Oracle® Flow Manufacturing

User Guide, Release 11i

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

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Oracle Corporation welcomes your comments and suggestions on the quality and usefulness of this publication. Your input is an important part of the information used for revision.

- Did you find any errors?
- Is the information clearly presented?
- Do you need more information? If so, where?
- Are the examples correct? Do you need more examples?
- What features did you like most about this manual?

If you find any errors or have any other suggestions for improvement, please indicate the chapter, section, and page number (if available). You can send comments to us in the following ways:

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If you would like a reply, please give your name, address, and telephone number below.

If you have problems with the software, please contact your local Oracle Support Services.

Preface

Audience for This Guide

Welcome to Release 11*i* of the Oracle Flow Manufacturing User Guide.

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

- The principles and customary practices of your business area.
- Oracle Flow ManufacturingFlow Manufacturing

  If you have never used Oracle Flow Manufacturing, we suggest you attend one or more of the Oracle Flow Manufacturing training classes available through Oracle University.
- The Oracle Applications graphical user interface.

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

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

How To Use This Guide

This guide contains the information you need to understand and use Oracle Flow Manufacturing.

This preface explains how this user guide is organized and introduces other sources of information that can help you. This guide contains the following chapters:

- Chapter 1 Provides an overview of Flow Manufacturing.
- Chapter 2 Describes how to set up Flow Manufacturing.
- Chapter 3 Describes how to build, view, edit, print, and confirm planning, shipping, and simulation schedules.
- Chapter 4 Provides an overview of the Autoschedule process.
- Chapter 5 Provides an overview of CUM Management.
- Chapter 6 Provides an overview of Supply Base Management.
- Chapter 7 Describes the Planning and Shipping Reports and Processes.

- Chapter 8 Describes EDI Transactions.
- Chapter 9 Describes possible solutions to problems that you might encounter.

Other Information Sources

You can choose from many sources of information, including online 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 unless we specify otherwise.

Online Documentation

All Oracle Applications documentation is available online (HTML and PDF). The technical reference guides are available in paper format only. Note that the HTML documentation is translated into over twenty languages.

The HTML version of this guide is optimized for onscreen reading, and you can use it to follow hypertext links for easy access to other HTML guides in the library. When you have an HTML window open, you can use the features on the left side of the window to navigate freely throughout all Oracle Applications documentation.

- You can use the Search feature to search by words or phrases.
- You can use the expandable menu to search for topics in the menu structure we provide. The Library option on the menu expands to show all Oracle Applications HTML documentation.

You can view HTML help in the following ways:

- From an application window, use the help icon or the help menu to open a new Web browser and display help about that window.
- Use the documentation CD.
- Use a URL provided by your system administrator.

Your HTML help may contain information that was not available when this guide was printed.

Related User Guides

Oracle Flow Manufacturing shares business and setup information with other Oracle Applications products. Therefore, you may want to refer to other user 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.

User Guides Related to All Products

Oracle Applications User Guide

This guide explains how to navigate the system, enter data, and query information, and introduces other basic features of the GUI available with this release of Oracle Flow Manufacturing (and any other Oracle Applications product).

You can also access this user guide online by choosing *Getting Started and Using Oracle Applications* from the Oracle Applications help system.

Oracle Alert User Guide

Use this guide to define periodic and event alerts that monitor the status of your Oracle Applications data.

Oracle Applications Implementation Wizard User Guide

If you are implementing more than one Oracle product, you can use the Oracle Applications Implementation Wizard to coordinate your setup activities. This guide describes how to use the wizard.

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*. It also provides information to help you build your custom Oracle Developer forms so that they integrate with Oracle Applications.

Oracle Applications User Interface Standards

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.

Oracle Applications Demonstration User's Guide

This guide documents the functional storyline and product flows for Vision Enterprises, a fictional manufacturer of personal computers products and services. As well as including product overviews, the book contains detailed discussions and examples across each of the major product flows. Tables, illustrations, and charts summarize key flows and data elements.

Oracle Assets User's Guide

If you install Oracle Assets, you can use this manual to add assets and cost adjustments directly into Oracle Assets from invoice information in Payables.

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 Business Intelligence System Implementation Guide

This guide provides information about implementing Oracle Business Intelligence (BIS) in your environment.

BIS 11*i* User Guide Online Help

This guide is provided as online help only from the BIS application and includes information about intelligence reports, Discoverer workbooks, and the Performance Management Framework.

Oracle Capacity User's Guide

This guide describes how to validate a material plan by verifying that there are resources sufficient to perform the planned work for repetitive and discrete jobs. Using finite capacity planning techniques, you learn how to use rough-cut capacity

planning to validate a master schedule and capacity planning to validate the material plan.

Oracle Cash Management User's Guide

This manual explains how you can reconcile your payments with your bank statements.

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 e-Commerce Gateway User's Guide

This guide describes how Oracle e-Commerce Gateway provides a means to conduct business with trading partners via Electronic Data Interchange (EDI). Data files are exchanged in a standard format to minimize manual effort, speed data processing and ensure accuracy.

Oracle Engineering User's Guide

This guide enables your engineers to utilize the features of Oracle Engineering to quickly introduce and manage new designs into production. Specifically, this guide details how to quickly and accurately define the resources, materials and processes necessary to implement changes in product design.

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 HRMS Documentation Set

- *Using Oracle HRMS - The Fundamentals* explains how to set up organizations and site locations.

- *Managing People Using Oracle HRMS* explains how to enter and track employee data.
- *Running Your Payroll Using Oracle HRMS* explains how to set up payroll, do withholding, run statutory reports, and pay employees.
- *Managing Compensation and Benefits Using Oracle HRMS* explains how to set up Total Compensation, including 401(k), health, and insurance plans.
- *Customizing, Reporting, and System Administration in Oracle HRMS* explains how customize to the system and design reports.

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 Manufacturing Scheduling User's Guide

This guide describes how to use Oracle Manufacturing Scheduling to view and reschedule single discrete jobs or the entire shop floor. Specifically, this guide details how to easily use the drag and drop functionality to view and reschedule jobs, operations, and resources.

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 and repetitive schedules.

Oracle Order Entry/Shipping User's Guide

This guide describes how to enter sales orders and returns, copy existing sales orders, schedule orders, release orders, plan departures and deliveries, confirm shipments, create price lists and discounts for orders, and create reports.

Oracle Payables User's Guide

This guide describes how accounts payable transactions are created and entered in Oracle Payables. This guide also contains detailed setup information for Oracle Payables.

Oracle Configurator User's Guide

This guide describes how to improve order taking and fulfillment productivity by eliminating errors in new sales orders and bills of materials. You can use Oracle Configurator to verify product configurations, automatically select configuration options, and generate manufacturing bills of materials according to configuration constraints.

Oracle Project Manufacturing User's Guide

This guide describes the unique set of features Oracle Project Manufacturing provides for a project-based manufacturing environment. Oracle Project Manufacturing can be tightly integrated with Oracle Projects. However, in addition to Oracle Projects functionality, Oracle Project Manufacturing provides a comprehensive set of new features to support project sales management, project manufacturing costing, project manufacturing planning, project manufacturing execution and project quality management.

