BOM.

Report Submission

Navigate to the Scheduling Reports window. Select Flow Schedule Report.

Report Parameters

From Line

Select the single line or the first line in the range you wish to review. The list of values displays all active lines in the organization. This is an optional parameter.

To Line

Select the final line in the range to be displayed, if you are requesting data for a range of lines. The list of values displays all active lines in the organization. Tab through this field to request date for a single line. This is an optional parameter.

From Date

Choose the start date from which you wish to view line data, if you want a date other than the default value of the system date. The date must be greater than the system date.This is a required parameter.

To Date

Choose the end date through which you wish to view line data, if you want a date other than the default value of the system date. This is a required parameter.

Schedule Group

Select a specific schedule group to limit the data shown. The default is to show data for all schedule groups within the line(s) selected. This is an optional parameter.

Display BOM

Enter Yes to include the Bill of Material for the first level of all components for each assembly in the report. Phantom items are displayed and the Bill of Material will explode until it reaches a non-phantom item. The default is No.

Display Optional Items Only

This field is active only when Display BOM is set to Yes. Enter Yes to display only optional items in the BOM.

Linearity Report

The Linearity Report provides a performance monitoring tool that compares planned and actual production on a daily basis for the selected date range. The report displays the planned production rate, the actual production rate, the variance, and the linearity index for selected lines and, optionally, schedule groups and assemblies over a given time range.

Variance can be either positive or negative. The linearity index tracks the absolute value of variance as deviation. The formula for linearity index is:

linearity index = {1 - [total deviations/total planned rate]} * 100

The higher the linearity index, the more closely matched the actual production rate is to the planned rate.

The Linearity Report can be run with two different sort options and two levels of detail. The report options include: Linearity Report by Week (Summary), Linearity Report by Week (Detail), Linearity Report by Line (Summary), and Linearity Report by Line (Detail). Detail reports include information by assembly in addition to the information provided on Summary reports. The sort order for Week-based reports is: week of > line > schedule group. The sort order for Line-based reports is: line > schedule group > week of.

Summary reports include the following information: date from to date to, week of, line, schedule group, planned production, actual production, variance, linearity index, day #, summary for line, summary for week, and weekly total.

Detail reports include the following information: date from to date to, week of, line, schedule group, assembly, planned production, actual production, variance, linearity index, day #, summary for schedule group, summary for line, summary for week, summary for schedule group, and weekly total.

Report Submission

Navigate to the Productivity Reports window. Select Flow Linearity Report.

Report Parameters

Report Option

Select Summary or Detail. If Detail is selected, the report will include information for individual assemblies. The default value is Summary.

Sort Option

Select whether the data should be sorted by Week or by Line. The default value is Week. The sort order for Week-based reports: week of > line > schedule group. The sort order for Line-based reports: line > schedule group > week of.

From Line

Select the single line or the first line in the range you wish to review. The list of values displays all active lines in the organization. This is an optional parameter.

To Line

Select the final line in the range to be displayed, if you are requesting data for a range of lines. The list of values displays all active lines in the organization. This is an optional parameter.

From Date

Choose the start date from which you wish to view line data, if you want a date other than the default value of the system date. This is a required parameter.

To Date

Choose the end date through which you wish to view line data, if you want a date other than the default value of the system date. This is a required parameter.

Schedule Group

Select a specific schedule group to limit the data shown. The default is to show data for all schedule groups within the line(s) selected. This is an optional parameter.

A

Windows and Navigation Paths

This appendix shows the default navigator path for each Oracle Flow Manufacturing window.

Windows and Navigator Paths

Although your system administrator may have customized your navigator, typical navigational paths include the following windows and pages.

Oracle Application	Description
FLM	Oracle Flow Manufacturing
FLMSE	Oracle Flow Manufacturing Sequencing and Execution

Window Name	Navigation Path
Add Item Routing	FLM > Product Sync > Graphical Line Designer > Pop-Up Menu > New
Alternates	FLM > Setup > Bills > Alternates
Attribute Controls	FLM > Setup > Items > Attribute Controls
Bill of Materials Parameters	FLM > Setup > Bills > Bill of Materials Parameters
Bills	FLM > Bills > Bills FLM > Reports > Bills
BOM Comparisons	FLM > Bills > BOM Comparisons
Category Sets	FLM > Setup > Items > Categories > Category Sets
Catalog Groups	FLM > Setup > Items > Catalog Groups
Category Accounts	FLM > Setup > Items > Categories > Category Accounts
Category Codes	FLM > Setup > Items > Categories > Category Codes
ChangeOrganization	FLM > Other > ChangeOrganization
Compare Kanban Plans	FLM > Kanbans > Graphical Kanban Workbench > Planning Region > Comparisons
Comparison	FLM > Reports > Comparison
Default Category Set	FLM > Setup > Items > Categories > Default Category Set
Delete Groups	FLM > Delete Groups
Delete Groups	FLM > Reports > Delete Groups
Delete Items	FLM > Products & Parts > Delete Items

Window Name	Navigation Path
Department	FLM > Lines > Department
Department Classes	FLM > Setup > Bills > Department Class
Disable Import of Configurator Model	FLM > Other > Configurator > Disable Import of Configurator Model
Documents	FLM > Products & Parts > Documents FLM > Bills > Documents
Event	FLM > Product Sync > Graphical Line Designer > Line Operation or Process tab > Toolbar > Event icon
Feeder Line Sychronization	FLM > Line Scheduling > Feeder Line Sychronization
Flow Routings	FLM > Product Synchronization > Flow Routings
Flow Workstation	FLM > Production > Flow Workstation
Generate Kanban Cards	FLM > Kanbans > Kanban Setup > Generate Kanban Cards
Graphical Kanban Workbench	FLM > Kanbans > Graphical Kanban Workbench
Graphical Line Designer	FLM > Product Sync > Graphical Line Designer
Import	FLM > Bills > Import
Indented Bills	FLM > Bills > Indented Bills
Item	FLM > Kanbans > Graphical Kanban Workbench > Pop-Up Menu > New
Item Types	FLM > Setup > Items > Item Types
Item Where Used	FLM > Bills > Item Where Used
Kanban Cards	FLM > Kanbans > Kanban Setup > Kanban Cards
Kanban Details	FLM > Kanbans > Graphical Kanban Workbench > Planning Region > Calculations
Launch	FLM > Kanbans > Kanban Planning > Launch
Line Operation	FLM > Product Sync > Graphical Line Designer > Line Operation tab > Toolbar > Line Operation icon
Lines	FLM > Lines > Lines
Location	FLM > Kanbans > Graphical Kanban Workbench > Toolbar > Source Type icon

