

11*i* Overview of Flow Manufacturing

Student Guide

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Preface

Profile

Before You Begin This Course

Before you begin this course, you should have the following qualifications:

- Thorough knowledge and proficiency in navigating Oracle applications
- Working *knowledge* with *a working of the manufacturing business process*

Prerequisites

- *Oracle Inventory*
- *Oracle Bills of Material and Oracle Engineering*

How This Course Is Organized

This is an instructor-led course featuring lecture and hands-on exercises. Online demonstrations and written practice sessions reinforce the concepts and skills introduced.

Related Publications

Oracle Publications

Title	Part Number
<i>Oracle Inventory User's Guide</i>	<i>A83507-01</i>
<i>Oracle Bills of Material User's Guide</i>	<i>A75087-01</i>

Additional Publications

- System release bulletins
- Installation and user's guides
- *read.me* files
- *Oracle Magazine*

Typographic Conventions

Typographic Conventions in Text

Convention	Element	Example
Bold italic	Glossary term (if there is a glossary)	The <i>algorithm</i> inserts the new key.
Caps and lowercase	Buttons, check boxes, triggers, windows	Click the Executable button. Select the Can't Delete Card check box. Assign a When-Validate-Item trigger to the ORD block. Open the Master Schedule window.
Courier new, case sensitive (default is lowercase)	Code output, directory names, filenames, passwords, pathnames, URLs, user input, usernames	Code output: <code>debug.set ('I', 300);</code> Directory: <code>bin (DOS), \$FMHOME (UNIX)</code> Filename: Locate the <code>init.ora</code> file. Password: User <code>tiger</code> as your password. Pathname: Open <code>c:\my_docs\projects</code> URL: Go to <code>http://www.oracle.com</code> User input: Enter <code>300</code> Username: Log on as <code>scott</code>
Initial cap	Graphics labels (unless the term is a proper noun)	Customer address (<i>but</i> Oracle Payables)
Italic	Emphasized words and phrases, titles of books and courses, variables	Do <i>not</i> save changes to the database. For further information, see <i>Oracle7 Server SQL Language Reference Manual</i> . Enter <code>user_id@us.oracle.com</code> , where <i>user_id</i> is the name of the user.
Quotation marks	Interface elements with long names that have only initial caps; lesson and chapter titles in cross-references	Select "Include a reusable module component" and click Finish. This subject is covered in Unit II, Lesson 3, "Working with Objects."
Uppercase	SQL column names, commands, functions, schemas, table names	Use the SELECT command to view information stored in the LAST_NAME column of the EMP table.

Convention	Element	Example
------------	---------	---------

Arrow	Menu paths	Select File—> Save.
Brackets	Key names	Press [Enter].
Commas	Key sequences	Press and release keys one at a time: [Alternate], [F], [D]
Plus signs	Key combinations	Press and hold these keys simultaneously: [Ctrl]+[Alt]+[Del]

Typographic Conventions in Code

Convention	Element	Example
Caps and lowercase	Oracle Forms triggers	When-Validate-Item
Lowercase	Column names, table names	SELECT last_name FROM s_emp;
	Passwords	DROP USER scott IDENTIFIED BY tiger;
	PL/SQL objects	OG_ACTIVATE_LAYER (OG_GET_LAYER (‘prod_pie_layer’))
Lowercase italic	Syntax variables	CREATE ROLE <i>role</i>
Uppercase	SQL commands and functions	SELECT userid FROM emp;

Typographic Conventions in Navigation Paths

This course uses simplified navigation paths, such as the following example, to direct you through Oracle Applications.

(N) Invoice > Entry > Invoice Batches Summary (M) Query > Find (B) Approve

This simplified path translates to the following:

1. (N) From the Navigator window, select Invoice > Entry > Invoice Batches Summary.
2. (M) From the menu, select Query > Find.
3. (B) Click the Approve button.

Notations :

(N) = Navigator

(M) = Menu

(T) = Tab

(I) = Icon

(H) = Hyperlink

(B) = Button

Typographical Conventions in Help System Paths

This course uses a “navigation path” convention to represent actions you perform to find pertinent information in the Oracle Applications Help System.

The following help navigation path, for example—

(Help) General Ledger > Journals > Enter Journals

—represents the following sequence of actions:

1. In the navigation frame of the help system window, expand the General Ledger entry.
2. Under the General Ledger entry, expand Journals.
3. Under Journals, select Enter Journals.
4. Review the Enter Journals topic that appears in the document frame of the help system window.

Getting Help

Oracle Applications provides you with a complete online help facility.

Whenever you need assistance, simply choose an item from the Help menu to pinpoint the type of information you want.

To display help for a current window:

1. Choose Window Help from the Help menu, click the Help button on the toolbar, or hold down the Control key and type 'h'.

A web browser window appears, containing search and navigation frames on the left, and a frame that displays help documents on the right.

The document frame provides information on the window containing the cursor. The navigation frame displays the top-level topics for your responsibility, arranged in a tree control.

2. If the document frame contains a list of topics associated with the window, click on a topic of interest to display more detailed information.

3. You can navigate to other topics of interest in the help system, or choose Close from your web browser's File menu to close help.

Searching for Help

You can perform a search to find the Oracle Applications help information you want. Simply enter your query in the text field located in the top-left frame of the browser window when viewing help, then click the adjacent Find button.

A list of titles, ranked by relevance and linked to the documents in question, is returned from your search in the right-hand document frame. Click on whichever title seems to best answer your needs to display the complete document in this frame. If the document doesn't fully answer your questions, use your browser's Back button to return to the list of titles and try another.

11*i* Overview of Flow Manufacturing

Chapter 1

11i Overview of Flow Manufacturing

11i Overview of Flow Manufacturing

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Objectives

After completing this lesson, you should be able to do the following:

- **Understand the role of Demand Management in Flow Manufacturing**
- **Understand the use and function of Product Families**
- **Create and maintain Product Family forecasts**
- **Understand how and when Product Family forecasts are consumed**
- **Understand the role of MDS/MPS in Flow Manufacturing**
- **Understand the purpose and functionality of tolerance fences**

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Agenda

Agenda

- **Managing Demand in a Flow Environment**
- **Designing and Balancing Flow Lines**
- **Scheduling and Sequencing Flow Lines**
- **Executing Flow Line Production**
- **Planning and Executing Kanbans**

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Agenda

Agenda

- **Managing Demand in a Flow Environment**
- Designing and Balancing Flow Lines
- Scheduling and Sequencing
- Executing Flow Line Production
- Planning and Executing Kanbans

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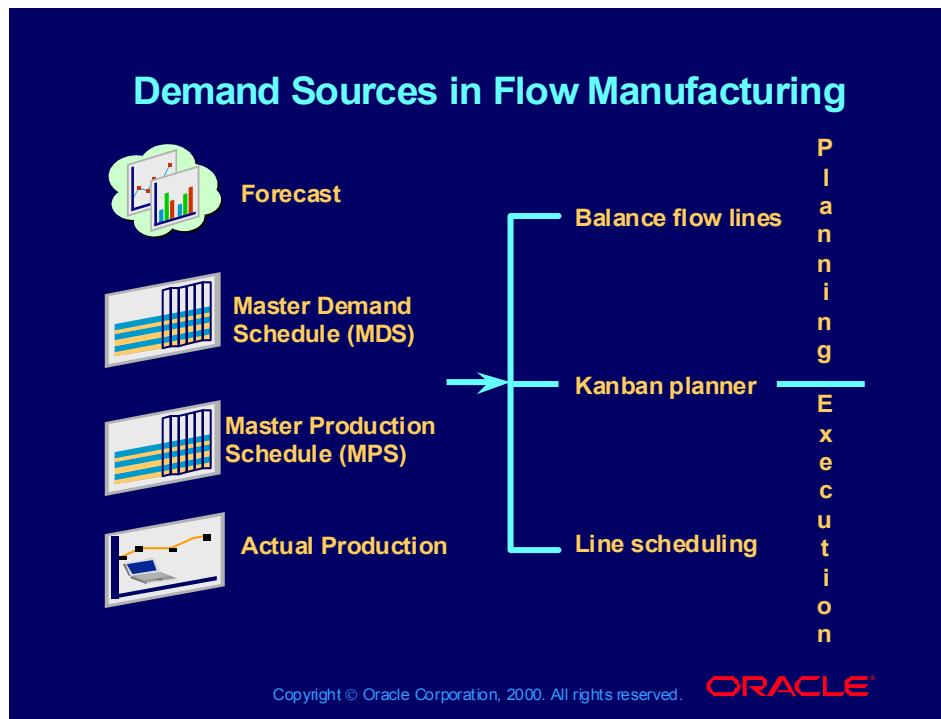
Overview

- **The role of Demand Management in Flow Manufacturing**
- **The use and function of Product Families**
- **Create and maintain Product Family forecasts**
- **Understand how and when Product Family forecasts are consumed**
- **The role of MDS/MPS in Flow Manufacturing**

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Demand Sources in Flow Manufacturing



Demand Sources

Demand sources are used in Flow Manufacturing during both the design phase and during manufacturing execution.

During the design phase they are used for:

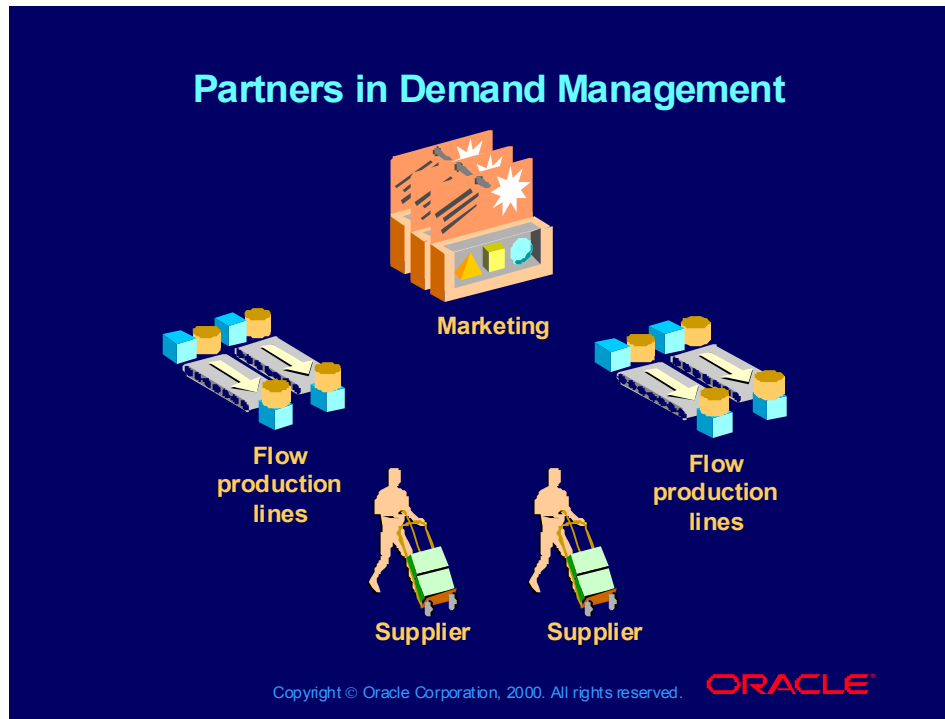
- Defining the design capacity of the flow lines and establishing line TAKT.
- Sizing and stocking kanban containers to support the design and customer demand.

During execution customer orders or planned orders are scheduled for production on the flow line. Once scheduled, that demand can be used for:

Comparing the mix and demand of the schedule to the balanced line to determine bottlenecks and resource requirements.

- Comparing the schedule to the production kanbans to determine if component supplies are adequate.

Partners in Demand Management



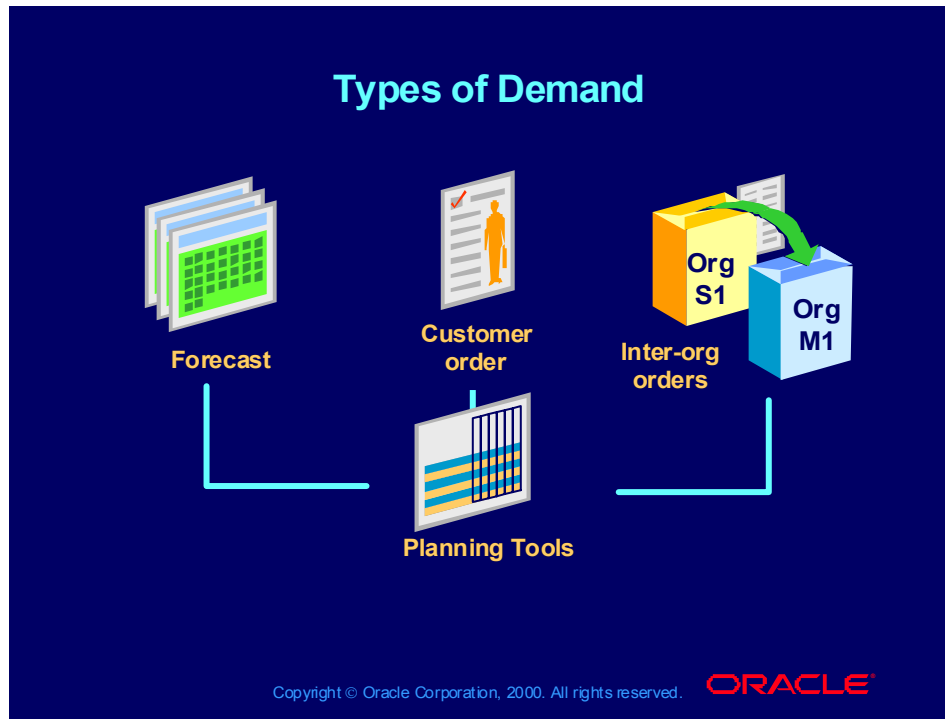
Demand Management

In Flow Manufacturing, the need to create a partnership between Sales and Marketing, production and suppliers becomes essential to success. Strategy must be developed to synchronize the flow of products from supplier to the flow line, to the distribution network, and finally to the customer.