Oracle Projects User's Guide

This guide explains how to set up projects for use in project manufacturing and project accounting.

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 Receivables User's Guide

Use this manual to learn how to implement flexible address formats for different countries. You can use flexible address formats in the suppliers, banks, invoices, and payments windows.

Oracle Sales and Marketing Connected Client User's Guide

This guide describes how to set up your connected client, manage your account information, manage your database of contacts, and how to record, review and add information about an account, contact, or opportunity. This guide also describes how to view pending, current, and past customer orders, to create and track responses to promotional campaigns, track the effectiveness of a promotional program, and how to project your progress towards sales goals.

Oracle Sales Compensation User's Guide

This guide describes how to categorize your sales revenue, how to define the data you need to Oracle Sales Compensation, and where to collect the data from. Each sales organization has different ways of paying compensation; thus each organization needs different types of data to calculate a compensation payment. This guide also explains how to setup and calculate compensation for a salesperson, adjust for sales credits, and view a salesperson's performance against their quota. In addition, this guide also explains how to run a variety of reports for individuals or groups of salespeople.

Oracle Self Service Web Applications User's Guide

This guide describes how Oracle Self Service Web Applications enable companies to provide a self-service and secure web interface for its employees, customers and suppliers. Employees can change their personal status, submit expense reports or request supplies; customers can check on their orders; and suppliers can share production schedules with their trading partners. This guide is available in HTML only.

Oracle Release Management User's Guide

This manual describes how to manage high volume electronic demand by continually incorporating you customers demand into your order and planning processes. By explaining how to validate, archive, manage and reconcile incoming planning, shipping and production sequence schedules with updates to sales orders and forecasts. it enables you to electronically collaborate with your customers to more accurately manager demand. It also describes how to plan, create and manage trading partner layers for trading partner specific customizations.

Oracle Supplier Scheduling User's Guide

This guide describes how you can use Oracle Supplier Scheduling to calculate and maintain planning and shipping schedules and communicate them to your suppliers.

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.

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.

Reference Manuals

Oracle Technical Reference Manuals

Each technical reference manual 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.

You can order a technical reference manual for any Oracle Applications product you have licensed.

Oracle Automotive Implementation Manual

This manual describes the setup and implementation of the Oracle Applications used for the Oracle Automotive solution.

Oracle Manufacturing and Distribution 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 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.

Oracle Project Manufacturing Implementation Manual

This manual describes the setup steps and implementation for Oracle Project Manufacturing.

Oracle Receivables Tax Manual

This manual provides everything you need to know about calculating tax within Oracle Receivables, Oracle Order Management, Oracle sales, and Oracle Web Customers. It includes information about implementation procedures, setup forms and windows, the Oracle Receivables Tax calculation process, tax reports and listings, and open interfaces.

Oracle Self-Service Expenses Implementation Guide

This guide explains in detail how to configure Oracle Self-Service Expenses and describes its integration with Oracle Payable and Oracle Projects.

Oracle Self-Service Web Applications Implementation Manual

This manual describes the setup steps for Oracle Self-Service Web Applications and the Web Applications dictionary.

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 guide also provides information on creating custom reports on flexfields data.

Installation and System Administration Guides

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, and major issues, for Applications-wide

features such as Business Intelligence (BIS), languages and character sets, and self-service 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 One-Hour Install, which minimizes the time it takes to install Oracle Applications and the Oracle 8*i* Server technology stack by automating many of the required steps. This guide contains instructions for using Oracle One-Hour Install and lists the tasks you need to perform to finish your installation. You should use this guide in conjunction with individual product user 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 in general and lists database upgrade and product-specific upgrade tasks. You must be at either 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.

Using the AD Utilities

Use this guide to help you run the various AD utilities, such as AutoInstall, AutoPatch, AD Administration, AD Controller, Relink, and others. It contains how-to steps, screenshots, and other information that you need to run the AD utilities.

Oracle Applications Product Update Notes

Use this guide as a reference if you are responsible 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 and enhancements and changes made to database objects, profile options, and seed data for this interval.

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 processing.

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.

Training and Support

Training

We offer a complete set of training courses to help you and your staff master Oracle Applications. We can help you develop a training plan that provides thorough training for both your project team and your end users. We will work with you to organize courses appropriate to your job or area of responsibility.

Training professionals can show you how to plan your training throughout the implementation process so that the right amount of information is delivered to key people when they need it the most. You can attend courses at any one of our many Educational Centers, or you can arrange for our trainers to teach at your facility. We also offer Net classes, where training is delivered over the Internet, and many multimedia-based courses on CD. In addition, we can tailor standard courses or develop custom courses to meet your needs.

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

We STRONGLY RECOMMEND that you never use SQL*Plus, Oracle Data Browser, database triggers, or any other tool to modify Oracle Applications tables, unless we tell you to do so in our guides.

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 an Oracle Applications form can update many tables at once. But when you modify Oracle Applications data using anything other than Oracle Applications forms, you might 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 forms to modify your data, Oracle Applications automatically checks that your changes are valid. Oracle Applications also keeps track of who changes information. But, 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.

About Oracle

Oracle Corporation develops and markets an integrated line of software products for database management, applications development, decision support and office automation, as well as Oracle Applications. Oracle Applications provides the E-business Suite, a fully integrated suite of more than 70 software modules for financial management, Internet procurement, business intelligence, supply chain management, manufacturing, project systems, human resources and sales and service management.

Oracle products are available for mainframes, minicomputers, personal computers, network computers, and personal digital assistants, enabling organizations to integrate different computers, different operating systems, different networks, and even different database management systems, into a single, unified computing and information resource.

Oracle is the world's leading supplier of software for information management, and the world's second largest software company. Oracle offers its database, tools, and application products, along with related consulting, education and support services, in over 145 countries around the world.

Your Feedback

Thank you for using Oracle Flow Manufacturing and this user guide.

We value your comments and feedback. This guide contains a Reader's Comment Form you can use to explain what you like or dislike about Oracle Flow Manufacturing or this user guide. Mail your comments to the following address or call us directly at (650) 506-7000.

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Or, send electronic mail to **appsdoc@us.oracle.com**.

1

Overview of Flow Manufacturing

This chapter will give you an overview of the featrures 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 1-7
- Kanban Planning and Execution on page 1-9

Overview of Flow Manufacturing

Flow manufacturing is a manufacturing approach with the objective of building the highest quality product in the shortest possible time at the lowest cost. To achieve this objective, flow manufacturing employs the following practices:

- Building to customer demand rather than building to a forecast

  This practice reduces finished goods inventories, reduces cost, and increases customer satisfaction.

- Linear manufacturing rather than batch production

  This practice 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

  This practice allows 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

  This practice 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.

  This practice reduces the amount of component inventory and reduces costs.

- Uses rate-based production rather than work orders

  This practice simplifies shop floor activities and reduces cost.

- Labor flexibility rather than labor specialization

  This practice increases productivity and reduces costs.

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

  This practice helps to simplify 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. Oracle Flow

Manufacturing provides a framework to create effective partnerships between the various business units of the enterprise, including engineering, production, planning, distributors, suppliers, and customers.

