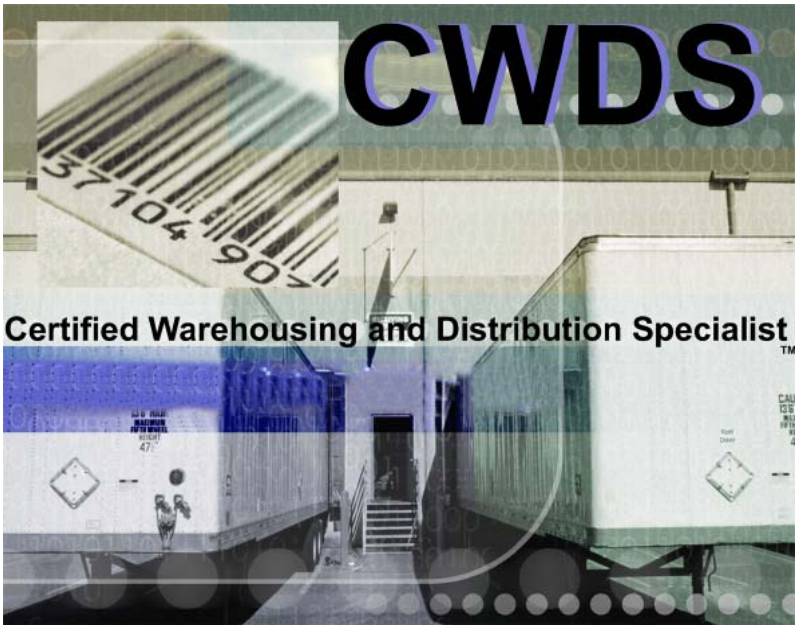

Instructor Guide

Methods of Inventory Management

QUICKSTART®
TECHNICAL COLLEGE SYSTEM OF GEORGIA

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Unit Description

Overview

Inventory management is critical to the success of any company. In today's world, a company must manage its entire supply chain. This means that inventory managers must understand (and manage) their own inventory as well as that of their suppliers. The often-changing demands of production means that manufacturers and suppliers must be strategically linked. In this unit we will discuss the types of inventory control systems, including MRP, the Just-in-Time philosophy and the Kanban process.

Objectives

The information, activities and practice provided in this unit will enable the participant to:

1. List the two classifications of inventory control systems.
2. State the advantages and disadvantages of a "push" system.
3. State the advantages and disadvantages of a "pull" system.
4. Explain the purpose of MRP.
5. List the three key inputs to MRP.
6. State whether MRP is a "push" or a "pull" system.
7. Explain the JIT philosophy.
8. List the seven goals of JIT.
9. State which ABC classification requires the most, less, or the least management attention.
10. List the two basic options businesses have when reordering raw material.
11. Explain how vendor-managed inventory can benefit both the supplier and the customer.
12. Explain the Kanban process.
13. State the two key factors involved with the Kanban process.

Materials

Instructor Guide

Participant Guides

PowerPoint Slides

1. Methods of Inventory Management
2-3. Objectives
3. Push Distribution System
4. Push System in Manufacturing
5. Pull Distribution System
6. Pull System in Manufacturing
7. Material Requirement Planning Inputs
8. Goals of Just-in-Time Philosophy
9. Implementing Just-in-Time
10. "ABC" Analysis
11. Fixed Quantity System
12. Fixed Time System
13. Advantages of Kanban
14. Key Factors Addressed by Kanban

Agenda

Introduction	15 minutes
Inventory Control Systems	60 minutes
Material Requirement Planning	45 minutes
Just-in-Time Philosophy	75 minutes
Reordering Systems	45 minutes
Kanban	60 minutes
Total	**5 hours**

Introduction

Overview

DISPLAY the slide titled "Methods of Inventory Management."

WELCOME the participants to the unit and introduce yourself.

DIRECT the participants to the section titled "Introduction" in the Participant Guide.