In determining the demand schedule, the following factors should be taken into account:

- Product volume
- Factor pricing and promotions within the product volume
- Supplier relationships developed to support product volume
- Predicted growth patterns
- New product introductions

Types of Demand



Types of Demand

Oracle Flow Manufacturing uses the *Demand Management* tools provided in *Oracle APS*, *MPS/MRP*, or *Supply Chain Planning* to plan production.

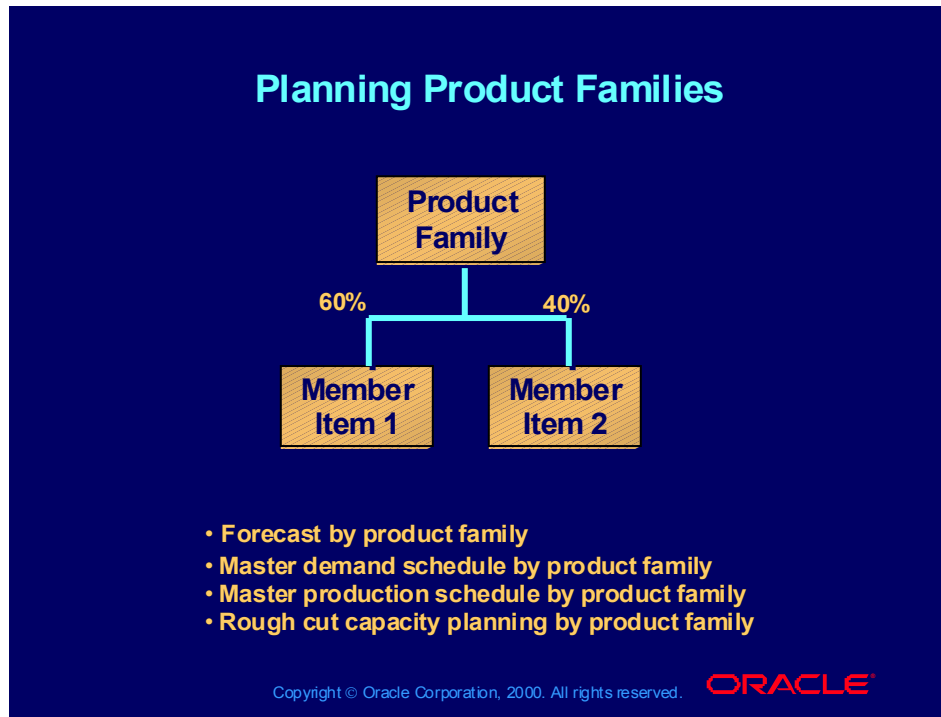
Types of Demand include:

- Forecasts: By Product Family or Finished Goods

Note: Product Family forecasts cannot be generated from member item shipments

- Customer orders
- Inter-org transfer orders
- Manual MDS entries
- Manual MPS entries

Planning Product Families



Planning for Product Families

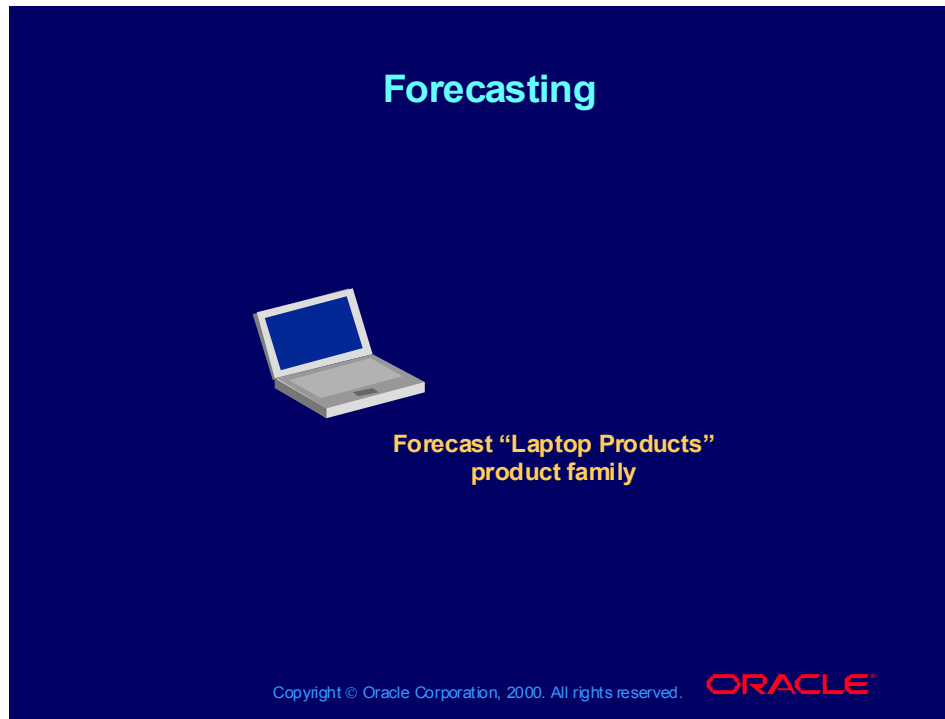
In Flow Manufacturing where mixed model production is supported, planning at the aggregate level of product family yields greater accuracy. To plan production for a flow line by product family:

- Forecast by product family
- Schedule for product family
- Plan material for product family

Note: Typically, a Flow Line is designed for one specific product family containing a mix of products. However, flow lines can be designed for multiple product families.

Note: Product families are not required for flow manufacturing.

Forecasting



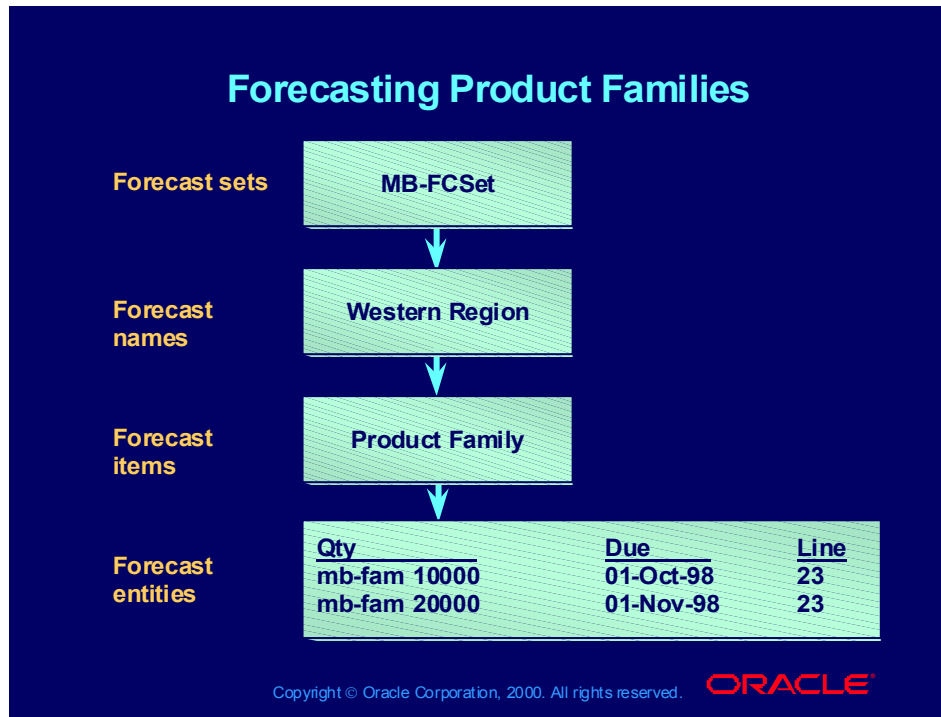
Forecasts

A forecast shows predicted future demand for items over time.

You can forecast at the aggregate level using product family forecasts. With each forecast entry, you enter the days, weeks, or periods and the quantities that you expect to ship. The product family forecast is then exploded to its members.

You can load forecasts, together with sales orders, into master demand and production schedules, and use the master schedules to drive line design, kanban requirements and planned material requirements.

Forecasting Product Families



Forecasting for Product Family

Forecasts for product families are created like any other manual forecast. You must:

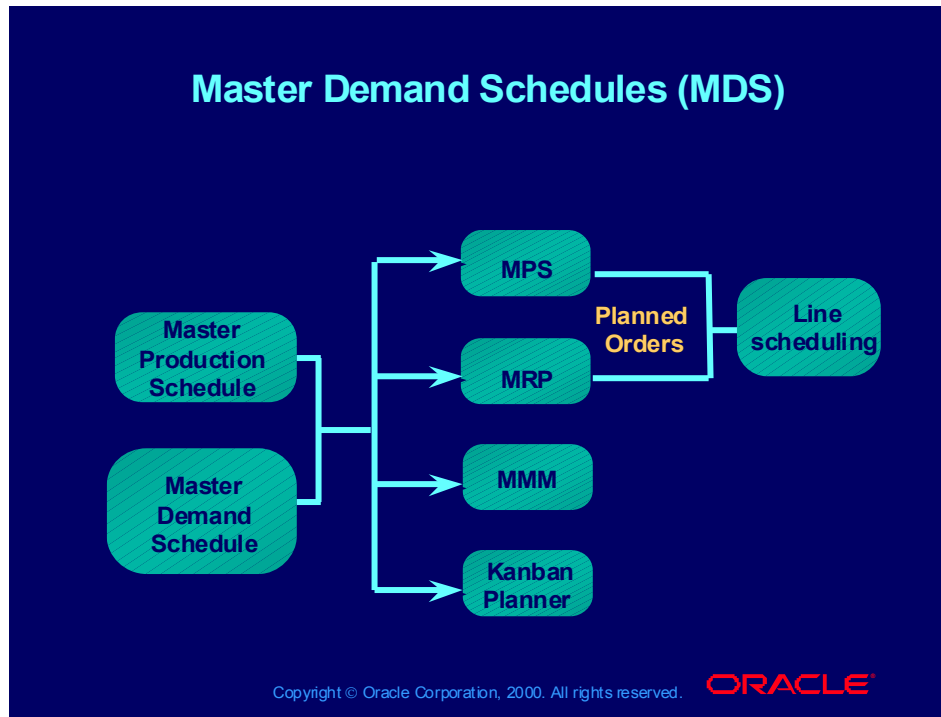
- Create a forecast set.
- Create one or more forecast names.
- Add product family items to forecast names.

Note: You can add forecasts for any item, along with product family forecasts.

- Add forecast entries for product families items.

Optionally, assign product family forecast entries to a specific flow line. If left blank, then the system looks for a flow routing to determine the line.

Master Demand Schedules (MDS)



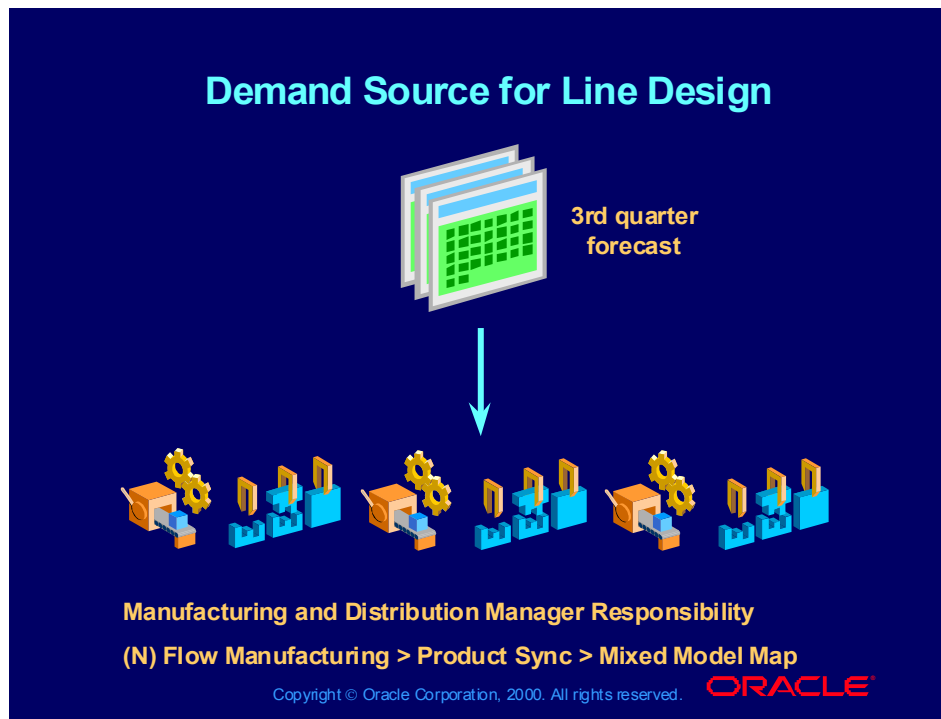
Master Demand Schedule

In a flow environment, a long term forecast is used to design the line, design kanban sizes, and do capacity planning (via the Mixed Model Map). Then, the execution system (line scheduling, MMM, work order-less completions, and kanbans) runs the shop based on actual customer orders. MDS/MPS and MRP are not required to run the daily activities of the shop floor. However, an MPS or MRP plan should be used to get long term visibility of component requirements for kanban items.