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

- Demand Management
- Line Design and Balancing
- Line Scheduling and Sequencing
- Production Execution
- Kanban Planning and Execution

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 Also

Oracle Master Scheduling/MRP, Forecasting

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.

See Also

Oracle Master Scheduling/MRP, Kanban Planning

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 Flow Routing

Oracle Bills of Material, Bills of Material,

Oracle Bills of Material, Routings

Mixed Model Map

The Mixed Model Map is the tool that Oracle Flow Manufacturing uses to achieve balanced flow lines. The Mixed Model Map combines the information from the products assigned to a specific line, including their routing, product family grouping, and forecasted demand. This information is displayed on the Mixed Model Map in tabular form. 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.

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 often leads to analysis that includes the questions:

- Can non-value-added work be reduced or eliminated?
- Can the work be broken into smaller units?
- Can the work be grouped into larger units?
- Should resource (machine, labor) capacity be increased?
- Should in-process inventory be increased?
- Is an additional line needed?

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 Mixed Model Map.

See Also

Oracle Bills of Material, Routings

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-overs, 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.

See Also

Oracle Master Scheduling/MRP, Setting Up Line Scheduling Workbench

Oracle Master Scheduling/MRP, Line Scheduling Workbench

Oracle Master Scheduling/MRP, Line Scheduling Calculation Examples

Sequencing Criteria

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

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

The Mixed Model Map is 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.

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 backflushs all components and performs resource and overhead transactions upon recording completion of the finished product. Additionally, Oracle Flow Manufacturing allows assemblycompletions to be recored 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 Also

Oracle Work in Process, Work Order-less Completions

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.

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.

2

Flow Manufacturing Setup

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

- Overview of Setting Up on page 2-2
- Setup Objectives on page 2-3
- Setup Steps on page 2-5

Overview of Setting Up

This chapter outlines the required Oracle Flow Manufacturing setup steps, in a logical sequence. For detailed instruction and data field considerations, see the Oracle Flow Manufacturing Implementation Manual. For other modules that interact with Oracle Flow Manufacturing, please refer to the User's Guide and Implementation Manual of the appropriate Oracle application for more detailed explanation of setup requirements and alternatives.

Setting up Oracle Flow Manufacturing follows the business process for a flow implementation and relates directly to the tasks performed in the implementation. The following setup steps must be applied with full understanding of the Oracle Flow Manufacturing functionality and your production processes to ensure an effective implementation. The sequence in which the setup is done is important since there are data dependencies.

Setup Prerequisites

- Naming Convention Definition
- Setup Profile Options
- Setup Organization
- Setup Item Flexfield
- Inventory Parameters Setup
- Cost Accounts Creation
- Subinventories
- BOM Parameters Setup
- Purchasing Setup
- Order Entry Setup

Item Templates

- Flow Finished Good (Flow Assembly) Template
- Flow Component Template

Demand Management

- Products and Parts Setup
- Bills Setup

- Planning Setup

Line Design and Balancing

- Flow Line Setup
- Product Synchronization Setup

Line Scheduling

- Scheduling Rules

Production Execution

- Work Order-less Completion
- Quality Collection Plan

Kanban Planning and Execution

- Pull Sequence Setup
- Sourcing Rules Setup
- Assignment Sets Setup

Setup Objectives

Flow manufacturing requires teamwork and organization. The teamwork and organization must start in the planning and setup stages of implementation. Oracle Flow manufacturing setup steps may be classified into logical groups assigned to each of the Business Processes to achieve specific implementation objectives.

Setup Prerequisites

The ten setup objectives of Prerequisites are:

- **Naming Convention Definition** to define a naming convention adequate for the implementation.
- **Setup Profile Options** to create an organization
- **Setup Organization** to create the name of the organization
- **Setup Item Flexfield** to activate Flexfields for organization

- **Inventory Parameters Setup** to define the inventory parameters needed to be able to create items.
- **Cost Accounts Creation** to open accounts later needed for WIP accounts.
- **Subinventories** to create at least one subinventory for the flow line
- **BOM Parameters Setup** to define BOM parameters and locations.
- **Purchasing Setup** to setup suppliers and purchasing functionality.
- **Order Entry** to setup Order Entry in order to receive product orders.

Item Templates

The two setup objectives for the Item Templates are:

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

Demand Management Setup

The three setup objectives of Demand Management are:

- Products and Parts- to define the products and parts to be produced and group them in a logical way to facilitate demand forecasting and production assembly.
- Bills- to create a bill of materials for the products and parts to include their family relationship, their location in the flow line and the source of their supply in order to do proper backflushes
- Planning- to identify and create the appropriate planning tools which will apply expected demand to the product family structures, item demand locations and item supply locations to calculate the flow line capacity and rates.

Line Design and Balancing Setup

The two setup objectives of line design and balancing are:

- Flow Line Setup - to define the flow lines, production resources and departments.
- Product Synchronization Setup - to define the activities and processes in the flow line and to produce a management tool to balance the resources and processes to meet demand.

Line Scheduling Setup

The objective of line scheduling setup is:

- To define your scheduling rules

Production Execution Setup

The primary setup objective of production execution is:

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

Kanban Planning and Execution Setup

The primary setup objective of kanban planning and execution is:

- To define the flow line's replenishment chain which will execute the flow of the requested material, just in time, in the expected quantity to the place it's needed.

Setup Steps

Demand Management Setup Steps

In designing a flow line, a company analyses 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 products' 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 Setup
- Planning Setup

Products and Parts Setup The objectives of products and parts setup are to create both the finished good and component items and to group the products and parts in logical product families to facilitate demand forecasting and production assembly. To implement Oracle Flow Manufacturing it necessary to set up:

- Create Items
- Product Family
- Product Family Members
- Categories and Category Sets

Bills Setup The objective of bills setup is to create a bill of materials for the products and parts but more importantly to assign a subinventory to each item in the BOM. Remember that the most fundamental setup requirement for Oracle Flow Manufacturing is that the subinventory assigned in the pull sequence for an item matches perfectly with the subinventory assigned in the BOM or item master for the same item.Pull sequences are defined in the kanban planning and execution section.

Planning Setup The setup objectives of planning are to identify and create the appropriate planning tools which will apply expected demand to the product family structures, item demand locations and item supply locations 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 Setup Steps

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 was built into the line design. Factors that determine

flex include employees certified to work multiple processes (operations) and machines that can 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, we will 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 then provides a planning tool, the Mixed Model Map to calculate process times and volumes to balance resources and events and optimize flow line efficiency.
The setup objective of flow lines is to define the flow line, production resources and departments. To implement Oracle Flow Manufacturing it necessary to set up:

- Flow Lines
- Resources
- Departments

Product Synchronization Setup 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 in balance with the resources to schedule smooth production while meeting daily demand.
At this point, you have defined the organizations, departments, resources and items to be produced on the flow line. The objective now is to:

- Identify the route each item will pass through towards completion.
- Produce a Mixed Model Map to balance the resources and processes to meet demand.