Window Name	Navigation Path
Locations	FLM > Setup > Bills > Locations
Mass Changes	FLM > Bills > Mass Changes
Master Items	FLM > Products & Parts > Master Items
Mixed Model Map Workbench	FLM > Product Synchronization > Mixed Model Map Workbench
Names	FLM > Kanbans > Kanban Planning > Names
Network Connection	FLM > Graphical Line Designer > Line Operation or Process tab > Toolbar > Connection icon
Organization Items	FLM > Products & Parts > Organization Items
Populate Configurator Models	FLM > Other > Configurator > Populate Configurator Models
Print Kanban Cards	FLM > Kanbans > Kanban Setup > Print Kanban Cards
Process	FLM > Graphical Line Designer > Process tab > Toolbar > Process icon
Product Family	FLM > Products & Parts > Product Family
Product Family Members	FLM > Products & Parts > Product Family Members
Productivity	FLM > Reports > Productivity
Pull Sequence	FLM > Kanbans > Kanban Setup > Pull Sequence
	FLM > Graphical Kanban Workbench > Replenishment Chain tab > Detail
Refresh Configurator Models	FLM > Other > Configurator > Refresh Configurator Models
Related Routings	FLM > Graphical Line Designer > Pop-Up Menu > New > Add Item Routing > Related Routings
Requests	FLM > Other > Requests
Resource Groups	FLM > Setup > Bills > Resource Groups
Resources	FLM > Lines > Resources
Routing Details	FLM > Graphical Line Designer > Detail
Routing Revisions	FLM > Graphical Line Designer > Tools > Routing Revisions
Routings	FLM > Reports > Routings

Window Name	Navigation Path
Scheduling	FLM > Reports > Scheduling
Scheduling Rules	FLM > Setup > Scheduling Rules
Scheduling Workbench	FLM > Line Scheduling > Scheduling Workbench
Setup	FLM > Reports > Setup
Standard Events	FLM > Product Synchronization > Standard Events
Standard Line Processes	FLM > Product Synchronization > Standard Line Processes
Standard Processes	FLM > Product Synchronization > Standard Processes
Status Codes	FLM > Setup > Items > Status Codes
Switch to Primary	FLM > Product Sync > Graphical Line Designer > Tools > Switch to Primary
Template Assignment	FLM > Kanbans > Graphical Kanban Workbench > Assign > Add Items Criteria
Templates	FLM > Setup > Items > Templates
View Kanban Demand	FLM > > Kanbans > Graphical Kanban Workbench > Demand Graph tab
WIP Accounting Classes	FLM > Setup > Bills > WIP Accounting Classes
WIP Parameters	FLM > Setup > Bills > WIP Parameters
Work Order-less Completions	FLM > Production > Work Order-less Completions
Workbench	FLM > Kanbans > Kanban Planning > Workbench

Page Name	Navigation Path
Adjust and Submit Sequencing Task	FLMSE > Create Sequencing Task > Next > Enter Production Lines > Next
	FLMSE > Create Sequencing Task > Next > Enter Production Lines > Next > Filter Demands > Next
Assign Production Lines to Rule	FLMSE > Setup tab >Sequencing Rules > Assign Lines
Assign Rule to Production Lines	FLMSE > Setup tab > Production Lines > Update > Assign Rule

Page Name	Navigation Path
Completing Line Operation	FLMSE > Workstation tab > Start > Enter Schedule > Line Operation > Complete Schedule or Complete Line Operation
	FLMSE > Workstation tab > Start > Work Queue Criteria > Start > Work Queue > Complete Schedule or Complete Operation
	FLMSE > Workstation tab > Start > Work Queue Criteria > Start > Work Queue > Get Schedule > Complete Schedule or Complete Line Operation
Create Attributes	FLMSE > Setup tab > Sequencing Attributes > Create Attribute
Create Constraint for Rule: Enter Details	FLMSE > Setup tab > Sequencing Rules > Create Rule > Create Constraint > Continue
Create Constraint for Rule: Specify Priority and Attribute	FLMSE > Setup tab > Sequencing Rules > Create Rule > Create Constraint
Create Rule	FLMSE > Setup tab > Sequencing Rules > Create Rule
Edit Preferences	FLMSE > Setup tab > Workstation Preferences > Edit
Enter Production Lines	FLMSE > Create Sequencing Task > Next
Enter Sequencing Task Parameters	FLMSE > Create Sequencing Task
Enter Schedule	FLMSE > Workstation tab > Start
Event	FLMSE > Workstation tab > Start > Enter Schedule > Get Event
	FLMSE > Workstation tab > Start > Work Queue Criteria > Start > Work Queue > Get Event
Filter Demands	FLMSE > Create Sequencing Task > Next > Enter Production Lines > Next
Line Operation	FLMSE > Workstation tab > Start > Enter Schedule > Get Schedule
	FLMSE > Workstation tab > Start > Work Queue Criteria > Start > Work Queue > Get Schedule
Move Demands	Adjust and Submit Sequencing Task > Move
Parameters	FLMSE > Workstation tab
Production Lines	FLMSE > Setup tab > Production Lines
Rule detail	FLMSE > Setup tab > Sequencing Rules > rule Name
Select Preferences	FLMSE > Setup tab > Workstation Preferences

Page Name	Navigation Path
Sequencing Attributes	FLMSE > Setup tab > Sequencing Attributes
Sequencing Rules	FLMSE > Setup tab > Sequencing Rules
Sequencing Tasks	FLMSE > Sequencing Tasks
Split Demands	Adjust and Submit Sequencing Task > Split
Task Detail	FLMSE > Sequencing Tasks > Sequencing Task Name Task Summary > View
Task Summary	FLMSE > Sequencing Tasks > Sequencing Task Name
Update Constraint for Rule: Specify Priority and Attributes	FLMSE > Setup tab > Sequencing Rules > Create Rule > Update
Update Demands	Adjust and Submit Sequencing Task > Update
Update Line Task Parameters	FLMSE > Create Sequencing Task > Next > Enter Production Lines > Next > Adjust and Submit Sequencing Task > Update
	FLMSE > Create Sequencing Task > Next > Enter Production Lines > Next > Filter Demands > Next Adjust and Submit Sequencing Task > Update
Update Production Line	FLMSE > Setup tab > Production Lines > Update
Work Queue Criteria	FLMSE > Workstation tab > Start
Work Queue	FLMSE > Workstation tab > Start > Work Queue Criteria > Start

B

Line Scheduling Calculation Examples

This appendix contains examples of the calculations used to create flow schedules in the Line Scheduling Workbench. These examples include:

Scheduling Calculations and Examples on page B-2

Roll Flow Schedules on page B-4

Tolerance Fences on page B-4

Feeder Line Synchronization Calculations on page B-5

Scheduling Calculations and Examples

Scheduling rules use the following routines for calculations:

- Sequence is determined by the criteria in the rule.