Other reasons you may use MDS or MPS:

- You operate in a mixed-mode environment, and you want the MPS to release production for non-Kanban items, or create planned orders for discrete production lines operating in the same organization.
- You want to schedule planned orders to compensate for seasonal industries, spares or internal requisitions.
- You are using Advanced Planning and Scheduling (APS) to optimize your flow schedules.

Demand Source for Line Design



Line Design/Mixed Model Map

(Help) Oracle Manufacturing Applications > Oracle Flow Manufacturing > Mixed Model Map > Entering Mixed Model Map Parameters

The mixed model map is a tool that displays the processes and products for a given line as well as the associated weighted times to complete the process. The mixed model map also displays the labor, machines and In-Process-Kanbans (IPK) resources needed to support forecast demand. This information is used to decide how to regroup events into line operations to balance the line.

Demand Type:

Forecast, MDS, MPS or Actual Production. Typically, you use a forecast to design your line, although you could use an MDS or MPS. Actual Production uses the current flow schedule in the date ranges you specify below. Use actual production when you are operating your line and want to compare actual production mix against your line design.

Demand Source for Kanban Planning



Kanban Plans

In *Oracle Flow Manufacturing*, you are able to create any number of baseline and simulation kanban plans in which you can calculate and store kanban quantities for each item/ kanban location. You are able to calculate optimal kanban quantities based on the demand schedule of your choice. When you create a new simulation plan, you are able to compare the newly calculated kanban quantities to those in the current production system (or any other plan) and make adjustments to the production system at your option.

Create Kanban Plan Name

(Help) Oracle Manufacturing Applications > Oracle Inventory >

Inventory Planning and Replenishment > Overview of Kanban Replenishment

All plans are tied to a specific demand forecast, MDS, MPS, or actual production.

Agenda

Agenda

- Managing Demand in a Flow Environment
- **Designing and Balancing Flow Lines**
- Scheduling and Sequencing Flow Lines
- Executing Flow Line Production
- Planning and Executing Kanbans

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Overview

Overview

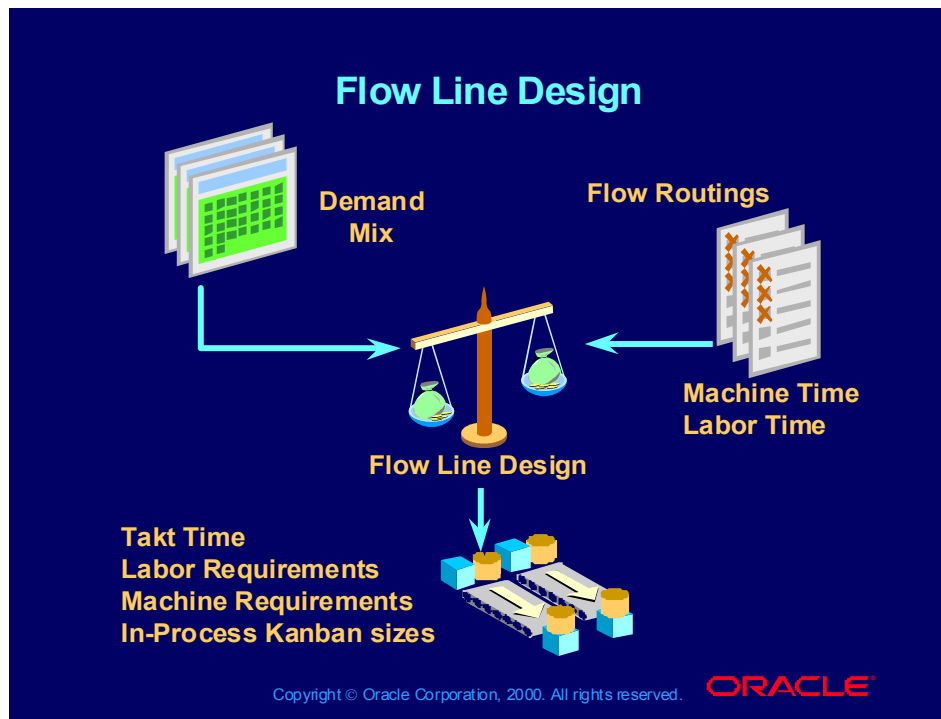
- Understand the process that leads to the creation of balanced flow lines
- Generate the Mixed Model Map
- Describe the information displayed
- Identify imbalances and bottleneck processes
- Resequence events to balance operation takt
- Update the flow routing with operations that balance the flow line

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(Help) Oracle Manufacturing > Oracle Flow Manufacturing >
Line Design and Balancing > Flow Manufacturing Line Balancing

Flow Line Design



Line Design and Balancing

The MMM mathematically analyzes your demand mix against each product's routing requirements. Precise recommendations to adjust resources and/or inventory are presented to you. You can then be proactive and act on those recommendations to ensure a smooth-flowing, balanced line that meets your customer demand.

Typically the design process is an iterative procedure. First, processes and their work events are created; then the calculated takt time is compared to the Process times to determine how many Line Operations are needed. Specific work events are grouped into the Line Operations such that the sum of their work content is less than or equal to the Line takt.

If resource requirements cannot be met the MMM will calculate the amount of temporary work-in-process inventory that is needed to buffer these constrained line operations. These buffers are called In-Process Kanbans and are located on either side of the constrained resource. Typically, that resource will be worked extra hours or shifts to both consume and build their IPKs.

Flow Line Design Prerequisites

**Demand
Mix**



Before you use the Mixed Model Map:

- **Define each product to the organization.**
- **Define each product's bill of material.**
- **Define a production design demand.**
- **Optionally, define and group similar products into product families and assign allocations.**

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Flow Line Design Prerequisites

Flow Line Design Prerequisites

Flow Routings



Before you use the Mixed Model Map:

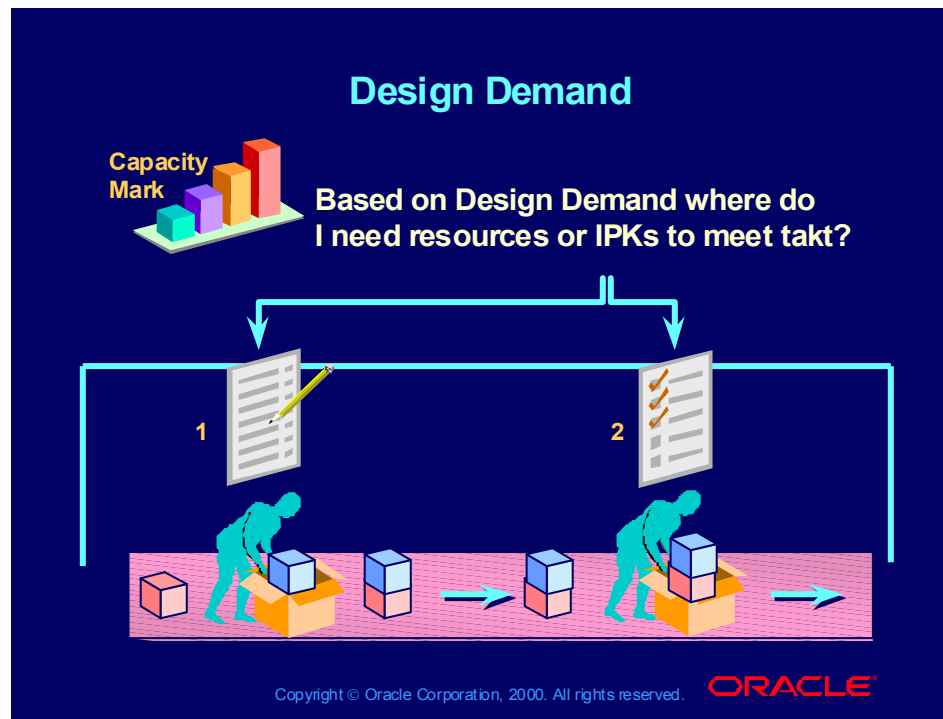
- **Define a flow line name.**
- **Define a flow routing for each product family member that contains:**
 - **Standard processes/line operations, events, and resources**
 - **Routing networks**
 - **Calculated Total Product Cycle Time (TCPT)**
 - **Calculated labor and machine time**

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(Help) Oracle Flow Manufacturing > Line Design and Balancing >
Creating a Flow Routing

Design Demand



Design Demands

Flow Lines are usually designed for a future demand and then staffed to the daily rate. The daily rate and sequence of demand determines what the output should be for the day and how the flexible work force should be deployed. When demand is under designed capacity, labor is pulled out of the line forcing the remaining labor to flex. The line adjusts to the daily demand as sequenced and will not over-produce.

Note: The daily total demand should never be more than the designed demand. Sequencing a higher than capacity demand down a line risks depleting your Kanbans and over-taxing your resources.

Responsiveness and Cost of Capacity

To design the line at capacity means you prepare or prestock the line with a specific amount of resource power, raw material (Kanbans), and optional In-Process Kanbans (IPK, imbalance equalizers)—in other words, money.

Capacity is a key business decision that enables a flow line to respond quickly to the future needs of the customer. Responsiveness is a weapon that can be used to drive competition out of the market place and allow businesses to gain market share.

Mixed Model Map: Takt

What Is takt?

- Takt is a German word for beat. In flow manufacturing, takt is a calculation and measurement tool.
- Takt is not related to machines needed or labor needed or IPKs needed. It is simply a statement of hours divided by demand.
- Units of work must complete to takt in order for the line to meet the daily demand.
- The flow line and every process/line operation is measured against their required takt.

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What Is Takt?

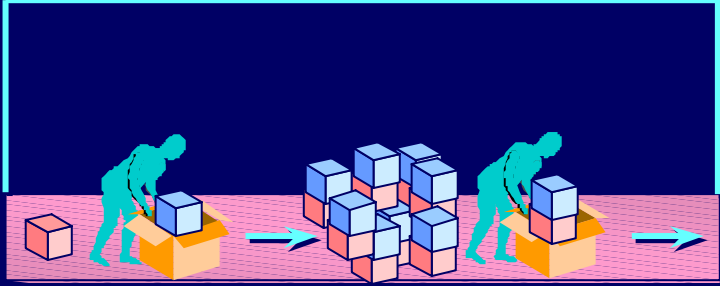
Flow lines achieve a level of mixed-model production because they are designed to ensure that each product is built within a specified amount of time (Line takt). Once the Line takt determined, performance is measured along the line at the process/line operation level. Imbalances (slow- or fast-moving processes/line operations) are discovered and adjusted to meet required takt. Adjustments to resources or inventory at the imbalance ensures that product moves through the production process at a steady rate from beginning to end with minimal stopping.

Line Takt and Process Takt

- Line takt: Displayed in the header section of the Mixed Model Map. It's simply the time or the speed at which the line must produce product to meet the daily demand rate.
- Process/Line Operation takt is the required performance of the process/line operation needed to insure the daily line rate. The demand at the process/line operation is the calculated process volume. The hours are the hours available (parameter form).

Line Imbalance

Line Imbalance



Make a business decision on how to solve the imbalance.

- **Add resources**
- **Use In-Process Kanbans (IPK)**
- **Re-group into line operations**

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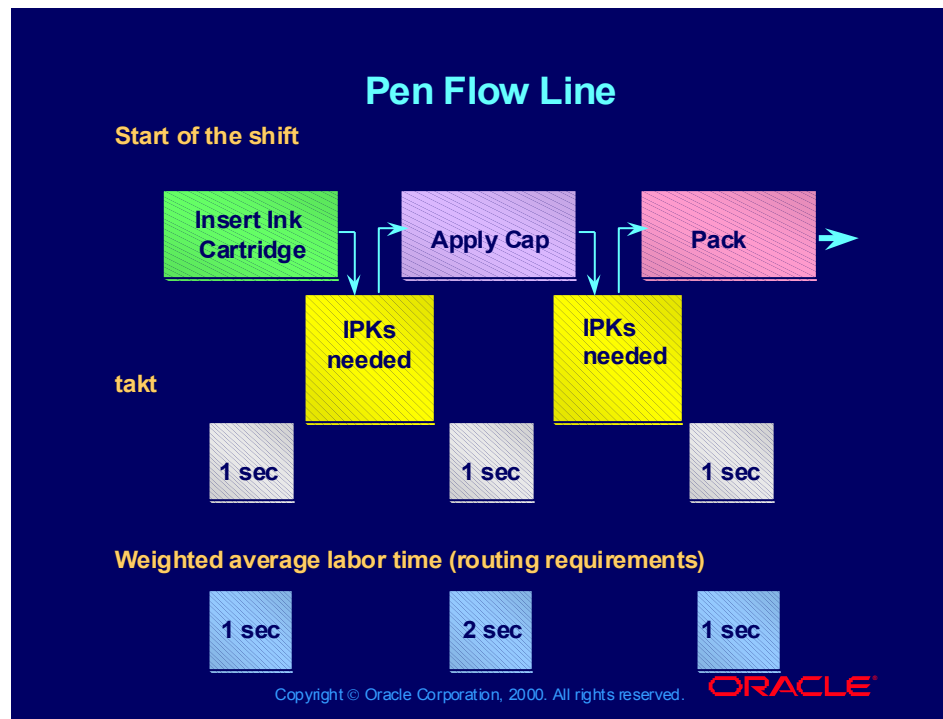
MMM Imbalances

An imbalance can occur in the line when one or more processes/line operation is not producing to the required takt. It might be because the process has higher process volumes or the required work just takes longer than the required takt.