In order to implement these objectives through Oracle Flow Manufacturing you will define and set up:

- Standard Events
- Standard Processes
- Flow Routings
- Standard Operations

Event and Resource Functions in a Standard Processes Understanding Oracle functionality and your production processes are critical to the successful implementation of flow manufacturing. To illustrate the relationship of Standard Processes, Resources and Events, assume a line worker has two work events to perform to install handle bars on a bike.

- Mount bar to frame
- Bolt to frame

The standard process would be Install Handle Bars. The resource assigned to the process would be one line worker. The events assigned to the process would be to 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 / 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 total product cycle time is 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 / 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 successful implementation of 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 Execution Setup Steps

The primary objective of setting up production execution is to meet daily production requirements simply. This objective is achieved through the successful setup of Work In Process Setup Parameters. You can complete assemblies using the work order-less completions form without having to create a job or repetitive schedule. Additionally, if you require quality collection plans for work order-less completions, they will be set up at this time.

Work in Process Setup

Set up the following parameters as shown:

Discrete Tab

- **Default Discrete Class** Flow
- **Default Lot Number Type** Based on inventory rules
- **Respond to sales order changes** Always

Move transaction tab

- **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 Setup Steps

An item that is pulled through the kanban system, rather than pushed by the planner, is called a kanban-released item, or simply 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 through external suppliers, specifying the sequence to follow to obtain the kanban item.

The setup objectives of kanban planning and execution are achieved through the successful implementation of the flow line replenishment chain.

Replenishment Chain Setup The objective of setting up the kanban replenishment chain is to execute the flow of the materials through the line. The steps required to implement the replenishment chain are to set up:

- Pull Sequence
- Sourcing Rules
- Assignment Sets

Purchasing Blanket PO, ASL, Sourcing Rules and Quotation Setup You may enter the supplier/supplier site on the pull sequence. If you have completed the pull sequence setup with the proper supplier/supplier site information, then it is carried over to the requisition via the requisition import process. However, if you do not enter the supplier and supplier site information on a pull sequence and a replenishment signal is generated, then the resulting requisition can pull the source information from a valid source document.

3

Line Design and Balancing Procedures

The sequence in which tasks are performed in flow manufacturing line design varies. This section provides a broad overview of the necessary steps to enable flow manufacturing.

The topics covered in this chapter include:

Product Synchronization on page 3-2

Flow Manufacturing Line Balance on page 3-4

Defining Flow Manufacturing Standard Processes on page 3-5

Defining Flow Manufacturing Standard Events on page 3-6

Defining Flow Manufacturing Standard Line Operations on page 3-8

Creating a Flow Routing on page 3-9

Creating a Routing Network on page 3-14

Calculating Operation Times on page 3-16

Operation Times Calculations on page 3-17

Calculating Total Product Cycle Time on page 3-18

Calculating Operation Yields on page 3-19

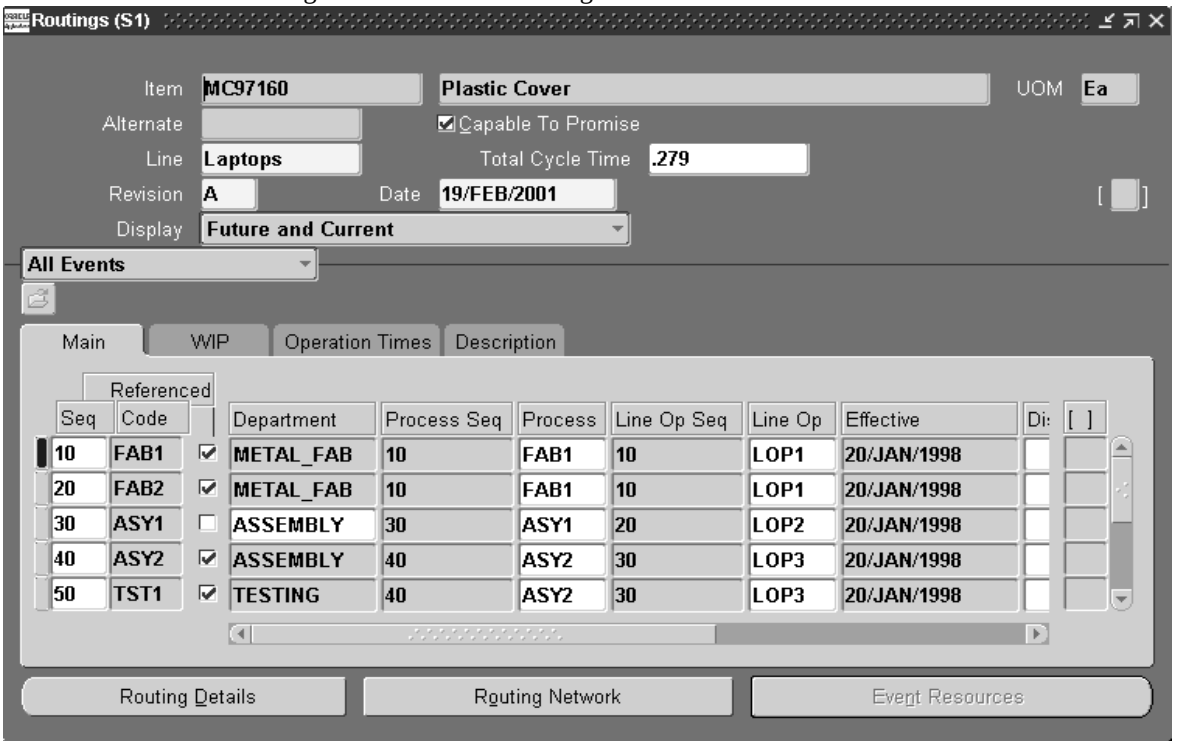
Operation Yields Calculations on page 3-20

Product Synchronization

Attention: 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.

◗◗ To create product synchronization for standard items

1. Navigate to the Flow Routing window.



2. Optionally, create a flow routing for an item. 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 Routing Network. See Creating a Routing Network.
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.

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 will reveal the line takt time, process takt times, weighted average times, and so on. See: Entering Mixed Model Map Parameters
2. Create line operations for the current line.

   You can do this by selecting the Tools menu in the Mixed Model Map window. The line identification will default to the standard operations window and the operation type will be set to line operation.
3. Assign line operations to the product level routings.

   You can do this by selecting Routing from the Tools menu.

Attention:

> **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.

8. 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: Generating a Mixed Model Map

9. Once your line is balanced, select Save as Baseline from the Tools menu to save this mixed model map. This map can be used to compare resource and IPK requirements against future runs of the of the same line. See: Saving a Baseline

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.