- The first flow schedule created is slated to the first available date in the scheduling horizon.

- This process of attaining the line rate for each day continues until the end of the scheduling horizon.

> **Note:** For No Level Load and Level Daily Rate algorithms, unscheduled orders generated from planned orders have quantities initially changed by order modifiers, if they exist. Order modifiers (fixed order quantity, minimum order quantity and maximum order quantity) are used to limit lot size.

> **Note:** If items have the rounding attribute set to yes, flow schedule quantities are non-fractional, that is, quantities are rounded to whole numbers.

No Level Loading Algorithm

If you choose a scheduling rule that has no level loading, the level daily rate and the mix model algorithms are not used in scheduling the sales orders. The criteria defined in the scheduling rule is used to prioritize and sequence the sales orders. Orders are scheduled on the line with capacity constraint considerations. After using the criteria in the scheduling rule to sequence the sales orders, scheduling begins with the first sales order in the sequence. The scheduling process searches for available capacity beginning with the first date of the scheduling date range. If the entire order quantity cannot be scheduled on a date, the remaining quantity is scheduled on subsequent days where capacity is available.

Level Daily Rate Algorithm

If you choose a scheduling rule that uses level daily rate for leveling, the demand ratio of the item is used to calculate the quantity scheduled. The demand ratio of an item equals the total demand of the item divided by the grand total demand.

The quantity scheduled for an item on a particular day is determined by the available capacity of the line on the day and the demand ratio of the item. The calculations performed each day are as follows:

- The total demand for each item is calculated from all unscheduled sales orders.

- The grand total demand is calculated for all items.

The demand ratio is calculated. For each day in the scheduling horizon, the production quantity for each item is calculated by multiplying the available capacity on the line by the demand ratio of the item.

Scheduling using level daily rate attempts to schedule, for each day, each item at a rate in regard to the demand ratio of the item. The criteria selected is used to prioritize schedules; scheduling continues until capacity is reached or until all demand is scheduled.

Mixed Model Algorithm

In scheduling rules using a mixed model algorithm for leveling, sales orders are scheduled with the goal of achieving a balanced production mix across all items. In this case, flow schedules are created with unit quantity and scheduled in order to create the total demand of each item.

The key difference between the mixed model algorithm and the level daily rate is that the calculation is at the unit level, whereas in level daily rate the calculation is at the daily level. There are two key steps in the process of establishing the production pattern:

- The total demand for each item is calculated from unscheduled sales orders.

- The production pattern is established using the total demand of each item and spreading out the demand to show the demand mix of all items.

The criteria defined in the scheduling rule prioritizes and sequences the sales orders, and the orders are scheduled on the line based on the established production pattern. During the scheduling process, the earliest available capacity is used to schedule the items on the line. Daily capacity constraints are used in the calculation.

Roll Flow Schedules

Rolling flow schedules forward adds undercompletion quantities to the schedule, and subtracts overcompletions quantities from the schedule – past planned quantities are not reduced or increased. A report is generated from this process showing the effect of moving flow schedule quantities to future dates. Select your flow schedules by date ranges, lines, or categories. Choose Close All Past Due Schedules, Roll with Details, or Spread Evenly Without Details.

Tolerance Fences

Tolerance fences indicate how much flexible capacity the line has available. You enter a value in the Day in Advance field on the Tolerance Fence window in Oracle Work in Process. This value indicates the number of days of notice needed before increasing the line capacity by the tolerance percentage. The Days in Advance value should be greater than or equal to the fixed lead time value.

This feature is activated by checking the Flex Tolerance check box on the Line Scheduling Workbench.

Scheduling with tolerance fences begins after the last day indicated from the Days in Advance value. For example, if Days in Advance is 5, scheduling at the new capacity begins on the sixth day. Other factors in the calculations include:

- Capacity is added incrementally. The standard rate is used first to schedule all items. If the items cannot be scheduled by using the standard rate, the program considers the first tolerance fence and attempts to schedule within that capacity. If there is still not enough capacity, the second tolerance fence is considered, and so on.

- When line scheduling start and stop times are within the line definition start and stop times, the extra capacity provided by the tolerance fence is prorated based on the portion of the day being scheduled. For example-capacity is 100 for a line, the tolerance fence percentage is 10 percent, and the standard line definition is from 7:00 to 15:00 hours (8 hours). If the scheduled start and stop times are 7:00 to 11:00 hours (4 hours), the flexible tolerance fence capacity is 5 percent.:

  4 divided by 8 = .5

  .5 multiplied by 10 = 5

- Decimal calculation results for the new line capacity are rounded up.

- All schedules created within the tolerance fence, but over the standard running line capacity, are scheduled to complete at the stop time of the line.

Tolerance fences provide temporary increases to capacity above the normal operating rate to handle rises in orders. If you want to permanently increase the standard operating rate to correspond with a change in demand–update the line rate in the line design.

> **Note:** The lead time of the item being scheduled is not part of the Days in Advance total. You must perform the scheduling operation sufficiently in advance to accommodate the lead time.

Schedule Completion Time

When the line scheduling start and stop times are outside the line definition start and stop times, the calculations are as follows:

- The first schedule completion time is the sum of the line start time and quantity divided by the line rate.

- The other schedule completion times are the sum of the previous completion times and quantity divided by the line rate.

- The last schedule completion time ends at the end time of the line.

When the line scheduling with start and stop times are within the line definition start and stop times:

- The first schedule completes at scheduling start time

- The other schedule completion times are the sum of the previous completion time and quantity divided by the line rate.

- The last schedule completion time ends at the scheduling end time

  Start times = [completion time - (fixed lead time + (quantity-1) x variable lead time)]

Feeder Line Synchronization Calculations

The feeder line synchronization program calculates the date and time when the subassembly is delivered to the particular line operation. This date is then used as the completion date for the subassembly line. To calculate this time, the program uses the following formula:

$$S = P - \sum_{\text{last operation}}^{\text{consuming operation}} f_n$$

$$= P - (30 \text{ min} + 60 \text{ min}) = P\text{-}90 \text{ minutes}$$

The values are defined as follows:

- S is the subassembly completion time.

- P is the parent item completion time.