How the line designer identifies the imbalance:

- Look at the mixed model map calculated process/line operation takt and
- analyze the recommendations for labor, machines, and IPKs needed.
- Makes a business decision on how to solve the imbalance.
- Execute the corrective action.

Pen Flow Line



Using In-Process Kanbans

You can deal with an imbalance in several ways—flexing employees, adding shifts, or strategically placing in-process kanbans (IPK) as shown above. In-process inventory can be added based on the mixed model map IPK recommendation.

Since the Insert Ink Cartridge and Pack processes are at takt there are no IPKs required. However, the Apply Cap process moves at a much slower rate and experiences the same Process Volume as the other two. Apply Cap takes 2 seconds to perform the work on one unit when a unit should be produced every second. To adjust for this imbalance, IPKs are inserted before and after the Apply Cap process. The result: Two shifts are worked at the Apply Cap process in order to reduce the input kanban and to fill the output kanban. This action keeps the Insert Ink Cartridge and Pack processes moving at a smooth rate during one shift.

In-Process Kanbans

IPKs are a special type of Kanban. Unlike a real raw material Kanban, IPKs do not have a part number. They are simply piles of partially completed work put in sequence to keep the line moving at a rate that meets demand.

Agenda

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- Designing and Balancing Flow Lines
- **Scheduling and Sequencing Flow Lines**
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- Planning and Executing Kanbans

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Overview

- **Schedule production through the Line Scheduling workbench**
- **Name the business drivers that affect the choice of a scheduling policy**
- **Describe how to protect production from demand variability (volume and mix)**
- **Manage your line schedules through the Line Scheduling workbench. View unscheduled orders**
 - **Create, view, and maintain flow schedules**
 - **Check component availability**

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Objectives

After completing this course, you should be able to do the following:

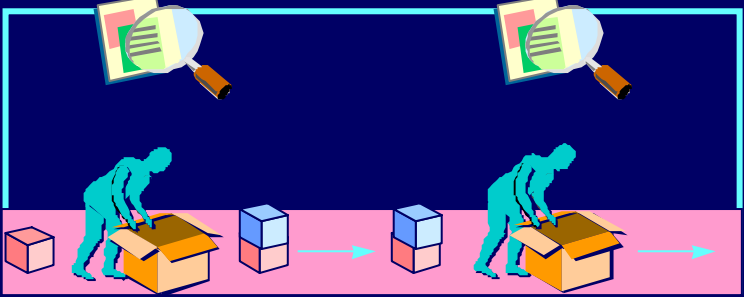
- **List the process steps for creating flow schedules on synchronized feeder lines**
- **Demonstrate when and how to roll flow line schedules**

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Line Sequencing and Scheduling Benefits

Line Sequencing and Scheduling Benefits



Line sequencing and scheduling can avoid production that:

- Is too slow
- Is too fast
- Is overloaded and does not have enough resources
- Is idle and has too many resources

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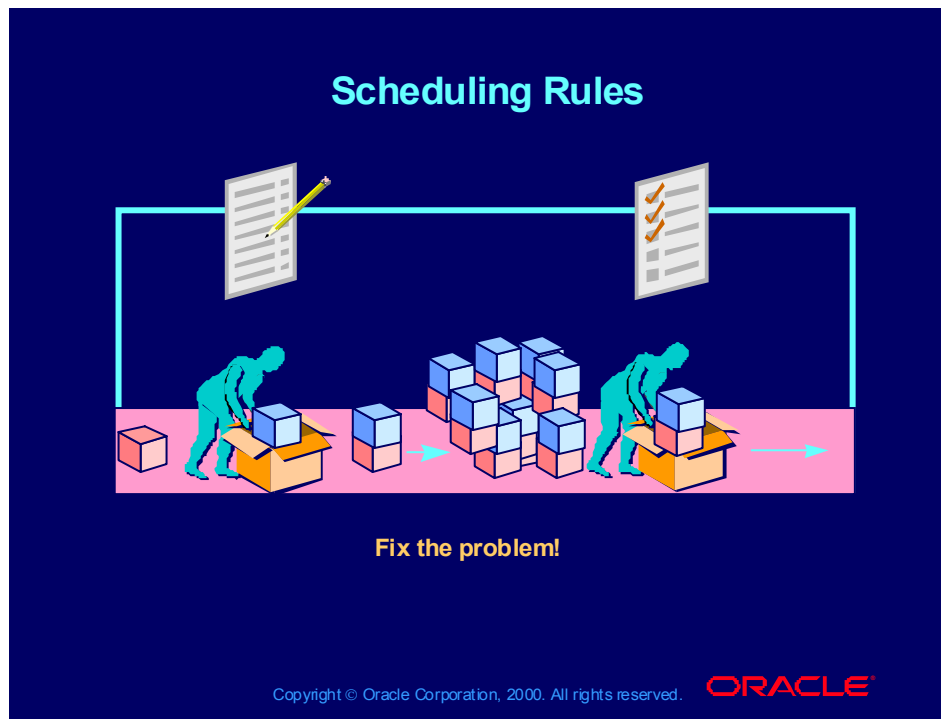
Overview of Line Scheduling

Flow Manufacturing uses production lines and rate-based schedules instead of work orders to control production. Production occurs on lines that have been designed and balanced to synchronize your activities and customer demand.

Line scheduling does the following:

- Sequences and schedules sales orders from Oracle Order Management and planned orders from Oracle Planning to the line capacity. You can create flow schedules that represent a volume and mix of products.
- Synchronizes production to customer demand, and establishes a realistic pace and flow of products throughout your production and supply chain.
- Provides WIP schedulers the ability to plan, simulate, and schedule the production lines using the Line Scheduling workbench.

Scheduling Rules



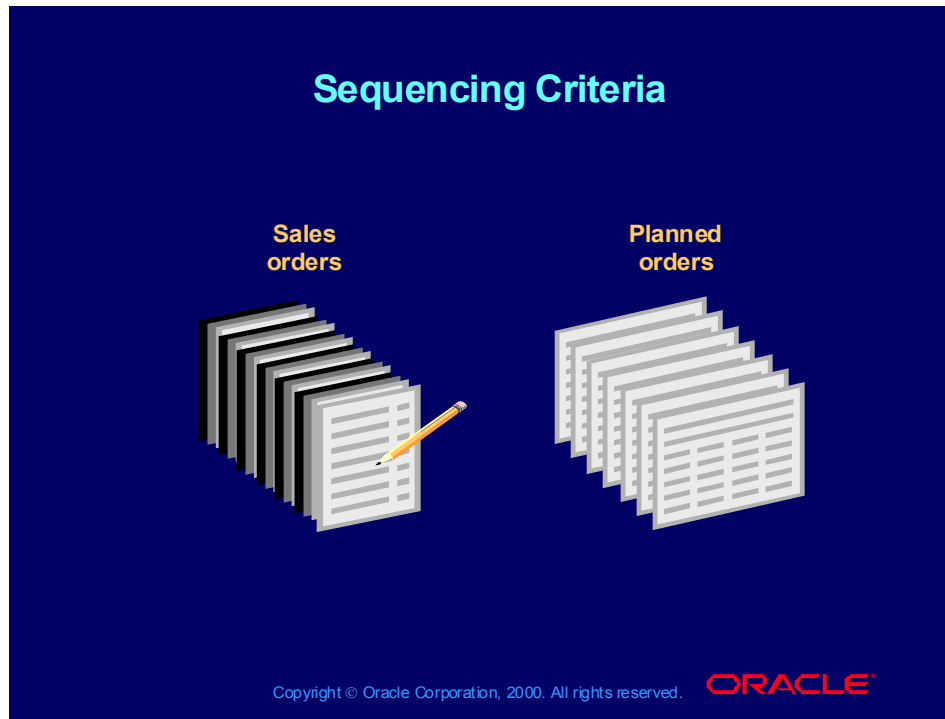
Definition and Business Process

Scheduling rules contain the logic used to set the sequence and quantity for the flow schedules. The rule is composed of the criteria used to sequence the orders and an algorithm that determines how much of each item to schedule each day. This logic helps you to pull your demand forward or backward in time in order to meet takt for the current day. Several types of scheduling rules are provided with Oracle Flow Manufacturing. You can define a unlimited number of rules that pertain to all organizations.

Types of Rules

- **Predefined rules:** Predefined scheduling rules combine one sequencing criterion and a system algorithm. Five predefined rules are provided. They are listed on the following page.
- **System definition-type rules:** These are user-defined scheduling rules that you create by combining one or more of the system-provided sequence criteria with a system-provided algorithm.
- **User definition-type rules:** You can also create your own rules by modifying the custom line scheduling procedure that is executed at the time of scheduling flow lines.

Sequencing Criteria



Sequencing Flow Schedules

Flow schedules can be sequenced on one or more of the following criteria. The sequence in which you enter your selections determines the order of priority:

- Order Entry Date
- Order Priority
- Order Promise Date
- Order Request Date
- Order Schedule Date

Considerations

For unscheduled planned orders, the generated planned order due date is the only criterion used for sequencing.

If you do not select a sequencing criterion, the system defaults to the sales order schedule date or to the planned order suggested due date.

Scheduling Algorithms

Scheduling Algorithms

Scheduling algorithms are used in conjunction with sequencing criteria to create scheduling rules. The three seeded algorithms are:

No Level Loading

- **Level Daily Rate**
- **Mixed Model**

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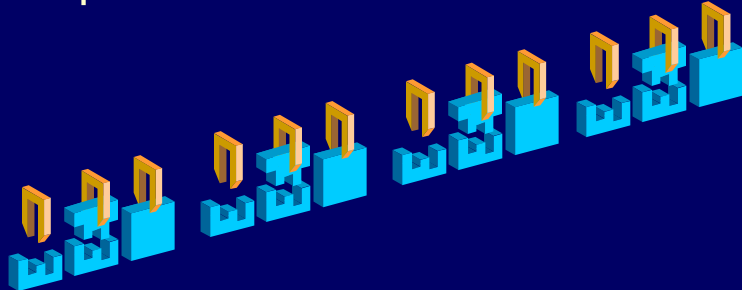
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(Help) Oracle Flow Manufacturing > Line Scheduling Workbench >
Defining Scheduling Rules > Scheduling Algorithms

No Level Loading Algorithm

No Level Loading Algorithm

- Protects production from volume variation
- Schedules to line rate
- Sequence based on criteria



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Definition and Business Process

Flow schedules are sequenced according to the designated sequencing criteria, and the demand is placed in the days of the scheduling horizon. Starting with the first available day, demand is scheduled until capacity is reached.

The sequencing criteria determines the sequence of the flow schedules. Beginning with the sales order line with the lowest sequence (or highest priority), the order lines are scheduled in ascending order. This preserves capacity for future orders.

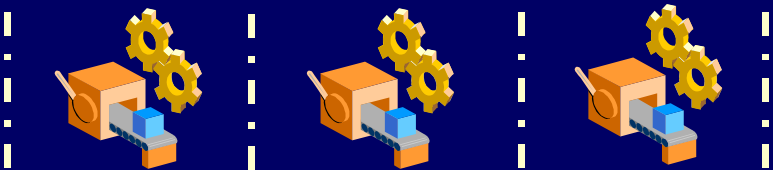
If you select a scheduling rule that uses the No Level Loading algorithm, the criterion defined in the scheduling rules is used to prioritize and sequence the orders. Orders are scheduled with capacity considerations beginning with the first available date of the scheduling date range. If the entire quantity of the sales order cannot be satisfied on a date, the remaining quantity is scheduled on subsequent days where capacity is available.

This rule protects production from volume variation by scheduling only up to the daily line rate. Any demand exceeding that rate is scheduled for the following day. Therefore this rule is based on the finite capacity in the factory. It sequences orders (sales orders or planned production orders) based on the defined criteria.

Level Daily Rate Algorithm

Level Daily Rate Algorithm

- Protects production from volume and mix variation
- Minimizes setup
- Considers demand ratio of the item (demand for item/demand for family)
- Schedules to demand daily ratio
- Schedules to line rate
- Sequence based on criteria



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Definition and Business Process

If you choose to schedule your line using the Level Daily Rate, each item is scheduled at a rate in regard to the demand ratio of the item. The demand ratio of an item equals the total demand for the item divided by the grand total demand. It is multiplied by each day's available capacity to determine how much of an item will be scheduled every day.