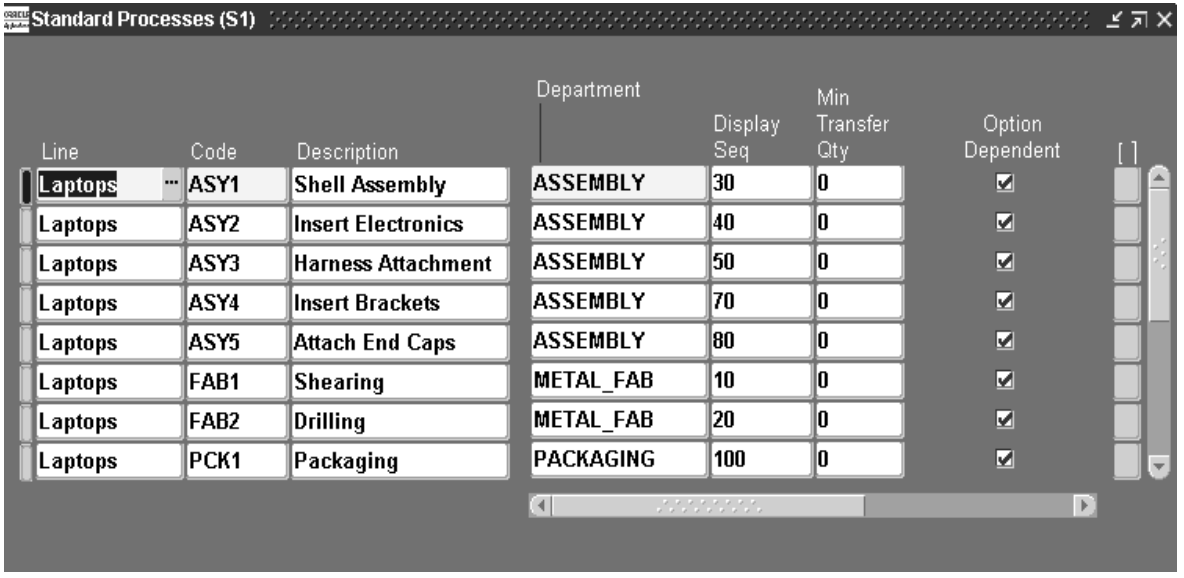
> **Note:** Processes and standard processes can be created and used only with Oracle Bills of Material.

Prerequisites

To define flow manufacturing processes, you must first define a line in Oracle Work in Process. See: Defining Production Lines, Oracle Work in Process User's Guide.

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.

See Also

Creating a Flow Routing

Defining Flow Manufacturing Standard Events

Standard Events can be created and used only with Oracle Flow Manufacturing.

Note: Events and standard events can only be created and used with Oracle Bills of Material.

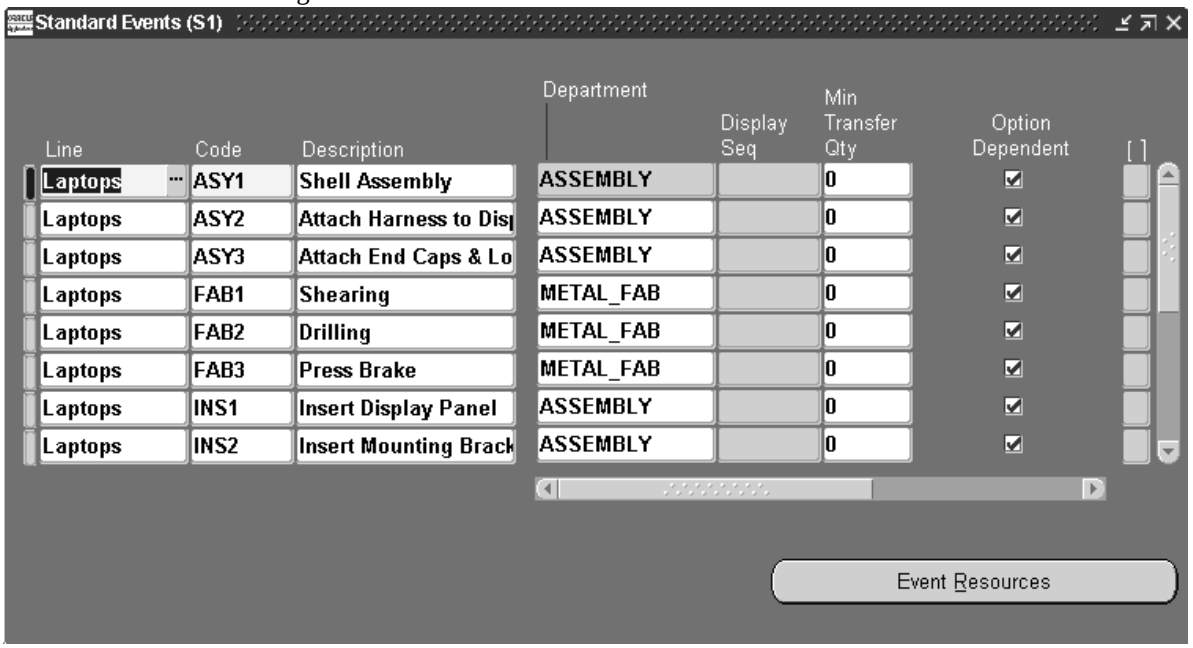
Note: When using Oracle Flow Manufacturing, the Operation Sequence on the Bill of Materials refers to the Event Sequence.

Prerequisites

To define flow manufacturing line operations, you must first define a line in Oracle Work in Process. See: 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.

Note: 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

Defining Flow Manufacturing Standard Processes

Creating a Flow Routing

Calculating Operation Times

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 only be created and used with Oracle Bills of Material.

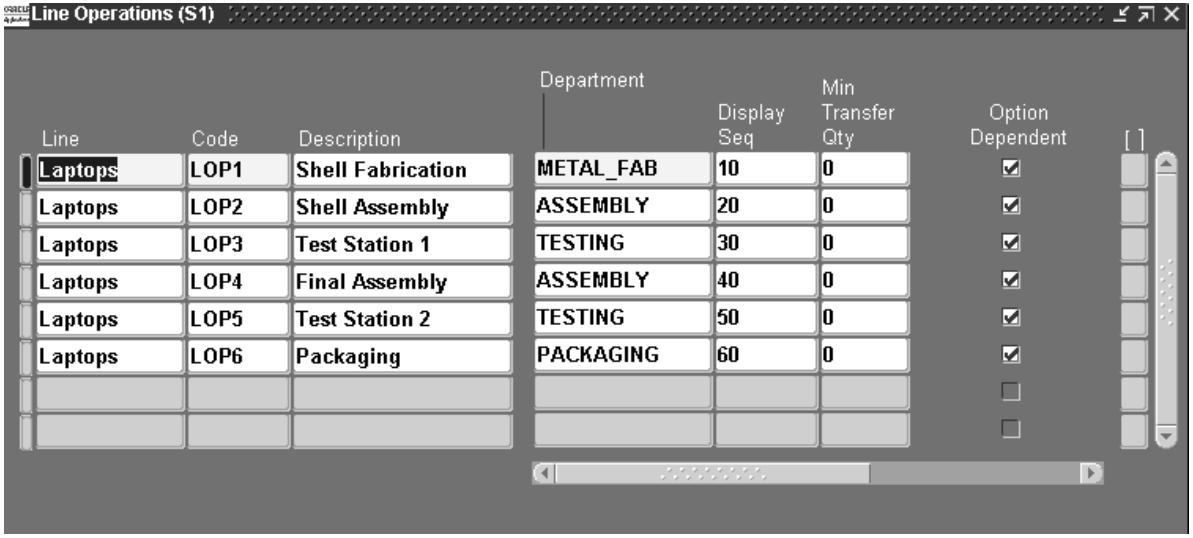
Note: When using Flow Manufacturing, the Operation Sequence on the BOM actually refers to the Event sequence.