- fn is he operation time rounded up to the closest multiple of takt. Summation is done by following the routing network primary paths from the point of consumption to the consuming operation.

takt = parent line takt = 1/maximum hourly rate from parent line definition

Example: Feeder Line Synchronization

The following graphic illustrates an example of a flow line producing pumps. On the main line is the final pump assembly. The subassembly line produces pump housings and feeds the line at Operation 5.
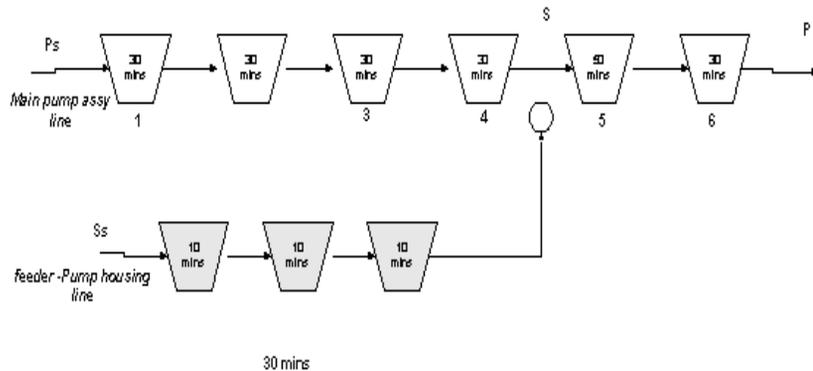
The values are defined as follows:

- P is the completion time of the final pump assembly as scheduled

- S is when the subassembly, the pump housing, is consumed at Operation 5

- T is the takt time, 30 minutes

When you schedule the parent line, schedules are created with P as the completion time. The completion time of the subassembly is shown in the following calculation

$$S = P - \sum_{\text{last operation}}^{\text{consuming operation}} f_n$$

$$Ss = S - (F + (Q-1) \times V)$$

C

Mixed Model Map

This chapter provides information on how to use the mixed model map to design a balanced production. Topics include:

- Overview of Mixed Model Map on page C-2

- Entering Mixed Model Map Parameters on page C-2

- Generating a Mixed Model Map on page C-4

- Saving a Baseline on page C-7

- Querying a Saved Baseline on page C-8

- Placing a Mixed Model Map on the Navigator on page C-9

- Mixed Model Map Calculations on page C-10

Overview of Mixed Model Map

Line design is the process of defining a production line, the products that you make on the line, the operations that you perform to make these products, and the resources and materials consumed at each step. The mixed model map helps you to create and monitor your line design. To balance a line against a specified demand, you will use the mixed model map which calculates the following at each process or line operation:

- Process volume

- Machine, labor, and total times

- Machine, labor, and total weighted times

- Machine and labor requirements

- Line, Process, and Operational Takt Time

- In-process kanban (IPK) requirements

In the Mixed Model Map the resource requirements are displayed in the summary table. You can also view details of the resources in the Resource Detail window.

See Also

Entering Mixed Model Map Parameters

Prerequisites

❏ You must create at least one line before you can create a mixed model map.

❏ You must have at least one flow routing for that line enabled for the Mixed Model Map. All enabled routings must have operation times and yields calculated or entered manually.

❏ You must have a demand schedule defined for the products on the line (forecast, MPS, MDS, flow schedule)

To enter mixed model map parameters

1. Navigate to the Mixed Model Map window.

2. In the Select region, select the line for generating a mixed model map.

3. Optionally, enter a family name if you want to restrict the display to a specific Product Family.

4. In the Demand Type field, select a value representing the source of this demand. The Demand Name displays for forecasted values. Your choices are:

   - Forecast—an estimate of future demand

   - MDS—master demand schedule, the anticipated forecasted ship schedule

   - MPS—master production schedule, the anticipated forecasted build schedule

   - Actual Production—demand generated from existing sales

5. Select start and end dates to calculate the number of demand days.

   The default is the beginning of the demand period.

6. In the Demand Days field, the value is calculated by the difference in the date fields entered. Or the value can originate from the forecasted demand.

7. Enter the hours per day that you are working.

8. Optionally, enter a boost percentage to increase or decrease your demand.

9. In the Display Option region, choose options for viewing the generated mixed model map.You can balance the line by line operation or process. Select Line Operation or Process to determine what displays on the matrix.

10. Select the Sort Order; choices are Display Sequence or Code.

11. In the Time field, select what machine or labor time values are used for the calculation.

    ■ Rolled-Up Time uses the value derived from the Usage field on the Event Resources window.

    ■ User Entered is the value entered on the Routings window, in the Operation Times tab, in the User Labor Time or User machine time fields.

12. Select the calculate for In Process Kanban Value. Your choices are either the entire process, or for each individual machine.

    The number of machines is specified at the department associated with the process.

13. Select a unit of measurement for the time values displayed in the mixed model map.

Generating a Mixed Model Map

To generate a mixed model map

1. Navigate to the Mixed Model Map window.

   Enter Mixed Model Map parameters. See: Entering Mixed Model Map Parameters on page C-2

2. Choose Generate.

The Mixed Model Map window displays the takt time hours available for the line.

In the first tabbed region in the upper part of the window, the information is displayed by elapsed time, machine time, labor time, and process volume.

In the second tabbed region in the lower part of the window, you can view baseline data.

- The Summary tab displays machine and labor values that are needed and assigned.

- The Baseline Variance tab displays a bar graph, you can choose to view variance by machines needed, labor needed, or in process kanbans needed. The baseline value for each process is shown in yellow as a column. If more resources (machines, labor, or in process kanbans) are needed than the current baseline value, the variance appears in red and a positive variance value is shown above the column in red. If fewer resources are needed than the current baseline value, the variance appears in blue and a negative variance value is shown above the column in blue.

- The Baseline tab displays the required machine, labor, and in process kanban values.

3. You can select a record on the mixed model map, and access details of that record. You can either view, define, or query in windows through the following options on the Tools menu:

   - *Standard Processes*—Standard Processes window

   - *Standard Line Operations*—Standard Line Operations window

   - *Flow Routings*—Routings window

   - *Forecast Entries*—Item Forecast Entries window

   - *Master Demand Schedule Entries*—Item Master Demand Schedule Entries window

   - *Master Production Schedule Entries*—Item Master Production Schedule Entries window

   - *Kanban Planner Workbench*—Kanban Workbench window

   - *View Baseline*—View Baseline window

   - *Save as Baseline*—Saves this mixed model map as the baseline calculation

   - *Resource Details*—Resource Details window

Resource Details Window

In the Mixed Model Map the resource requirements are displayed in the summary table. You can view resource, activity, line operation, resource type, and usage in the Resource Detail window. This enables you to make decisions on how best to move and adjust the resources. by displaying machine and labor details.