Within a day, all of the same product are scheduled sequentially, thereby minimizing setup on the shop floor.

This rule protects production from volume variation by scheduling only up to the daily line rate. Any demand exceeding that rate is scheduled for the following day. Therefore this rule is based on the finite capacity in the factory.

This rule reduces mix variation by spreading the mix evenly across the scheduling horizon based on demand ratio.

Level Daily Rate sequences orders (sales orders or planned production orders) based on the defined criteria.

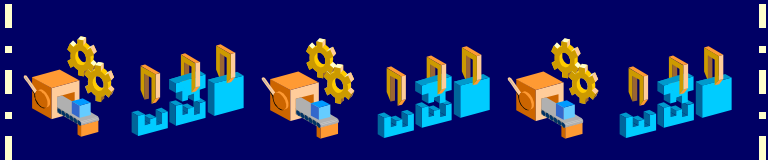
On planned order types only, order modifiers can be used to define the quantity of flow schedules.

The day's demand for an item is built consecutively at one time during the day.

Mixed Model Algorithm

Mixed Model Algorithm

- Protects production from volume and mix variation
- Considers demand ratio of the item (demand for item/demand for family)
- Schedules by unit quantities
- Schedules to line rate
- Sequence based on criteria



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Business Process

Similar to the Level Daily Rate algorithm, the Mixed Model algorithm schedules production at a rate governed by the demand ratio of each item in order to establish a production pattern for a mix of items.

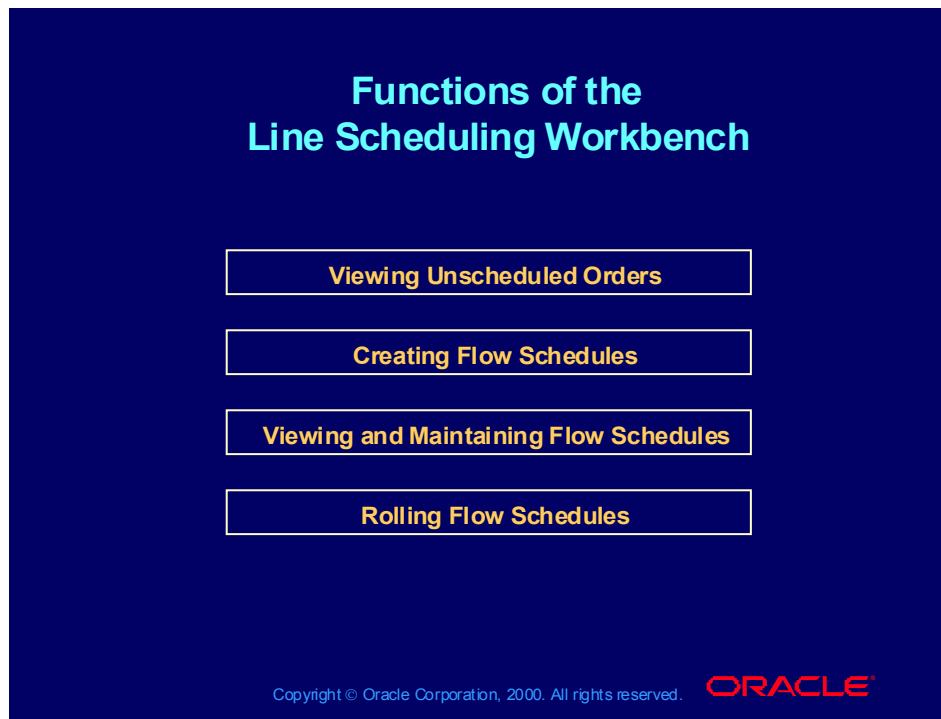
The demand ratio is an item's demand, divided by the demand for all items to be scheduled within that scheduling horizon. It is multiplied by each day's available capacity to determine how much of an item will be scheduled every day.

A sequencing pattern is developed based on the item's demand ratio. The pattern is run repeatedly throughout the day. A single item may therefore be built several times in the same day.

This rule protects production from volume variation by scheduling only up to the Level Daily Rate. Any demand exceeding that rate is scheduled for the following day. It sequences orders (sales orders or production orders) based on the defined criteria. Therefore this rule is based on the finite capacity in the factory. It also minimizes mix variation by spreading the demand mix evenly across the scheduling horizon, scheduling a repeated pattern of that mix within each day.

Note: This rule always creates schedules in unit quantities regardless of the order modifiers.

Functions of the Line Scheduling Workbench



Functionality

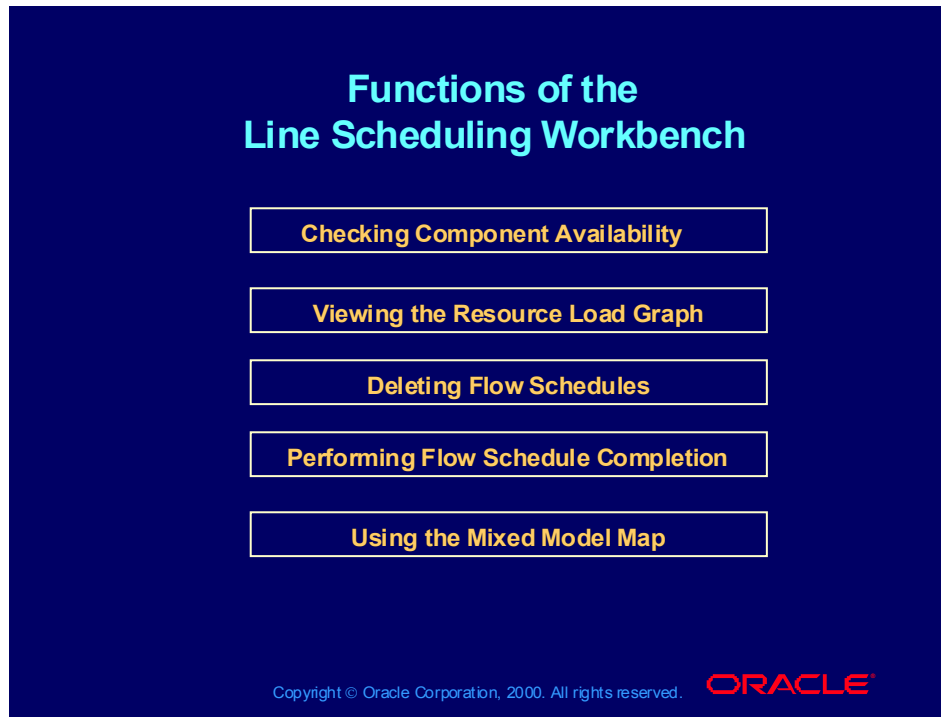
The Line Scheduling Workbench Options window is the interface to the other flow scheduling windows. The available functions in all windows are:

- Viewing unscheduled orders: You can view unscheduled orders in the Unscheduled Orders window. You can display either unscheduled planned orders or sales orders. These unscheduled orders can be converted into flow schedules.
- Creating flow schedules: You can create flow schedules from sales orders or planned orders using your scheduling rules.
- Viewing and maintaining flow schedules: You can view and modify schedule quantities and dates of flow schedules.
- Rolling flow schedules: You can roll flow schedules forward, based on under-completions and over-completions, in order to adjust future production.

(Help) Oracle Manufacturing Applications > Oracle Flow Manufacturing > Line Scheduling Workbench >

Overview of Line Scheduling in Flow Manufacturing

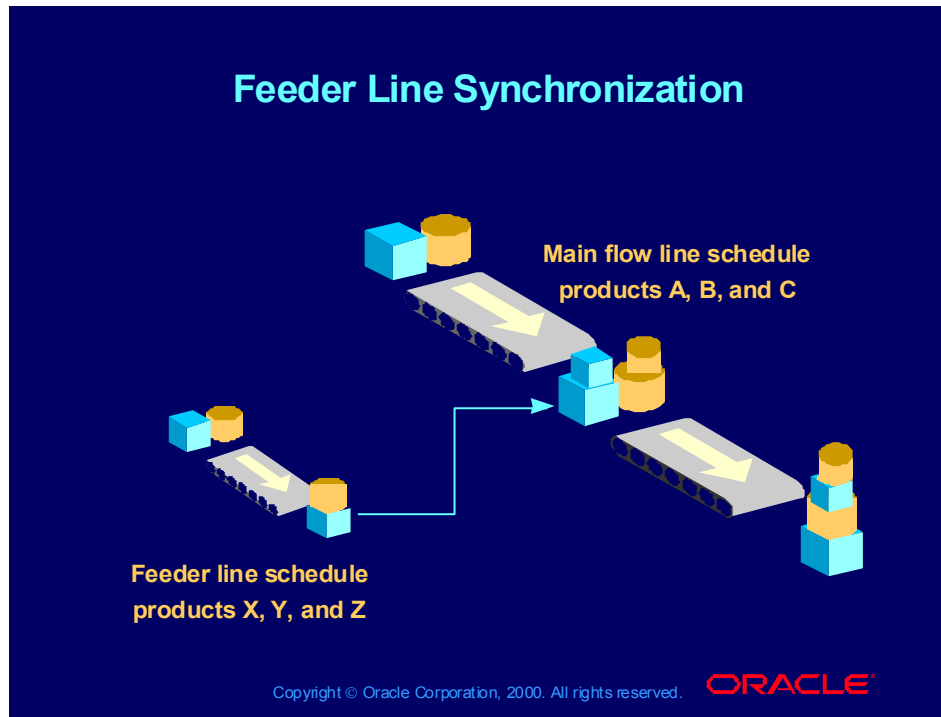
Functions of the Line Scheduling Workbench



Functionality (continued)

- Checking component availability: You can view component availability in the ATP Results window.
- Viewing the resource load graph in relationship to available capacity: You can view a graphical representation of the required load of the line and its associated resources.
- Deleting flow schedules: You can delete flow schedules in order to provide a clean slate for new schedule generation.
- Performing flow schedule completion: You can perform completion transactions for scheduled flow schedules when production is finished.
- Using the mixed model map: You can open the Mixed Model Map window from the workbench. You use this window to monitor your resource requirements against the scheduled production.

Feeder Line Synchronization



Definition and Business Process

(Help) Oracle Manufacturing Applications > Oracle Flow Manufacturing >
Line Scheduling Workbench > Other Features >
Feeder Line Synchronization

With Flow Manufacturing you can create schedules for subassemblies that are directly derived from parent assembly line schedules. You can specify a line, or range of lines, and a date range as input. These subassembly feeder lines use sequence information from the parent assembly schedules to synchronize their production.

Benefits

- With a synchronized feeder line schedule, you can control the sequences of subassemblies produced on the feeder line in support of customer demand.
- You can support complex mass customization environments.
- Kanban and in-process kanban inventory can be reduced.

•Setup

- This functionality relies on:
 - Existing multilevel bills of material
 - Flow routings for nonphantom subassemblies
 - Feeder line completion date equal to primary line start date

Summary

- You can use seeded algorithms and sequencing criteria to create your scheduling rules; or, because the system is extensible, you can specify a custom procedure to sequence complex problems.
- You can manage your line schedules through the Line Scheduling workbench. With the workbench, you can:
 - View unscheduled orders
 - Create, view, and maintain flow schedules
 - Check component availability
- Derive schedules for feeder lines from parents

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Agenda

Agenda

- Managing Demand in a Flow Environment
- Designing and Balancing Flow Lines
- Scheduling and Sequencing Flow Lines
- **Executing Flow Line Production**
- Planning and Executing Kanbans

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Objectives

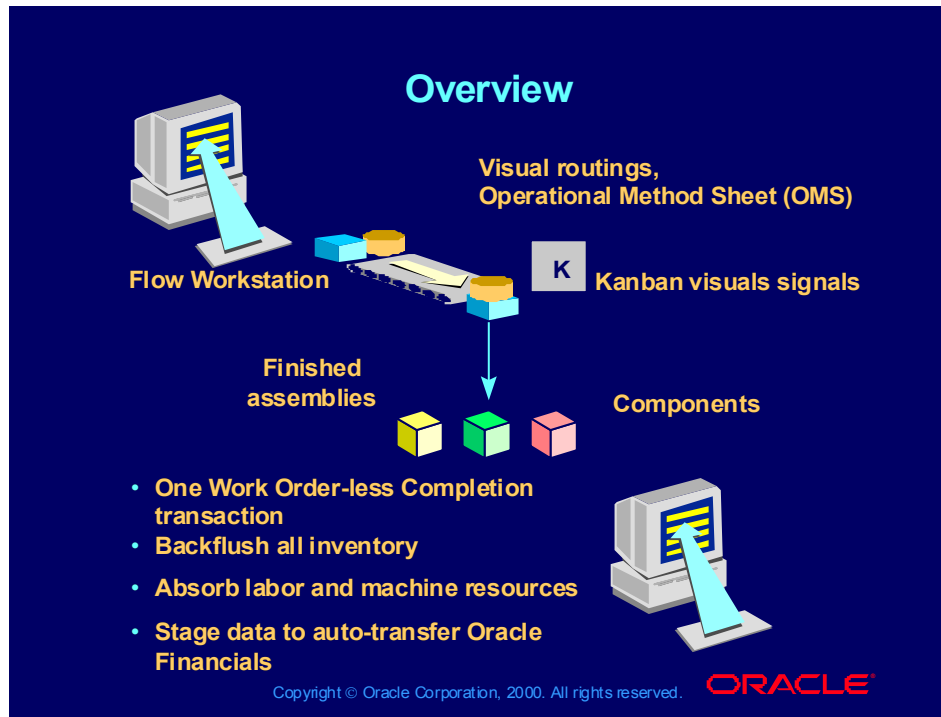
After completing this lesson, you should be able to do the following:

- **Use the Flow Workstation to monitor the work content at a specific line operation**
- **Perform a work order-less completion of a product**
- **Establish a quality collection plan to record quality data at work order-less completion**
- **Scrap assemblies at specific line operations**
- **Explain how serial numbers and lot numbers are assigned during completion**
- **Explain how components can be substituted**

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Overview



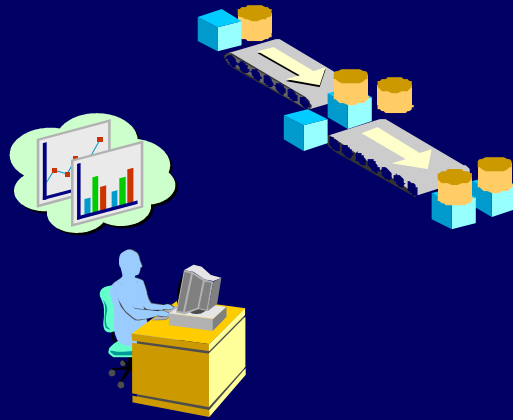
Overview of Production Execution

With your flow line established, scheduling rules in place, and your flow schedules created, you can follow the execution of your plan with the tools and completion functions provided.