Prerequisite❑ To define flow manufacturing line operations, you must first

define a line in Oracle Work in Process.

To define a Standard Line Operation for a flow manufacturing line

1. Navigate to the Line Operations window.



2. Enter the line identifier, sequence numbers, code and description.
3. Select a department and optionally choose the remaining options.

See Also

Creating Flow Manufacturing Standard Processes

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.

- 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.

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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.

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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 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 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 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.

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, click the Routing Network button. 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.

Note: When you first open the window, the graphics for all processes or operations will be on top of each other. Simply drag them to another portion of the drawing canvas to begin defining your network.

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

You can create a link between any two processes / line operations by clicking on the Connector button at the top of the screen. Then click a process or line operation and drag to the process or line operation to which you are linking. A pop-up screen will appear where you enter what type of connection and what percentage of material from source is moving to target.

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.

If you have not already associated events with processes or line operations, the events will be listed on the bottom left of the screen. 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 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, and move events from process to process by dragging and dropping.

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

2. Select Save to commit the changes.

See Also

Defining Flow Manufacturing Standard Processes

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.

Note: The 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.

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

Hint: 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.

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 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

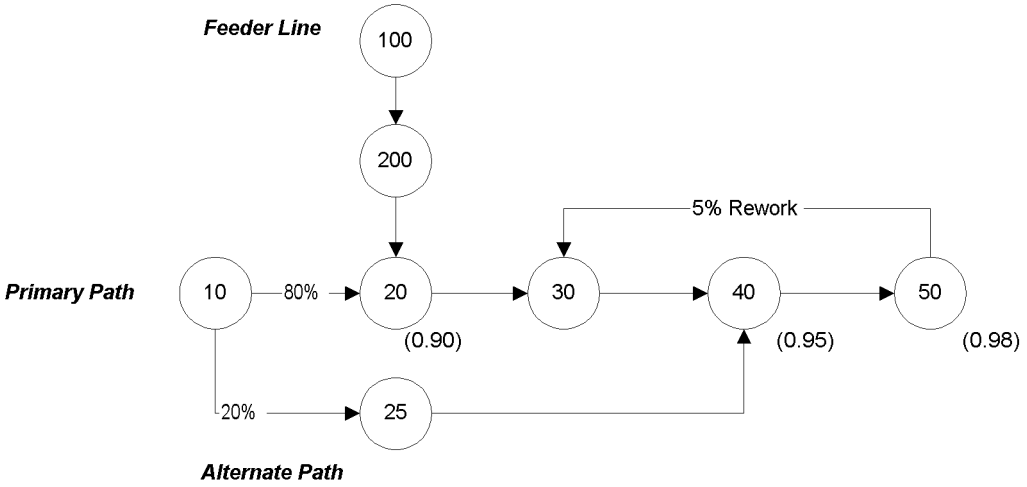
1. Navigate to the Flow Routing window.
2. Place your cursor in the Total Cycle Time field in the header.
3. Select Calculate Operation Yields from the Special menu.
4. Select process or operation. Choose update events to translate yields and net planning percent to events.

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 calculations and kanban planning. Please see the diagram below for an illustration of the set-up used in the example calculations.



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 (Pp * I c) + Sr (Io*Wo)

Where:

N = Net Planning Percent, in decimal format

S = sum over all paths

P = Planning Percent = (Pp * 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 & 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 & 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.

For our example, this results in:

Operation	Incoming Network Percent *(from routing network)*	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 (Cp * Pp * I c / Pc)

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 always 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

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

Operation	**Yield** (User Entered)	**Outgoing Network %** (from routing 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 & 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

Mixed Model Map

This chapter provides information on how to use the mixed model map to design a balanced production. Topics in this chapter include:

- Overview of Mixed Model Map on page 4-2
- Entering Mixed Model Map Parameters on page 4-2
- Generating a Mixed Model Map on page 4-4
- Saving a Baseline on page 4-6
- Querying a Saved Baseline on page 4-6
- Deleting a Saved Baseline on page 4-8
- Placing a Mixed Model Map on the Navigator on page 4-8
- Mixed Model Map Calculations on page 4-9

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

See Also

Entering Mixed Model Map Parameters

Saving a Baseline

Placing a Mixed Model Map on the Navigator

Mixed Model Map Calculations

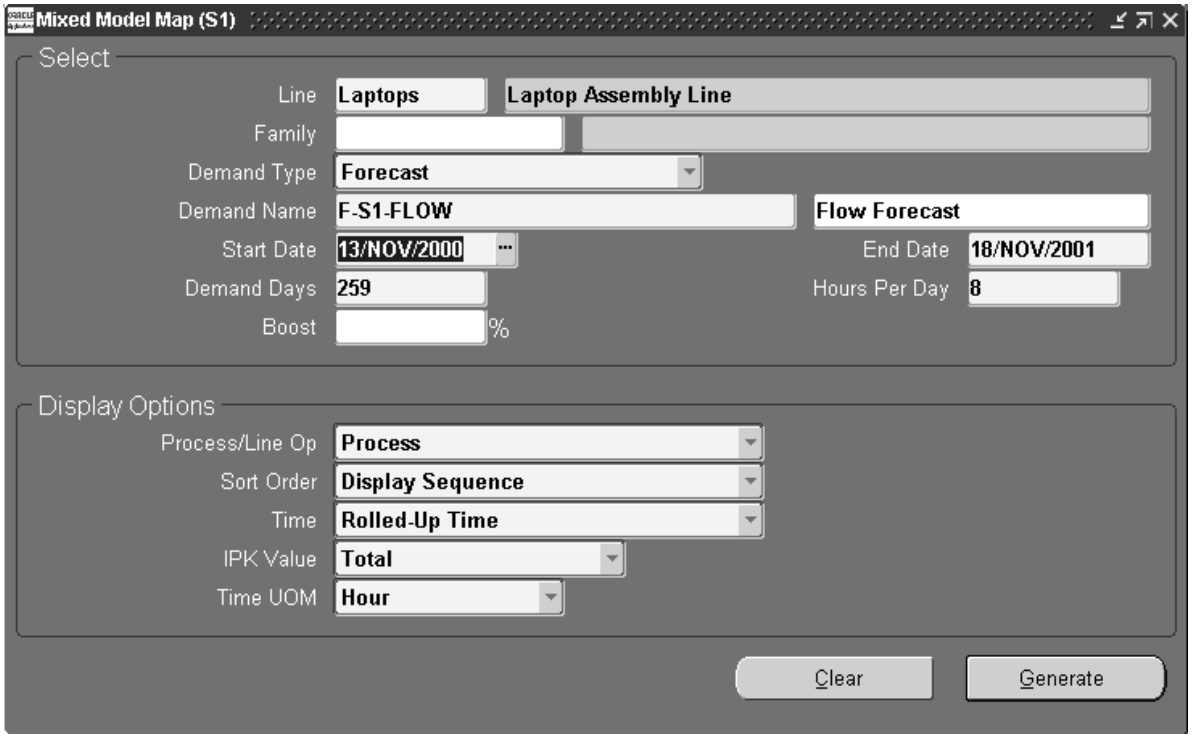
Entering Mixed Model Map Parameters

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. Enter the line for which you want to generate a mixed model map.
3. If you want to restrict the display to a specific Product Family, enter the family name.
4. Select a Type and Name for a statement of demand.