To view resource details in the mixed model map:

1. Select Resource Details from the Tools menu.

2. Use the Find Resource Details region to choose selection criteria.

   You can view all resources by choosing Find. Or you can filter your selection by selecting values, or any combination, in the Resource, Line Operation, Activity, or Resource Type fields—and then choose Find.

The window displays details by Resource, Activity, Line Operation and Resource Type. The the total usage calculated for all resources that meet the selection criteria displays in the Resources Needed field. This value is the weighted average usage of the corresponding resource across all assembly items on the line, and all events— per the demand.

3. Choose OK to close the window and return to the Mixed Model Map.

4. Choose Export save this generated information in a file a file in another location.

Saving a Baseline

You can save a Mixed Model Map as a baseline on a certain line and optionally for a certain family with a specific demand. Only one baseline can be saved for each product family and line combination. You compare any other calculations for this Family/Line/Forecast to this baseline.

To save a baseline:

❏ After you have generated a mixed model map, choose Save as Baseline from the Tools menu.

In the Saved Baseline window you can select the Find button to view all of the saved baselines

> **Attention:** If you have a previously saved baseline for this family and line, it will be replaced when you save it again.

Querying a Saved Baseline

You can bring up a saved baseline to compare calculations with different variables or over a period of time. The View BaseLine window displays the calculated machine, labor, and in process kanbans values you saved from the Mixed Model Map window.

To query a saved baseline:

1. Navigate to the Mixed Model Map window.

2. Select View Baseline from the Tools menu to display the View Baseline window.

   The window displays the parameters used to generate the map. You can view the machine, labor, and in process kanbans by both processes and line operations.

3. Close this window to return to the Mixed Model Map window, or choose Delete to delete this saved record.

Note: To view all saved maps, navigate to the Line field and select the query button.

Placing a Mixed Model Map on the Navigator

You can save a baseline to your Navigator desktop for easy access.

Prerequisites

You must create a Mixed Model Map before you can place it on the navigator. See: Entering Mixed Model Map Parameters on page C-2, and Generating a Mixed Model Map on page C-4.

To place a Mixed Model Map on the navigator

1. Generate a Mixed Model Map or query the baseline you would like to save to the Navigator.

2. Choose Place on Navigator from the file menu.

> **Note:**   Place on Navigator option is only available when you are in the Mixed Model Map matrix window.

Mixed Model Map Calculations

The mixed model map enables you to design and monitor each part of the line design process. The mixed model map bases calculations on the date range entered in the Mixed Model Map window if this date range falls within the forecast date range. Otherwise the forecast date range will be used.

Line Takt Time

Line Takt time is calculated as follows:

hours per day * time conversion factor * number if demand days
divided by total demand * (1 +boost percent)

> **Hint:**   Once your line is balanced, return to the organization item master and update the variable lead time to equal your Line Takt Time. The Total Product Cycle time (which is displayed on the routing for each item) should be entered in the fixed lead time field on the item master attributes.

Process Volume

Process volume is calculated as follows:

total demand * average net planning percent * (1 + boost percent)
divided by average reverse cumulative yield

> **Note:**   A process volume is calculated for a product and a process (or line operation). If the reverse cumulative yield is 0, the system will assume it is 1.

Machine Weighted Time

Machine weighted time is calculated as follows:

sum of (process volume * machine time)
divided by the sum of process volume

Labor Weighted Time

Labor weighted time is calculated as follows:

sum of (process volume * labor time)
divided by sum of process volume

Elapsed Weighted Time

Elapsed weighted time is calculated as follows:

sum of (process volume * elapsed time)
divided by the sum of process volume

> **Note:** Machine, labor, and elapsed weighted times are calculated by process (or line operation). For example, if your mixed model map displays five processes, then the mixed model map will calculate five machine weighted times, one for each process.

Machines Needed

Machines needed is calculated as follows:

machine weighted time
divided by operation takt time

> **Note:** The mixed model map calculates the number of machines needed by process or line operation.

Machines Assigned

Machines assigned is the total number of machine resources in the department(s) that the events are assigned to.

For example: OP10 is assigned to DEPT1, and there are two events underneath it. One event uses machine MCH1 for 0.25 hours and is assigned to DEPT1. The other event uses MCH2 for 0.1 hours and is assigned to DEPT2.

The program will look at DEPT1, note the total MCH1 resources assigned. It then goes to DEPT2, and notes the total MCH2 resources assigned. These two numbers are added together and displayed as machines assigned.

> **Note:** The number of resources assigned is the TOTAL available in the department(s), not the total available for that operation. IE - If you use the same machine resource at multiple events in the same line, or in multiple lines, the machines assigned will be overstated for each occurrence of the resource. The only way to avoid this is to assign a department to each operation/process and all its events.

Labor Needed

Labor needed is calculated as follows:

labor weighted time
divided by operation takt time

> **Note:** The mixed model map calculates labor needed by process or line operation.

Labor Assigned

This is the total number of labor resource units in the department(s) that the events are assigned to.   It is calculated in the same manner as Machines Assigned.

> **Note:** The number of resources assigned is the TOTAL available in the department(s), not the total available for that operation. IE - If you use the same labor resource at multiple events in the same line, or in multiple lines, the labor assigned will be overstated for each occurrence of the resource. The way to avoid this is to assign a department to each operation/process and all its events.

In Process Kanbans (IPKs) Needed

IPKs Needed is calculated as follows:

(elapsed weighted time - line takt time) * hours/day * time conversion factor
divided by elapsed weighted time * line takt time

> **Note:** The mixed model map calculates the number of IPKs needed by process (or line operation).

In Process Kanbans Needed by Machine

In Process Kanbans needed by machine is calculated as follows:

in process kanbans needed
divided by the number of machines

> **Note:**   Operational takt time is calculated for a process or line operation, unlike the line takt time which is calculated for the entire line.

Operation Takt Time

Operation Takt Time is calculated using the following formula:

number of days * hours per day * time conversion factor
divided by the sum of process volumes

Takt Time for Assigned

Takt time for assigned is the time per unit that each operation will achieve given the number of resources assigned. (Also called the Operational Cycle Time)

Takt Time for Assigned is calculated using the following formula:

Machine Weighted Time / Machines Assigned

If machines assigned is equal to 0, then takt time for assigned is 0.

> **Note:**   This number is relevant only if you assign a department to each operation or process and all of its events.