EXPLAIN that inventory management is critical to the success of any company. In today's world, a company must manage its entire supply chain. This means that inventory managers must understand (and manage) their own inventory as well as that of their suppliers. The often-changing demands of production means that manufacturers and suppliers must be strategically linked. In this unit we will discuss the types of inventory control systems, MRP, the Just-in-Time philosophy and the Kanban process.

Objectives

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STATE: "The information, activities and practice provided in this unit will enable the participant to:

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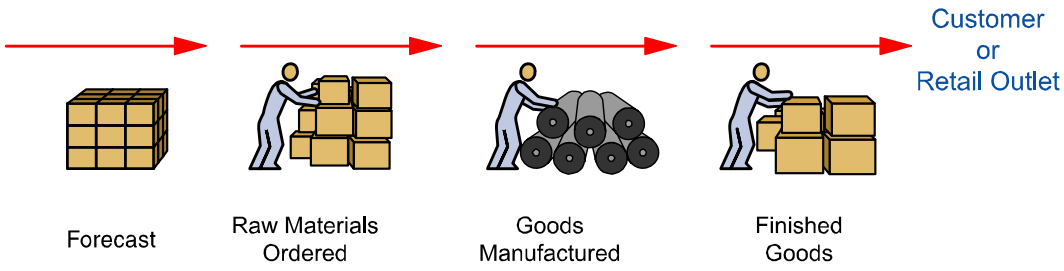
12. Explain the Kanban process.
13. State the two key factors involved with the Kanban process."

STATE: "There are two basic classifications of Inventory Control Systems. There are "Pull" systems and "Push" systems. Each has its own advantages and disadvantages."

Push Systems

STATE: "In a Push Distribution System, the manufacturer makes the ordering decisions. This system is generally used when the same company owns the distribution system and the manufacturer."



Push System

EXPLAIN that:

- The manufacturer determines the customers' needs.
- The manufacturer orders the necessary raw material and begins production.
- The end items are shipped to the retail outlets or distribution centers.

DISPLAY the slide titled "Push Distribution System."

EXPLAIN that the advantage of this system is that the manufacturer can utilize "economies of scale."

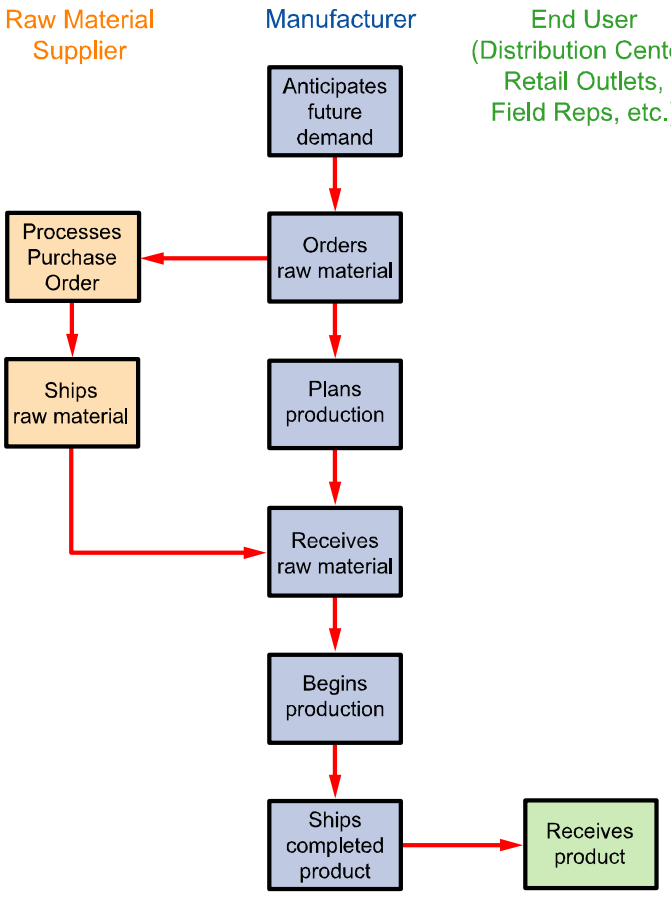
EXPLAIN that money can be saved due to many factors relating to the size of the operation.