   A demand code will be generated depending on your selection.
5. Enter a start date used to calculate the number of demand days. The default is the beginning of the demand period.
6. Enter an end date to determine the end of the demand period.

   The number of the Demand Days will be determined by the dates you supply.
7. Enter the hours per day that you are working.
8. Optionally, enter a boost percentage to increase or decrease your demand.

9. You can balance the line by line operation or process. Select Line Operation or By Process to determine what you will see on the X-axis of the matrix.
10. Select the sorting order to apply to your map.
11. Select the time type to be used in this calculation (rolled-up or manual).
12. Select whether to calculate IPKs for the entire process or for each individual machine

    The number of machines should be specified at the department associated with the process.
13. Select a unit of measurement for the time values to be shown in the mixed model map.

Generating a Mixed Model Map

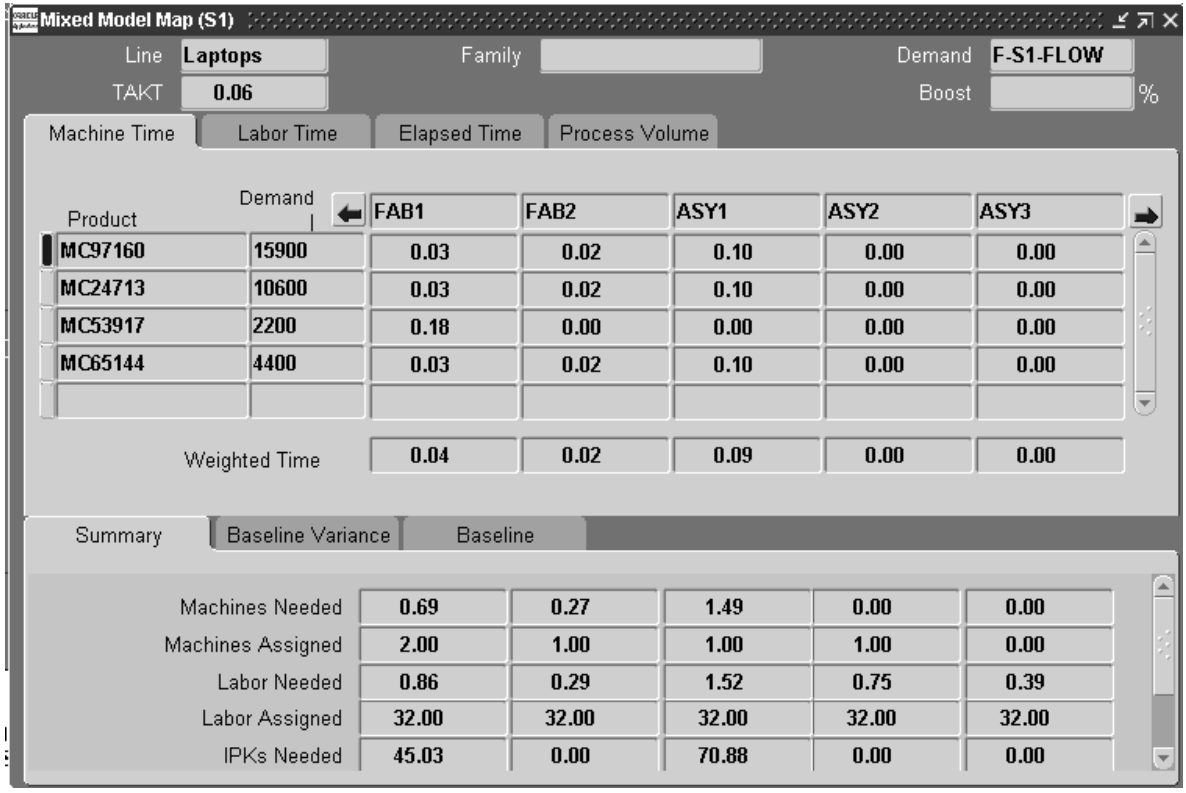
Prerequisites

❑ You must enter parameter information for the mixed model map you would like to generate. See: Entering Mixed Model Map Parameters

◗◗ To generate a mixed model map

1. Navigate to the Mixed Model Map window.
2. Enter MMM parameters.

3. Choose the Generate button.



The Mixed Model Map window will appear displaying the takt time hours available and total demand in your demand schedule for each product over the time frame you specified.

Note: From the Tools menu you can navigate to:

- *Standard Line Operations & Standard Processes* to define or view line operations and processes to help balance your line.
- *Forecast/MDS/MPS* The corresponding source of demand forecast displayed in the Mixed Model Map will be automatically queried.
- *Kanban Workbench*

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.

Prerequisites

❑ You must enter parameters and generate a mixed model map before you can save its baseline. See: Entering Mixed Model Map Parameters and Generating a Mixed Model Map.

◗◗ To save a baseline:

- After you have generated a mixed model map, choose Save as Baseline from the Tools menu.

Attention:	If you have a previously saved baseline for this family and line, it will be replaced when you save it again.

Note:	In the Saved Baseline window you can select the Find button to view all of the saved baselines.

Querying a Saved Baseline

You can bring up a saved baseline to compare calculations with different variables or over a period of time

Prerequisites

❑ You must enter parameters and generate a mixed model map before you can query its baseline.

To query a saved baseline

1. Navigate to the Mixed Model Map window.
2. Select View Baseline from the Tools menu.
3. Click the Find button to get a list of all saved baselines in the organization.