D

Mixed Model Map Workbench Calculations

Mixed Model Map Workbench Calculations

Mixed Model Map Workbench uses the following calculations:

Calculate

The Calculate function on the Mixed Model Map Workbench performs calculations using parameters specified for a plan. Calculate options include:

❑ No IPK—resource requirements are calculated using the IPK value as zero on the line operation.

IPK Needed = 0

  Resource Needed per operation

  = Weighted Resource Usage

  divided by Operation TAKT for the operation

❑ Based on one resource—the IPK needed on the line operation is calculated assuming one resource at each operation.

Resource Needed per operation = 1

  IPK Needed per operation
  = Maximum Resources (Weighted Resource Usage per operation)

  subtracted by Operation TAKT

  divided by Maximum Resource (Weighted Resource Usage per operation)

  multiplied by Working Hours Per Day of the line divided by Operation TAKT for the operation

❑ Based on Assigned IPK—resources are calculated using the Assigned IPK at the line operation.

IPK Needed for the operation = IPK assigned or the operation

  Resource Needed at each line operation

  = Working Hours Per Day for the line

  divided by Operation TAKT for the operation

  subtracted from the IPK Assigned for the operation

  multiplied by Weighted Resource Usage

  divided by the Working Hours per Day for the line

❏ Based on Assigned resource—the IPK Needed on the line operation is calculated using all the Assigned resources.

> IPK Needed for the operation

> = Maximum resource (Weighted Resource Usage divided by Resource Assigned

> subtracted by Operation TAKT

> divided by Maximum Resource (Weighed Resource Usage divided by Resource Assigned)

> divided by Operation TAKT for the operation

See:

Line TAKT:

Rate the line produces one item to fulfill demands:

> Working Hours Per Day (per line)

> divided by Average Daily Demand for the item.

Operation TAKT

Rate the operation produces one item to fulfill operation demands. A single line can be used to manufacture multiple items, different items can have different routings, and some operations might be unique for a particular item.

> Operation TAKT

> = Working Hours per day for the line

> divided by the item Process Volume

Process Volume

The number of items an operation produces in manufacturing day. A single operation can be used to manufacture multiple items, different items can use different routings, and some operations might be unique for a particular item. Process Volume is not effected by Assigned Resources and IPK.

> Process volume
>
> = Average Daily Demand for the item
>
> multiplied by Net Planning Percent for the operation
>
> divided by Reverse Cumulative Yield for the operation

Machine, Labor, Elapsed, Weighted Time

This includes:

- Total Machine Resources usage time in an operation
- Total Labor Resources usage time in an operation
- Total Machine and Labor Resources usage time in an operation
- Weighted Time is the weighted average usage time across all items produced in a line.

Machine, Labor, Elapsed, and Weighted Time are not effected by Assigned Resources, only usages are considered.

> Weighted Time per operation
>
> = sum of item manufacturing time
>
> multiplied by Process Volume per item, per operation
>
> divided by the sum of all items Process Volume per item, per operation

Usage, IPK, Assigned

For example:

Usage is 1

Assigned is 0.5, and the calculation is based on Assigned Resources

IPK is used to fulfill the required resource

The outputs will then be used by the next operation to keep the line flowing.

If the IPK is 20, 20 extra components are needed at the end of the resource per day, to keep the line flowing

See:

Operation TAKT As Assigned

Example 1:

Operation TAKT is 15 minutes
Usage is 1, Assigned is 2
Resource TAKT is 7.5 minutes

The work can be completed 2 times faster, that is—15 divided by 2 = 7.5 minutes

Example 2:

If Operation TAKT is 15 minutes
Usage is 2, Assigned is 3
Resource TAKT is 10 minutes.

The work can be finished 3/2 times faster, that is—15 divided by (3/2) = 10 minutes

Line TAKT As Assigned

The ratio of Line TAKT As Assigned, and Line TAKT, is the maximum ratio of the Operation TAKT As Assigned and Operation TAKT in the line.

- When Operation TAKT As Assigned is greater than Operation TAKT, the current setup results in slower time to complete the operation.

- When Operation TAKT As Assigned is less than Operation TAKT, the current setup results in faster time to complete operation.

Color Representation on the Mixed Model Map Workbench

Lines

Line TAKT As Assigned

- Red—Resource over-capacity or IPK over-capacity is greater than 0

- Yellow—Line TAKT As Assigned is greater than Line TAKT

Operations:

Operation, Operation TAKT As Assigned

- Red—Resource over-capacity or IPK over-capacity is greater than 0
- Yellow—Operation TAKT As Assigned is greater than Operation TAKT

Operation Detail

Resource, Usage, Needed, IPK Needed

- Red—IPK Needed is greater than IPK Assigned
- Yellow—IPK Needed is greater than 0, and Maximum Resource Needed or Assigned is less than Usage

Resources

Resource, Needed, Relocation Needed

- Red—Resource Needed is greater than Resource Assigned
- Yellow—Relocation Needed = Yes

Resource Detail

Line, Operation, Resource Needed, IPK Needed

- Red—Resource Needed is greater than Resource Assigned
- Red—IPK Needed is greater than IPK Assigned

Resource Assignments

Department, Unit, Total Unit

- Red—Unit is less than Assigned
- Red—Total Units is greater than Total Assigned

Percentage Needed

The percentage difference between Assigned and Needed based on the Needed value:

> Assigned subtracted by Needed
> divided by Needed
> multiplied by 100

- Green—resource is over-assigned
- Red—resource is under-assigned

Percentage Assigned

The percentage difference between Needed and Assigned based on the Assigned value:

> Needed subtracted by Assigned
> divided by Assigned
> multiplied by 100

- Green—resource is over-assigned
- Red—resource is under-assigned

Percentage number 999 signifies a value is zero or null.

Absolute Value

Needed (blue) and Assigned (green) values are displayed next to each other for comparison.

Glossary

A

Allocation Percent

See kanban allocation percent.

Areas

Areas represent either a section of the plant floor or an entire plant facility. You can use inventory organizations to define areas.

assemble-to-order (ATO)

An environment where you open a final assembly order to assemble items that customers order. Assemble-to-order is also an item attribute that you can apply to standard, model, and option class items.

assembly scrap

A process which allows you to scrap both scheduled and unscheduled flow assemblies from any flow operation. Operation Pull, Assembly Pull, and Assembly Push components, their associated costs, and all labor and machine resources used at all events prior to the scrap line operation are automatically backflushed.