- The Flow Workstation is a robust feature that presents work activities, component requirements and operational method sheets to a line operation.
- Work Order-less Completions is used to:
 - Backflush pull and push components
 - Charge resources and overhead based on the Flow routing
 - Complete assemblies to a designated completion subinventory/locator

Component requirements for work order-less completions are determined by the assembly bill. You can optionally add components that are not on the assembly bill and delete components that are on the assembly bill. You can also specify lot/serial information for components under lot, serial, or lot and serial number control.

Flow Workstation Overview



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Definition and Business Process

The Flow Workstation provides you with a highly graphical and intuitive user interface for managing production execution. It employs a tree structure that allows you to navigate through flow production schedules in an easy-to-understand manner. All the information and transactions that are used frequently are provided in a simple graphical format.

You can use the workstation to track the flow throughout the production line, request kanban replenishments, view work instructions, and record completions of flow schedules.

(Help) Oracle Work in Process > Flow Manufacturing > Flow Workstation

Work Order-less Completions Overview

Work Order-less Completions Overview



- **One Work Order-less Completions transaction**
- **Backflush all inventory**
- **Absorb labor and machine resources**
- **Stage data to auto-transfer Oracle Financials**

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Overview of Work Order-less Completion

Work order-less completions do all of the following in one simple step:

- Backflush pull and push components
- Charge resources and overhead based on the Flow routing
- Complete assemblies to a designated completion subinventory/locator

Component requirements for work order-less completions are determined by the assembly bill.


- You can optionally add components that are not on the assembly bill and delete components that are on the assembly bill.
- You can also specify lot/serial information for finished assemblies and components under lot, serial, or lot and serial number control.

Scrapping an Assembly

Scrapping an Assembly

Transaction Type

WIP Assembly Scrap



Assembly

Line

Schedule Number

Unit of Measure

Quantity

Scrap Line Operation

Use the Work Order-less Completions window to complete your scrap transaction.

Manufacturing and Distribution Manager Responsibility
Flow Manufacturing (N) Production > Work Order-less Completions

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Scrap Assemblies

(Help) Oracle Work in Process > Flow Manufacturing > Flow Schedules > Scrapping Flow Scheduled Assemblies

Setup

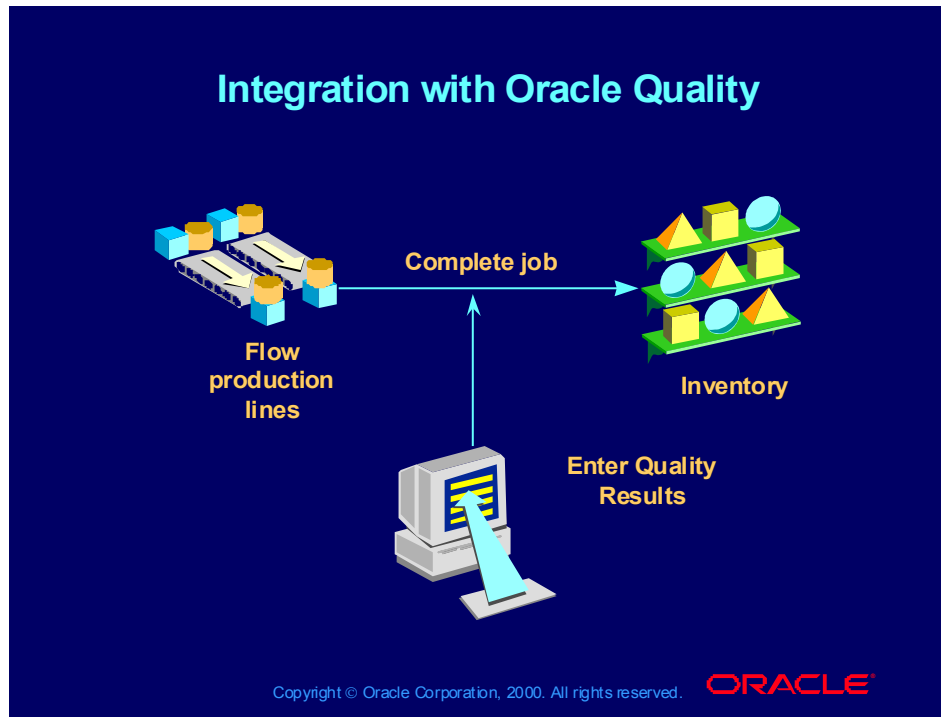
This function relies on:

- Existing flow routings and operation resources
- Bill of material components assigned to specific routing events
- Specified scrap accounts for scrap transactions and return from scrap transactions
- The establishment of line operations on the flow routing

Considerations

If you use scrap transactions, the operational sequence number on the bill of material must match the flow routing event where the component material is consumed. Therefore, when you enter the transaction for a midpoint line operation, only component materials up to and including that line operation are backflushed.

Integration with Oracle Quality



WIP Completion Transactions Integration

You can collect quality data when performing a Work Order-less Completions transaction. You can use this feature to collect the inspection results and descriptive attributes of your assemblies as they are completed.

Benefits

- Data collection can be made mandatory where the transaction cannot be completed unless the required data is entered.
- Material specifications can be enforced.
- Actions, such as alerts, can be invoked based on the collected results.
- Data is collected in the background, so the user is not required to enter results directly.

Prerequisites

- Create a collection plan, defined at implementation time, that has the collection elements on which you want to collect data.
- Associate the collection plan with the Work Order-less Completions transaction to invoke your collection plan during the Work Order-less Completions transaction.

Agenda

Agenda

- Managing Demand in a Flow Environment
- Designing and Balancing Flow Lines
- Scheduling and Sequencing Flow Lines
- Executing Flow Line Production
- **Planning and Executing Kanbans**

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Objectives of Kanban Planning

After completing this lesson, you should be able to do the following:

- **Identify the Item, BOM, and Pull Sequence attributes critical to enabling an item for Kanban planning**
- **Create and maintain Kanban Pull Sequences and replenishment chains**
- **Identify the four ways a Kanban location can be replenished**
- **Generate a Kanban plan from a forecast, MDS, MPS, or actual production**

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Objectives of Kanban Planning

- Update the production plan with new Kanban sizing
- View and compare Kanban plans to the production plan
- Generate and print Kanban cards
- Be familiar with Kanban card statuses
- Add nonreplenishable Kanban cards

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Objectives of Kanban Planning

- **Explain the supplier's role, Approved Supplier List (ASL)**
- **Replenish kanbans**

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Kanban Management

- Minimize inventory investment (replenish material only when needed)
- Increase inventory turns
- Stage material at point of use
- Integrate suppliers and other business units into the supply chain (flexibility, reliability)
- No work order kits
- No kit robbing

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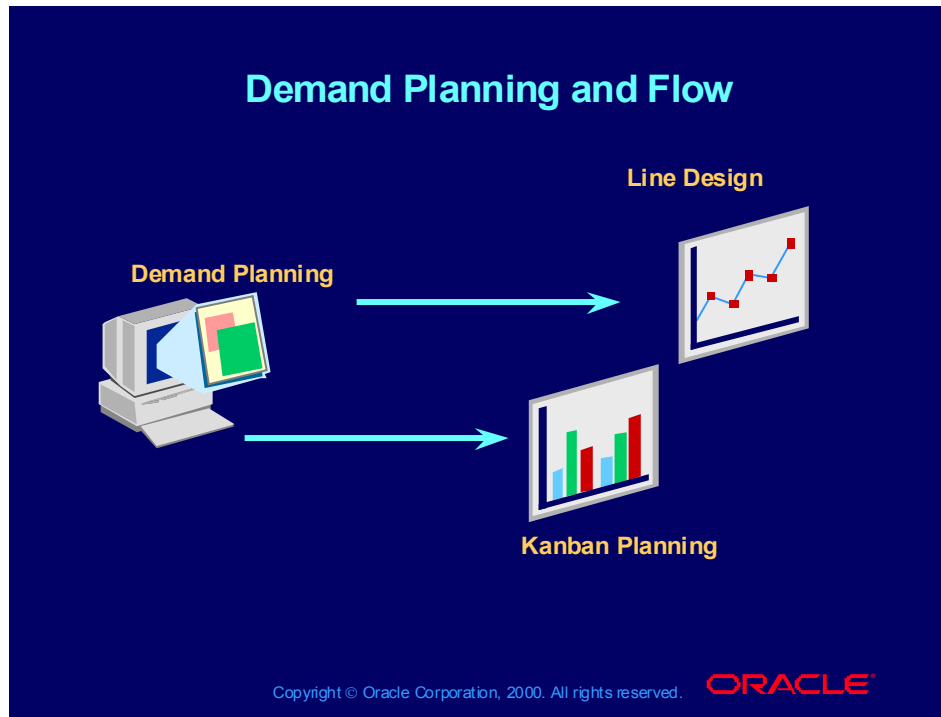
Overview of Kanban Management

Kanban is a pull replenishment system with objectives of zero stockouts, shorter lead times, and reduced inventory with minimal manual supervision. Instead of waiting for an MRP plan to *push* materials to the floor, each operation *pulls* the material it needs from its sources at the time it needs it, signaling with a replenishment signal.

Kanban Definition

The term Kanban refers to a visual replenishment signal, such as a card or an empty container for material. In a Kanban system, each work station on the flow line can have several containers, each holding the same quantity of material. Typically, an empty container is a signal to replenish. Meanwhile, work is continued using the other full Kanban containers at the location.

Demand Planning and Flow

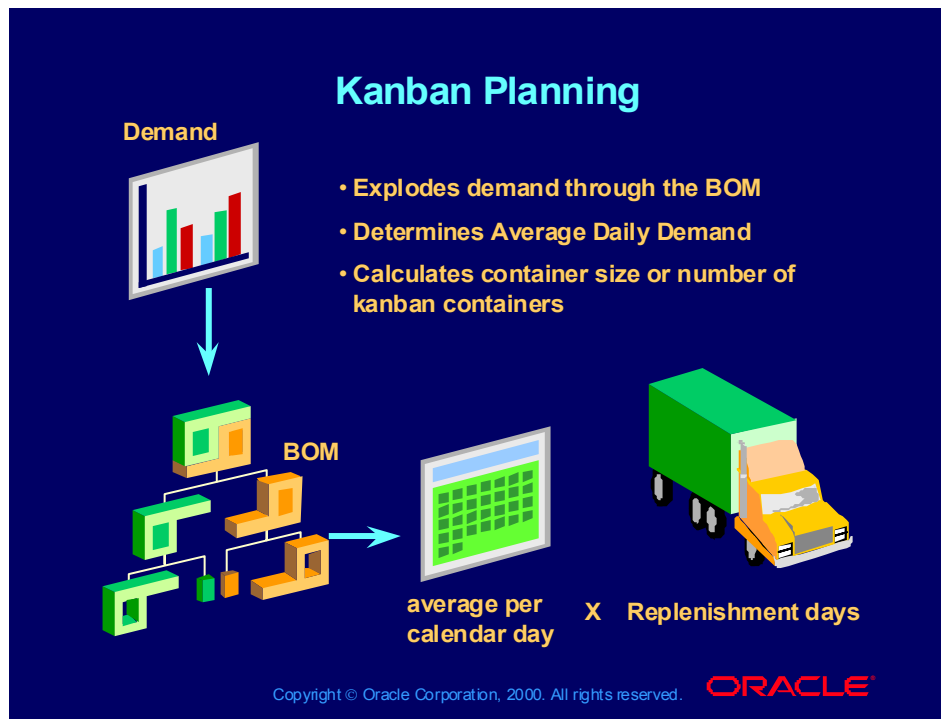


Demand Planning and Flow Manufacturing

Demand sources are used in Flow Manufacturing for both Line design and Kanban planning.