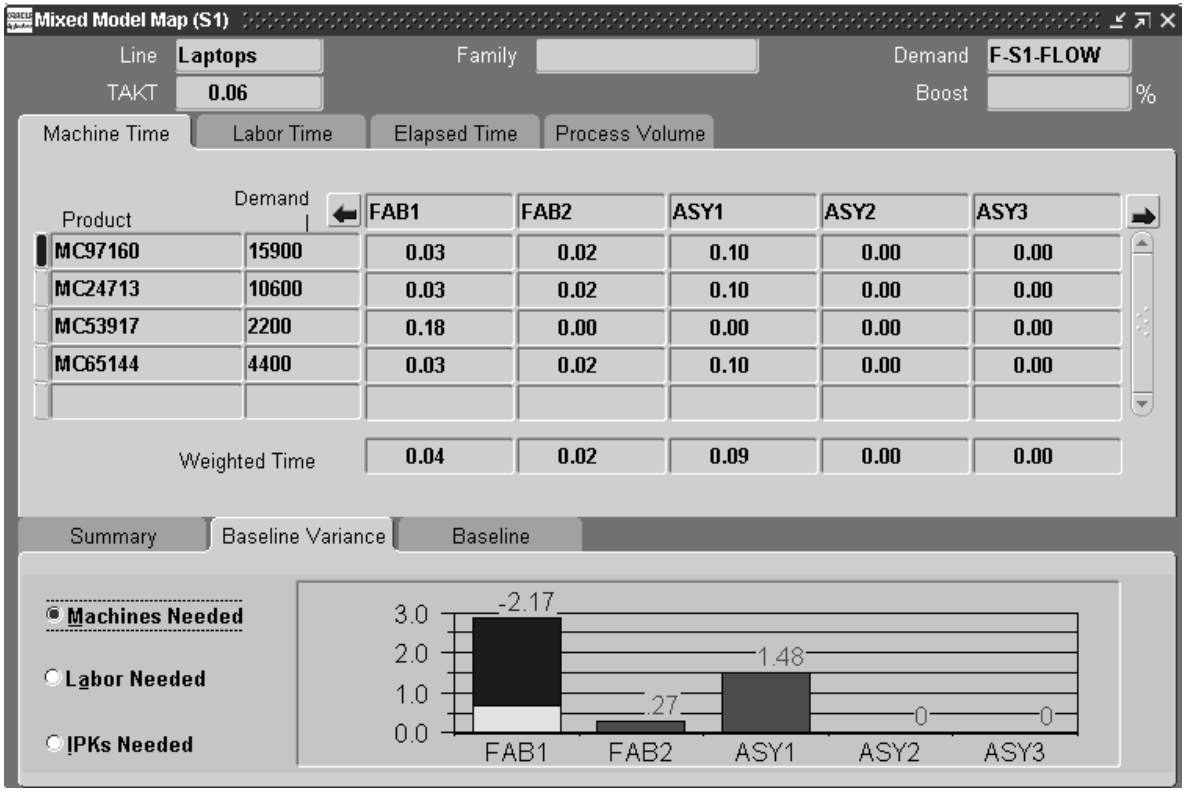
4. Select the baseline you want to see.

   It will show you the parameters used to generate the map, the calculated machine, labor, and IPKs by both processes and line operations.

To query a saved baseline while viewing a Mixed Model Map

There are three ways to see a baseline from within a Mixed Model Map.

- Choose the Baseline Variance tab on your current Mixed Model Map.



The Baseline Variance bar graph displays machine-needed variance for five processes. You can choose to view variance by machines needed, labor needed, or IPKs 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.

- Choose the Baseline tab on the current Mixed Model Map to view baseline values for calculated machine, labor, and IPKs needed.
- Choose View Baseline from the Tools menu.

  It will show you the baseline parameters and the calculated machine, labor, and IPKs needed by process and line operation.

Note:	To view all saved maps, navigate to the Line field and select the query button.

Deleting a Saved Baseline

If you have saved baselines that are no longer applicable, they should be deleted.

◗◗ To delete a saved baseline:

1. Query the baseline you would like to delete. See: Querying a Saved Baseline
2. Choose the Delete button.

   The baseline values for the processes and line operations will be deleted.

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 and Generating a Mixed Model Map.

◗◗ 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: The 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:

$$\text{line takt time} = \frac{\text{hours/day} * \text{time conversion factor} * \text{\# demand days}}{\text{total demand} * (1 + \text{boost\%})}$$

Hint: 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:

$$\text{process volume} = \frac{\text{total demand} * \text{average net planning\%} * (1 + \text{boost\%})}{\text{average reverse cumulative yield}}$$

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:

machine weighted time = sum of (process volume * machine time)
sum of process volume

Labor Weighted Time

Labor weighted time is calculated as follows:

labor weighted time = sum of (process volume * labor time)
sum of process volume

Elapsed Weighted Time

Elapsed weighted time is calculated as follows:

elapsed weighted time = sum of (process volume * elapsed time)
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:

machines needed = machine weighted time
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:

$$\textbf{labor needed} = \frac{\textbf{labor weighted time}}{\textbf{operation takt time}}$$

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:

$$\textbf{IPKS} = \frac{\textbf{(elapsed weighted time - line takt time) * hours/day * time conversion factor}}{\textbf{elapsed weighted time * line takt time}}$$

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:

$$\textbf{in process kanbans needed by machine} = \frac{\textbf{in process kanbans needed}}{\textbf{\# of machines}}$$

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:

$$\textbf{operation takt time} = \frac{\textbf{\# of days * hours/day * time conversion factor}}{\textbf{sum of process volumes}}$$

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:

Takt Time for Assigned = Elapsed Weighted Time/Resource Assigned

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Note: This number is relevant only if you assign a department to each operation or process and all of its events.

5

Reports and Processes

This chapter tells you what you need to know about Oracle Flow Manufacturing Reports and Processes, including:

- Schedule Report on page 5-2
- Linearity Report on page 5-4

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 navgator path for each Oracle Flow Manufacturing window.

Windows and Navigator Paths

For windows described in other manuals:

Brackets ([ ]) indicate a button.

See...	Refer to this manual for a complete form description
BOM	*Oracle Bill of Materials User's Guide*
INV	*Oracle Inventory User's Guide*
MRP	*Oracle Master Scheduling/MRP User's Guide*
WIP	*Oracle Work in Process User's Guide*
SYS	*Oracle System Administrator's Guide*
User	*Oracle Applications User's Guide*

Window Name	Navigation Path
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
Bills	FLM>Reports>Bills

Window Name	Navigation Path
Bom Comparisons	FLM>Bills>BOM Comparisons
Catagory Sets	FLM>Setup>Items>Categories>Catagory 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
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
Department	FLM>Lines>Department
Department Classes	FLM>Setup>Bills>Department Classe
Disable Import of Configurator Model	FLM>Other>Configurator>Disable Import of Configurator Model
Documents	FLM>Products & Parts>Documents
Documents	FLM>Bills>Documents
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
Import	FLM>Bills>Import
Indented Bills	FLM>Bills>Indented Bills
Item Types	FLM>Setup>Items>Item Types
Item Where Used	FLM>Bills>Item Where Used
Kanban Cards	FLM>Kanbans>Kanban Setup>Kanban Cards
Launch	FLM>Kanbans>Kanban Planning>Launch
Lines	FLM>Lines>Lines

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	FLM>Product Synchronization>Mixed Model Map
Names	FLM>Kanbans>Kanban Planning>Names
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
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
Refresh Configurator Models	FLM>Other>Configurator>Refresh Configurator Models
Requests	FLM>Other>Requests
Resource Groups	FLM>Setup>Bills>Resource Groups
Resources	FLM>Lines>Resources
Routings	FLM>Reports>Routings
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
Templates	FLM>Setup>Items>Templates
WIP Accounting Classes	FLM>Setup>Bills>WIP Accounting Classes

Window Name	Navigation Path
WIP Parameters	FLM>Setup>Bills>WIP Parameters
Work Order-less Completions	FLM>Production>Work Order-less Completions
Workbench	FLM>Kanbans>Kanban Planning>Workbench

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*. The term is often used synonymously for the specific scheduling system developed and used by the Toyota Corporation in Japan.

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. For example, you may want to give the location name of 'Receiving Dock' to the Ship To business purpose of 100 Main Street. **See kanban location.**

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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