ATO

See **assemble-to-order.**

C

Calculation Formula

One of the most important tasks of a Kanban planning system is determining the optimal number of Kanban cards. The Kanban planning software takes care of this calculation provided you enter correct values for Kanban size, average daily demand for the Kanban item, and the lead time to replenish one Kanban. We provide a package that you can use to customize the calculation. See the Oracle Manufacturing, Distribution, Sales and Service Open Interfaces Manual. By default, the standard calculation is: $(C - 1) * S = D * (L + SSD)$ where: C is the number of Kanban cards S is the Kanban size D is the average daily demand L is the lead time (in days) to replenish one Kanban. If you think through the Kanban process, you will see why this formula works best when the demand for the Kanban item is steady. In addition to this basic formula, when the calculation program calculates Kanban size, it takes into account the values for the following order modifiers (specified in the pull sequence), in the following order: Supply Days, Minimum Order Quantity, and Lot Multiplier. For example, suppose you have specified the Minimum Order Quantity for a particular item to be 50. You want the formula to calculate the Kanban size (S), so you enter values for S, D, and L. Even though—strictly based on the values you enter for C, D, and L—the formula should yield 40, the actual Kanban size will be 50 because of your order modifier, assuming the Lot Multiplier is a factor of 50.

Note: The program uses order modifiers only when calculating the Kanban size. If you specify the Kanban size and want the program to calculate the number of Kanban cards, the program does not use order modifiers.

Card Status

See kanban card status

CFM

Continuous Flow Manufacturing.

CFM Schedule

Work Order-less Schedule. In this document this would mean both the Scheduled and Unscheduled Flow Schedules.

cumulative yield

Product of the yields at each operation, process, or event on a flow line.

D

Down-time

Time when a resource is scheduled for operation but is not producing for reasons such as maintenance, repair, or setup.

Dual Card Kanban

A demand pull signal that uses a "move" and "produce" communication method. Generally, "move" cards are collected and when the "produce" lot size is reached, the "produce" card is used to create the replenishment. This procedure is generally used when a minimum order quantity is required as a result of long set up times or economic order cost.

E

efficiency

A productivity measure that focuses on actual performance against a standard. Expressed in a percentage figure, it is calculated by dividing actual resource time charged to a task by the standard resource requirements for the same task.

elapsed time

The clock time between start and completion. For example, if the build time of a resource is 10 hours, but you only schedule 5 hours of work a day, the elapsed time is 29 hours.

events

An event is an identifiable point in time among a set of related activities. Graphically, an event can be represented by two approaches: (1) in activity-on-node networks, it is represented by a node; (2) in activity-on-arc networks, the event is represented by the arc. In flow manufacturing, events are the lowest level of activities in a flow routing. Resources are assigned to events. Events can be grouped into processes and operations.

F

Feeder Line

A production line designed to feed sub-assemblies to a line producing higher level assemblies.

Feeder Line Synchronization

A concurrent process that allows you to synchronize sub-assembly flow schedules sequence with the parent assembly line flow schedule sequence.

first unit completion date

The date and time you plan to complete production of the first assembly on a repetitive schedule. This date equals the first unit start date plus the lead time.

first unit start date

The date and time you plan to begin production of the first assembly on a repetitive schedule. This date equates to the start of your lead time.

flexible tolerance fences

Used to represent the flexibility of supplier capacity. Shown as the percent increase or decrease over daily production rate available from a given supplier for a set amount of time.

flow line

The physical location where you manufacture a flow assembly, usually associated with a routing(s). You can build many different assemblies on the same line at the same time. Also known as assembly line or flow shop.

flow manufacturing

Manufacturing philosophy utilizing production lines and schedules instead of work orders to drive production. Mixed models are grouped into families and produced on lines balanced to the takt time.

flow routing

A sequence of manufacturing events that you perform to manufacture an assembly. In the flow routing, these events can be grouped in processes and balanced operations. A routing consists of an item, a series of events, processes and/or operations, a operation sequences, operation effective dates, and a flow routing network. You can also perform operation time, yield and total product cycle time calculations in the flow routing.

Flow Routings and Sequence of Events

Flow Routings define the production process of an assembly on the production line. You can use Flow Routings to define the processes and the sequence of events within each process. You can specify the setup, run, and move times for each event by associating the required resources.

flow routing network

A process-map of your processes and operations where you specify the primary path, alternate paths, feeder lines and rework loops within your flow line.

flow schedule

A schedule for your flow line that represents the volume and mix of products to be produced. Scheduling can be done based on customer orders and scheduling rules, with an objective of matching the customer orders as closely as possible while establishing an achievable pace and consistent flow of products through the flow line. Schedules DO NOT produce work orders.

flow workstation

The assigned location on a flow line where a worker performs the job. It could be a machine or a workbench.

K

kanban

A method of Just-in-Time production that uses standard containers or lot sizes with a single card attached to each. It is a pull system in which work centers signal with a card that they wish to withdraw parts from feeding operations or suppliers. The Japanese word *kanban,* loosely translated, means *card*, *billboard*, or *sign*.

kanban allocation percent

Percent of independent demand for the kanban item that is to be supplied from a given pull sequence.

kanban card

The visual replenishment signal. It corresponds to a kanban bin. Replenishable kanban cards are based on pull sequences; non-replenishable cards can be created manually.

kanban card status

The current state of the kanban card - Active, on Hold, or Canceled.

kanban card supply status

Describes the current state in the replenishment process. Example: New, Empty, Full, Wait, In Process, In Transit.

kanban chain

A series of kanban pull sequences that model the replenishment network on the shop floor.

kanban items

An item that is pulled through the Kanban system, rather than pushed by the planner, is called a Kanban-released item, or simply Kanban item. Your planning system can have Kanban items as well as items released by the planner.

kanban location

The designated location where a kanban bin is stored (and where the replenishment is delivered). In Oracle, this is a combination of sub-inventory and locator.

kanban plan

A set of kanban pull sequences in which the size or number of cards is calculated based on a given demand schedule.

kanban pull sequence

A body of information that defines the kanban location, source information, and planning parameters required to calculate the kanban size for a given kanban bin. Replenishment chains are created by multiple pull sequences.

kanban replenishment lead time

The time it takes to replenish a given pull sequence.

kanban size

The number of items in each kanban bin.

L

labor time

The sum of all labor resource times for a given event on a flow routing.

last unit completion date

The date and time you plan to complete production of the last assembly on a repetitive schedule. This date equates to the first unit completion date plus processing days.

last unit start date

The date and time you plan to begin production of the last assembly on a repetitive schedule. This date is the first unit start date plus processing days.

line balancing

Organizing work on the production line so that resources can by synchronized to daily demand.

line operations

Re-grouping of events on a flow routing to achieve approximate takt time. Line operations are line specific and are derived and defined during line balancing.