Specifically, demand planning is used to define the design capacity of the flow lines and establishing line TAKT. Typically, that same demand is used for sizing kanban containers to support the line design and customer demand.

Kanban Planning



Kanban Planning

Kanban planning is used to calculate the Kanban container quantity or number of containers for each component item at each point of use. The demand is specified for the finished assemblies and their bills of material are exploded to derive component quantities at consumption points. Additional factors such as replenishment time, safety stock and lot multipliers are used in the final calculation.

A kanban plan based on the same demand that was used for line design (establishing the demand at capacity) will help ensure that the components are available to support the production that the line was designed for.

Kanban Execution



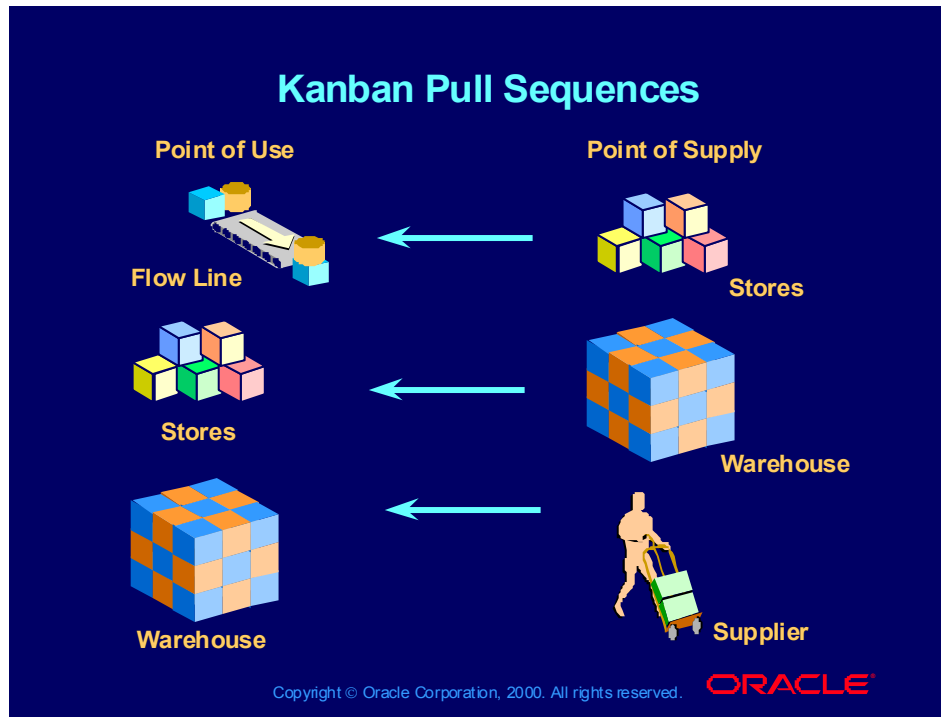
Kanban Execution

As component material is used it must be replenished. The replenishment is done with a signal, either visual or electronic.

The visual signals typically include the movement of kanban cards, the emptying of a shelf space or just the existence of an empty container.

Electronic signals are used to initiate additional processes within an ERP system such as the automatic creation of a release against a blanket purchase order.

Kanban Pull Sequences



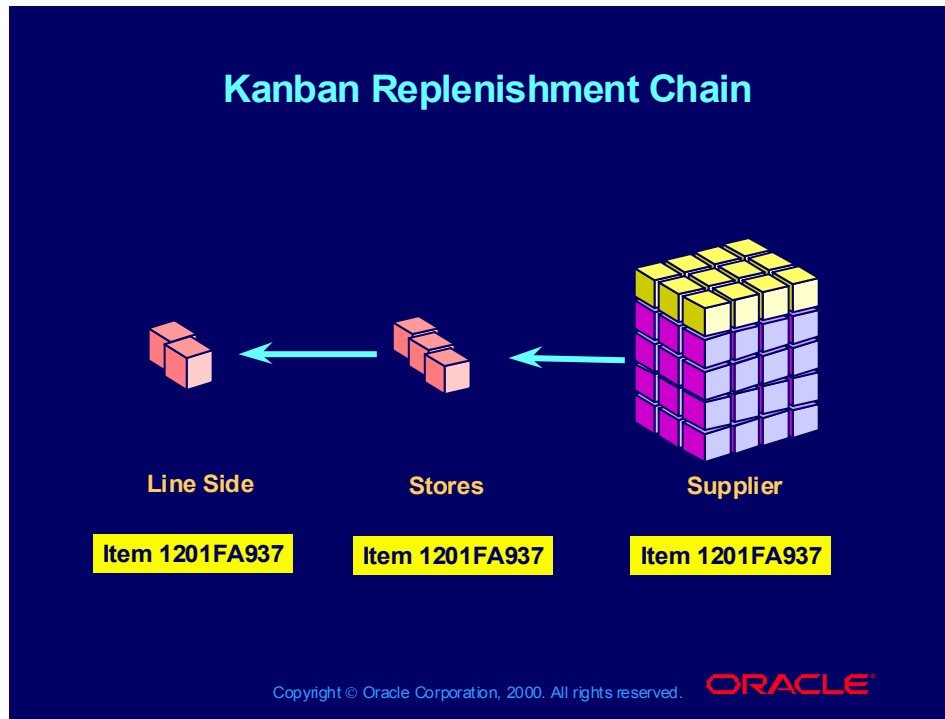
Kanban Pull Sequences

Pull sequences define the relationship between an item, its point of use and its point of supply. The attributes of a pull sequence define the kanban size, number of kanban containers, replenishment time, safety stock, lot multiplier and method of replenishment.

- Move Order
 - Intra Org Transfer
 - Inter Org Transfer
- Supplier
- Production

Multiple pull sequences may exist for an item if it is pulled from several sources. This is typically referred to as a pull chain.

Kanban Replenishment Chain

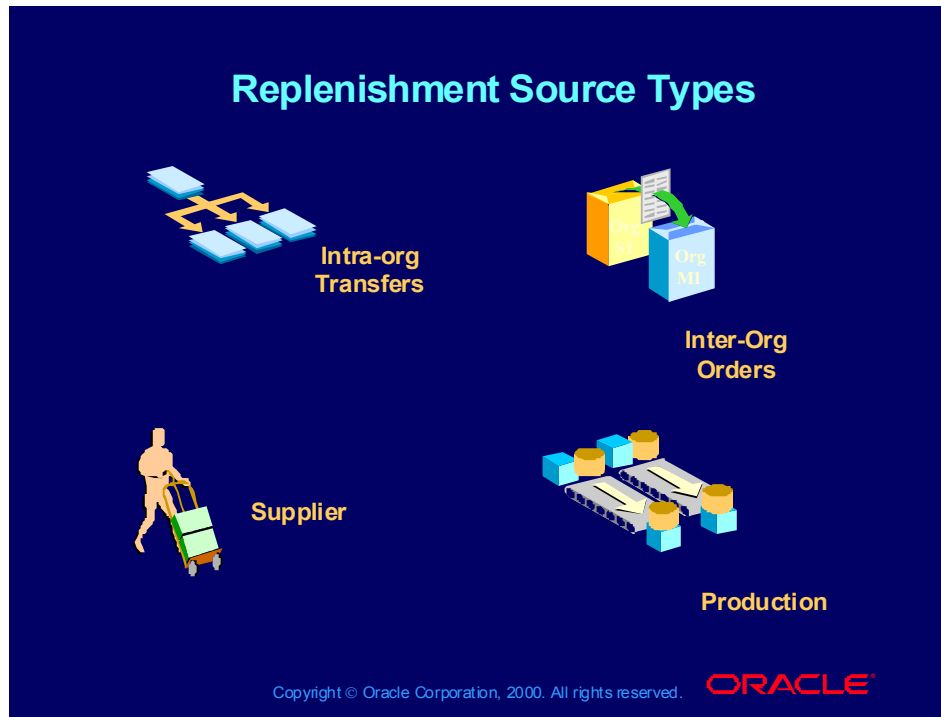


The Flow Line at Vision Computers

The figure above shows a Kanban replenishment chain supporting a flow line. The Kanban replenishment chain is nothing more than multiple Kanbans that replenish each other.

Each link in the chain would have a different kanban size (or number of containers) based upon the differences in replenishment times and other factors.

Replenishment Source Types



Four Methods to Replenish Kanban Locations

- Production, if you intend to have the Kanban replenished by a WIP job, Flow Schedule or Repetitive schedule.
- Supplier, if you intend to have the Kanban replenished by an outside supplier.
- Inter-org, if you intend to have the Kanban replenished by another Inventory Organization. The item must be Internal Order enabled at the organization level.
- Intra-org, if you intend to have the Kanban replenished by a subinventory/locator within the same Inventory Organization.

Calculation Methods

You can select the calculation method as follows:

- **Do Not Calculate:** Enter a value in the **Size** and **Number of Cards** fields.
- **Kanban Size:** Enter a value in the **Number of Cards** field and optionally enter a value in the **Minimum Order Qty** field.
- **Number of Cards:** Enter a value in the **Size** field, and optionally enter a value in the **Minimum Order Qty** field.

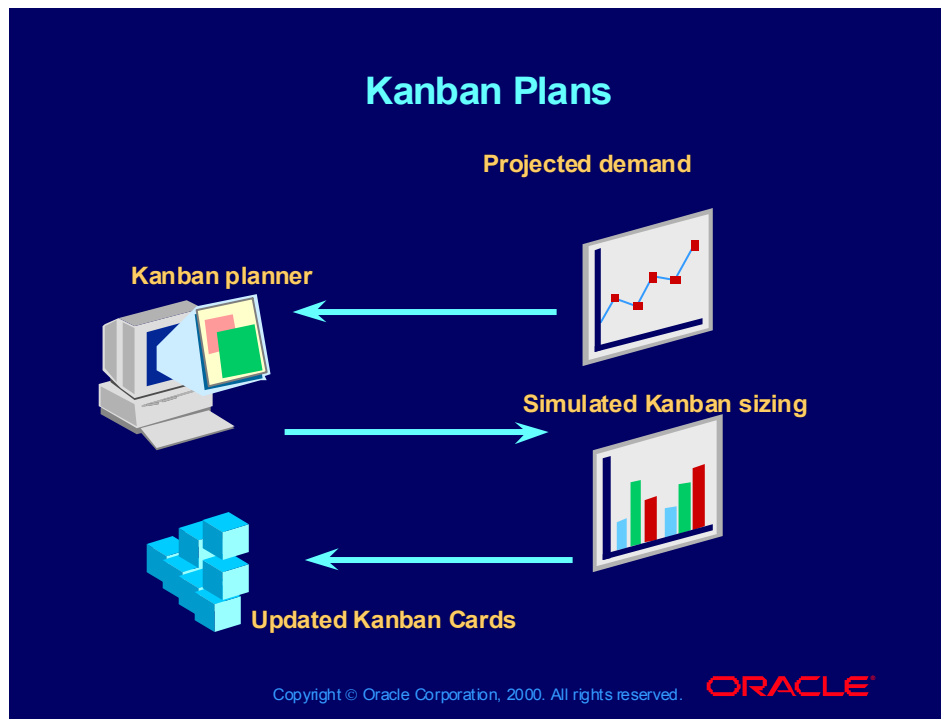
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Calculate

- **Kanban Size:** You will enter the number of Kanban Cards, and the Kanban Planner will calculate the Kanban size.
- **No of Cards:** You will enter the size of the Kanban, and the Kanban Planner will calculate the number of cards.
- **Do not Calculate.** The Kanban planner will not plan for this location. You must enter both Kanban size and number of containers.

Kanban Plans



Create Kanban Plans

(Help) Oracle Master Scheduling/MRP > Using the Kanban Calculation Program

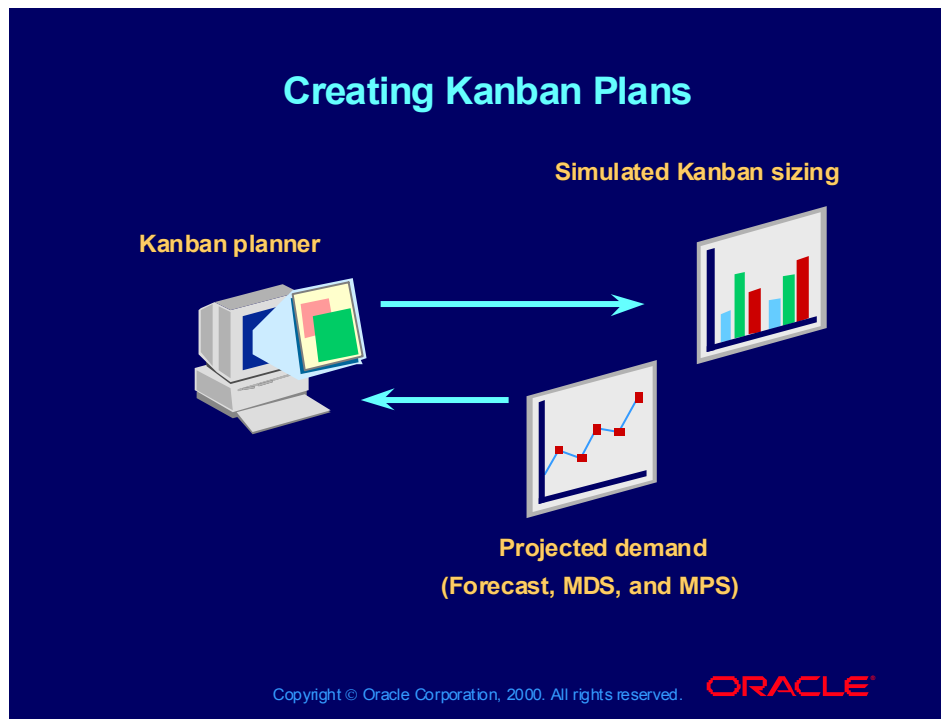
Calculating the kanban size or the number of kanban cards involves two steps:

- telling the application what demand information to use
- submitting a request for the calculation program

In the Kanban Names form, you are able to define any number of Kanban plans in which you can calculate and store Kanban quantities for each item/Kanban location. You will be able to calculate optimal Kanban quantities based on any demand schedule you choose.