Line Scheduling Workbench

A form where a WIP scheduler can access the data and utilize a suite of tools to effectively manage flow schedules.

lines

Lines are manufacturing work areas where you manufacture families of products.

location

A shorthand name for an address. Location appears in address lists of values to let you select the correct address based on an intuitive name.

M

machine time

The sum of all machine resource time for a given event on a flow routing.

mixed model map

Used to design balanced lines. The projected volume and mix of demand for a group of products is used to calculate weighted average work content times. These averages are compared to takt time to regroup events into balanced operations, and reallocate resources.

N

net planning percent

Percent of product that passes through a process or line operation. It equals the sum of the product of the network percentages at each operation along each path multiplied by 1 + the rework percent.

non-replenishable kanban

A non-replenishable Kanban is used to replenish a Kanban location once. This card is used typically for custom products, one-time customer orders or sudden spikes in demand.

O

operation time

In discrete manufacturing, operation time is the total of setup and run time for a specific task. In flow manufacturing, operation times includes the machine time, labor time, and elapsed time for events, processes, and line operations on your flow routing.

operation yield

The percent of material that passes through an operation, process or event on a flow line without being scrapped.

operational cycle time

See takt Time.

Operational Method Sheet Support

Operational Method sheets (OMS) are documents that describe the operation to be performed for an assembly. The information in the OMS often includes graphical representation of the process, material needed, and detailed work instructions. You can use attachments in Oracle Flow Manufacturing to attach OMS's to Line Operations in the Flow Routing.

P

Phantom

It is an item or a component which is never stocked and is used as a part in building the final item. A phantom may further be made up of phantoms.

Point of Use (POU)

Inventory located at a specific operation on a flow line where it will be used. Material is pulled from these locations via a Kanban signal. These locations are in turn, supplied from either raw material stores or ideally, directly from the supplier.

process

A set of Oracle Workflow activities that need to be performed to accomplish a business goal. **see Account Generator, process activity, process definition.**

Process

1) A planned series of actions or operations (e.g. mechanical, electrical, chemical, inspection, test) that advances a material or procedure from one stage of completion to another. 2) A planned and controlled treatment that subjects materials or procedures to the influence of one or more types of energy (e.g. human, mechanical, electrical, chemical, thermal) for the time required to bring about the desired reactions or results. In flow manufacturing, processes are very generic activities on a flow routing that often consist of several events that are performed in a specific sequence. They are specific to a line and are often defined during the as-is analysis on a flow line.

process network

You can use Flow Routings to represent the network processes on your production line. This network can include alternate processes, rework loops and feeder lines. You can assign yields and planning percentages for each of these processes to determine the optimal number of resource requirements.

process volume

In the Oracle Mixed Model Map, the quantity of an assembly that must pass through an operation or process to achieve the line demand volume. It equals the (demand times * average planning percent * boost%)/average reverse cumulative yield.

processes and events

Processes are very generic activities (in other words painting) that often comprise of multiple events (in other words prepare the surface, polish the surface, paint the surface) which are performed in a specific sequence. Events are the actual physical tasks performed on the line. You can define standard processes and standard events that are used consistently across product families and production lines.

product family

A group of products with similar characteristics, often used in production planning. Flow product families often have similar product synchronization.

product structure

See **production line**

The physical location where you manufacture a repetitive assembly, usually associated with a routing. You can build many different assemblies on the same line at the same time. Also known as assembly line.

product synchronization (Sync)

Process of defining events, processes, and operations and assigning them to a flow routing in a specific sequence in which they are performed.

productivity

An overall measure of the ability to produce a good or a service. It is the actual output of production compared to the actual input of resources. Productivity is a relative measure across time or against common entities (labor, capital, etc.).

products and parts

Products and parts are similar to items defined in Oracle Manufacturing. The item type attribute can be used to identify different types of items (for example, finished goods, spare parts, and so on).

production lines

Production Lines are manufacturing work areas where you manufacture families of products. Oracle Flow Manufacturing lets you manage flow production activities by production line. You can use Flow Routings to define the production process of assemblies. You can also use the Mixed Model Map to calculate the line takt time.

pull sequences

See kanban pull sequence.

R

replenishable kanban

A replenishable Kanban card cycles through the system until it is put on temporary hold or completely removed from the replenishment cycle by the user.

return from scrap transaction

This transaction is used for returning scrapped assemblies. In this document Return from Scrap transaction will mean CFM return from scrap.

reverse cumulative yield

Product of the yields at each operation, process, or event on a flow line starting with the last operation, process, or event.

roll flow schedules

An Oracle Manufacturing technique where you can copy the flow schedules you did not complete into the next available day or take over-completions and subtract the total from the quantities of future schedule.

routing network

Routing network defines the flow of work from one line operation to the next. It also specifies which path in the routing is an alternate or rework path. Routing networks, line operations, and events are the only entities considered in WIP.

S

sales order

In this document a sales order by default means an ATO sales order.

scheduled flow schedule

These are flow schedules that are created by planning with a specific scheduled completion date.

scheduling rule

Basic rules that can be used consistently in a scheduling system. Scheduling rules usually specify the amount of calendar time to allow for a move, queue, load calculation, etc. Syn: scheduling algorithm.

scrap account

An account that you may use to charge scrap transactions.

scrap line operation

This is the line operation in the flow routing that the assembly is scrapped.

scrap transaction

This transaction is used for scrapping assemblies. In this document Scrap transaction will mean CFM scrap transaction.

T

takt time

Operation cycle time the rate at which products need to be manufactured on the line. Aids in establishing the daily rate for the production line. takt Time=effective resource hours available per day / Average daily demand.

Total Product Cycle Time (TPCT)

The total time along the longest path of your flow routing. Calculated by taking the sum of the elapsed times along the longest primary path on the routing network.

unscheduled flow schedule

These are ad-hoc flow schedules that are created on the fly so that a completion or return can be performed for an assembly.

Utilization

A measure to describe how intense a resource is being used. Utilization measures the actual time used to the total available time. Utilization = actual time used / total available time. Actual time used is the total processing time and setup time in a given time period. Total available time is the total available hours in a given time period minus the total time the resource is down for repair or maintenance.

W

work order-less completion

A process which allows you to complete both scheduled and unscheduled flow assemblies and automatically backflush Operation Pull, Assembly Pull and Push components, their associated costs, and labor and machine resources used without having to create a discrete job, repetitive schedule or flow schedule.

Y

yield

See **component yield, cumulative yield, operation yield, and reverse cumulative yield.**

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