Once created, you are able to compare the new Kanban quantities to those in the current production system and optionally make updates to the production system.

Creating Kanban Plans

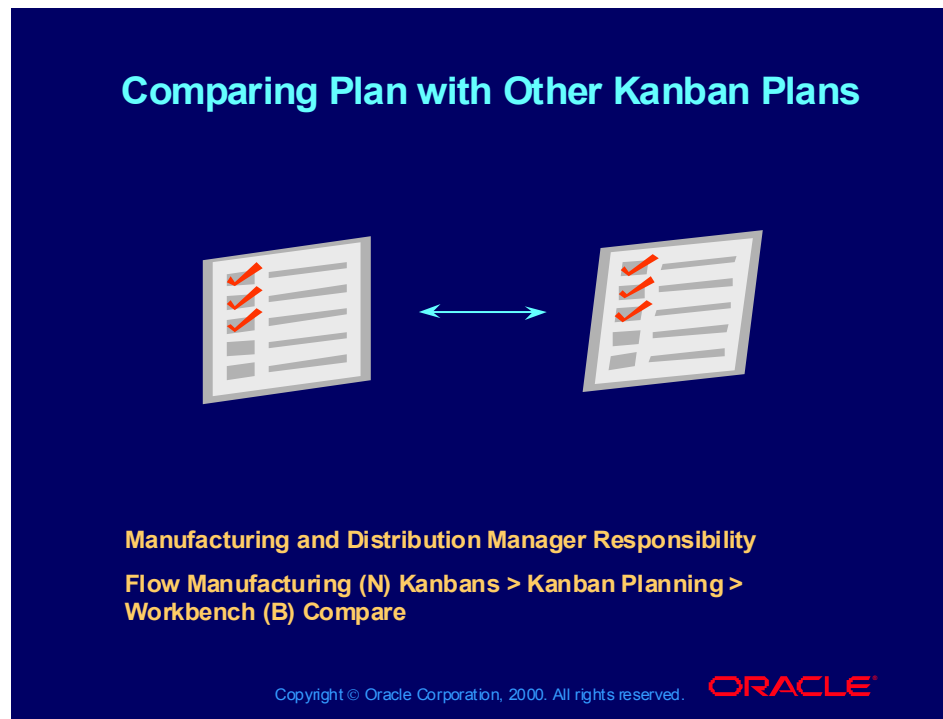


Kanban Plan Names

In choosing a demand type of either MDS, MPS, or Forecast, you are defining your intent to load one of those demand schedules into the Kanban Plan when you launch the Kanban Plan. The Forecast/Schedule field is the actual demand you wish to base your sizing calculations on.

Note: Remember, we are sizing the Kanbans to capacity, even though daily demand requirements will tend to be less. This is something typically done only once or twice a year, unless there is a huge increase in demand (maybe new product is added to the Product Family). Spikes in Demand do not warrant new Kanban sizing as they are resolved with Nonreplenishable Kanbans.

Comparing Plan with Other Kanban Plans



Comparing Plans

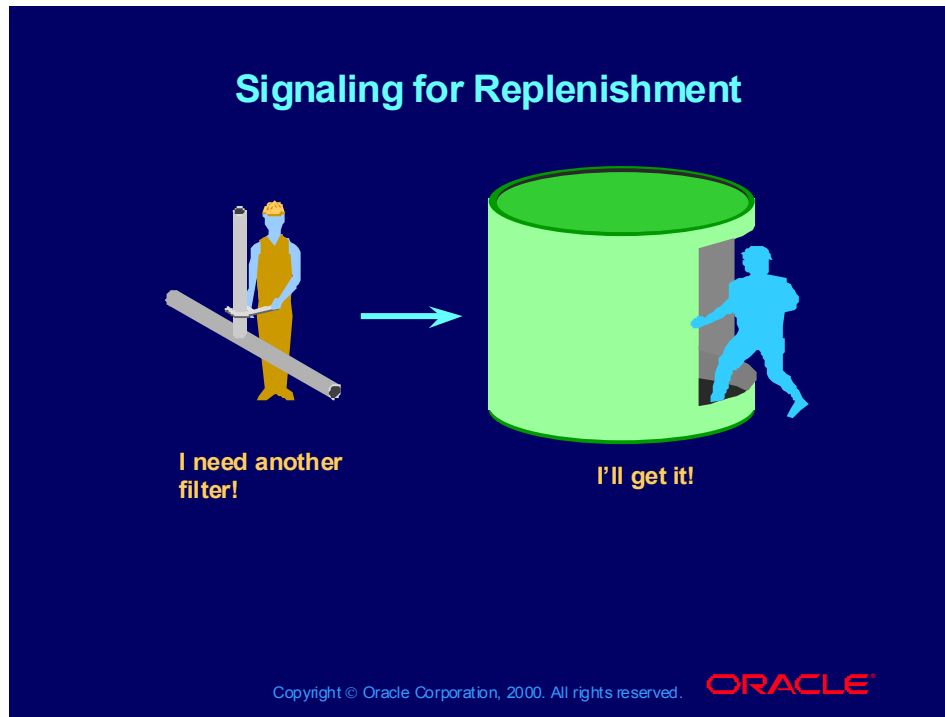
From the Kanban Workbench window, use the Compare button to open the Kanban Comparison Criteria window. You can compare the most recent launch of the Kanban plan with the recommendations previously saved in the Pull Sequence. This is essentially comparing your Kanban Plan to Production.

Instead of comparing Kanban planned items one-for-one, you can limit your comparison by using the following criteria:

- Category
- Item
- Locator
- Planner
- Subinventory
- Variance

You can do this by picking on the Field segment in the Kanban Comparison Criteria window.

Signaling for Replenishment



Kanban Replenishment

(Help) Oracle Inventory > Inventory Planning and Replenishment >

Defining Kanban Cards

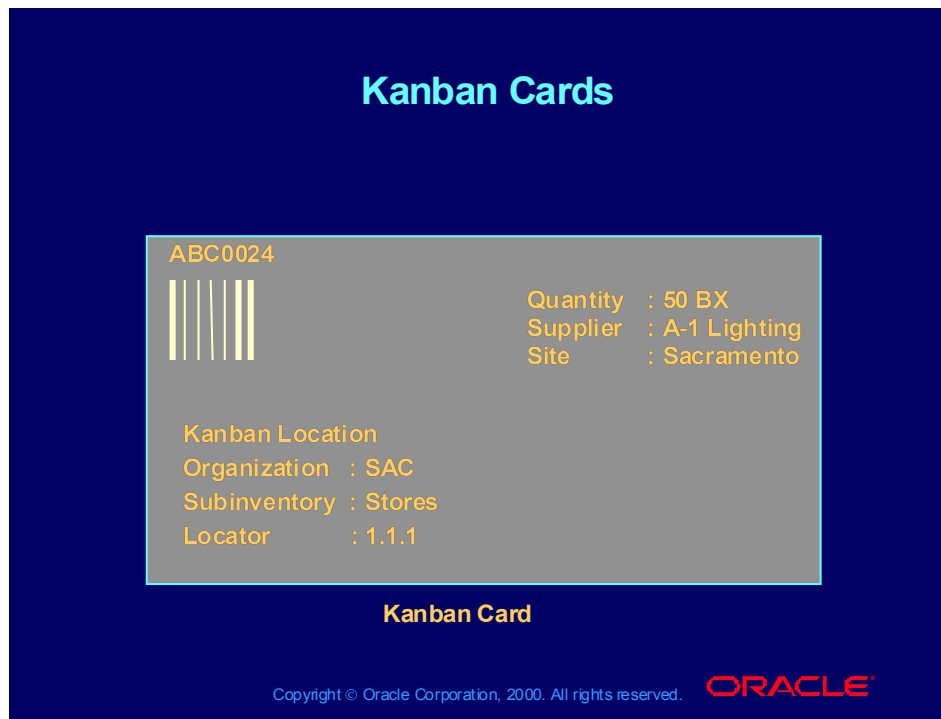
Kanban is a means of supporting pull-based replenishment in manufacturing systems. A Kanban system is a self-regulating pull system that leads to shorter lead times and reduced inventory. Kanban systems are typically applied to items that have relatively constant demand and medium-to-high production volume.

Kanbans represent replenishment signals that are usually manual and highly visible, such as a color-coded card that moves with the material, a light that goes on when replenishment is required, or an empty bin that is moved to the supply location to trigger replenishment.

The system provides support for external devices such as bar code readers to read Kanban cards and trigger a replenishment signal.

Kanbans are generally replenishable and cycle through the system from full to empty, remaining active until they are withdrawn. One-time signals called nonreplenishable Kanbans are used primarily to manage sudden spikes in demand.

Kanban Cards



Cards

Kanban cards are created for an item, subinventory, and locator (optional). They are uniquely identified by a Kanban number.

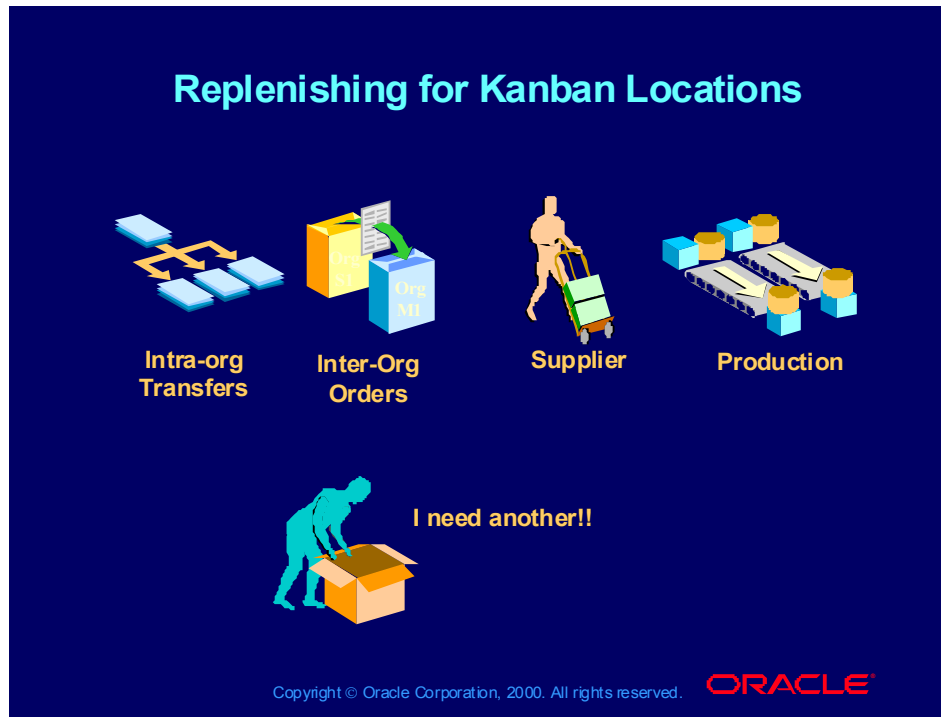
For cards generated from a Kanban pull sequence, the number is automatically generated. For manually defined cards, both replenishable and nonreplenishable, you can enter an unused Kanban number or let the system create the number.

Support of External Devices to Trigger Replenishment

An open API exists to enable the use of Bar Code readers, RF terminals to read a Kanban card and trigger replenishment.

The card example above is an example of customizations that can be done once a barcode has been added. Oracle Applications do print Kanban cards, but they do *not* include barcode. They do include the Item, From Locations, To Locations, and Quantity.

Replenishing for Kanban Locations



Supply Status = Empty

- Supplier Re-supply
 - Sends Purchase Order (PO)requisition to Purchasing
 - Follow standard PO release and receipt transactions
 - PO Receipt update Kanban card to Full
- Inter-org Re-supply
 - Sends PO requisition to Purchasing
 - Follow standard internal PO/SO release and receipt transactions
 - PO Receipts update the Kanban card to Full
- Intra-org Re-supply
 - Inventory Transaction creates a move order to transfer material from one subinventory/location to another.
- Production Re-supply
 - Creates a Flow Schedule, Discrete Job or Repetitive Schedule.