DISCUSS "economies of scale" by asking the participants, "How can being a large company be an advantage?"

EMPHASIZE the following points

- Larger order sizes.
- Improved efficiency of equipment and employees.
- Shipment consolidation.

EXPLAIN that the disadvantage of this "push" system is that the forecast could be incorrect. This could result in excess inventory.



Push Distribution System

DISPLAY the slide titled "Push System in Manufacturing."

STATE: "In manufacturing, a 'push' system is where the raw material ordering decisions are made by a central source in manufacturing based on a forecast which anticipates the needs of the customers. The forecast instructs manufacturing to order the raw material and schedule the production to begin on a specific date."

EXPLAIN that a "push" system "force feeds" material to manufacturing and does not take into account machine downtimes, personnel availability, etc. Because we are obtaining material and beginning production for product that has not yet been ordered, we are said to be "pushing" the product.

DISCUSS the advantages of a "push" system in manufacturing by asking "Why would a manufacturer use a 'push' system?"

EMPHASIZE the following

"Economies of scale" especially in machine and employee utilization.

EXPLAIN that a "push" system has disadvantages because inventories can grow if the forecast is incorrect.

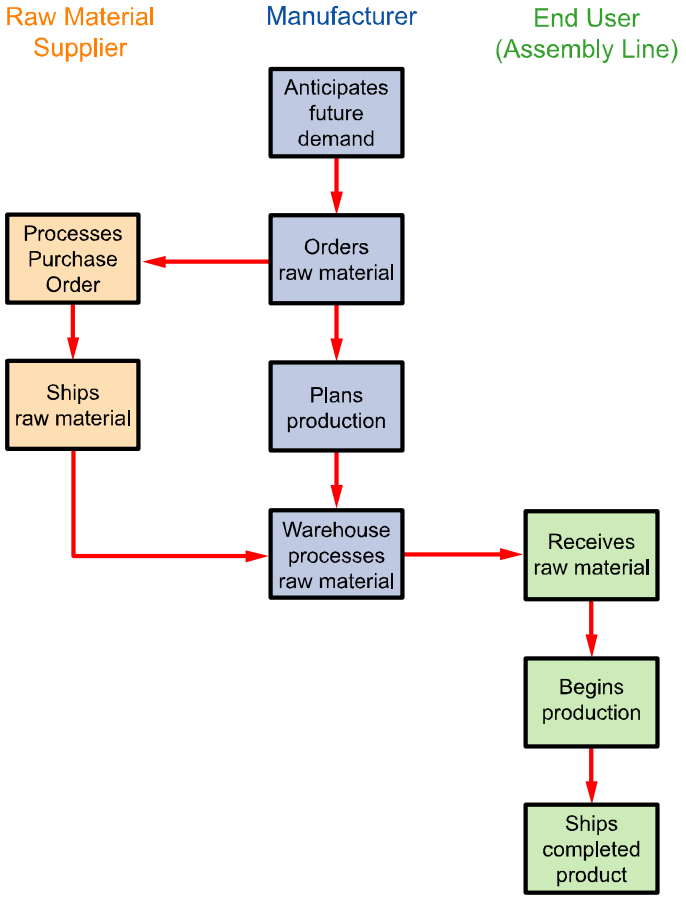
CONTINUE by saying that inventories can grow if manufacturing encounters production problems (machines down, personnel unavailable, quality issues, etc.).

ASK the participants, "What other problems might a manufacturer using a "push" system encounter?"

Anticipated responses:

Supply chain disruption (i.e. key material does not arrive).

Unexpected change in demand (up or down).



Push System in Manufacturing

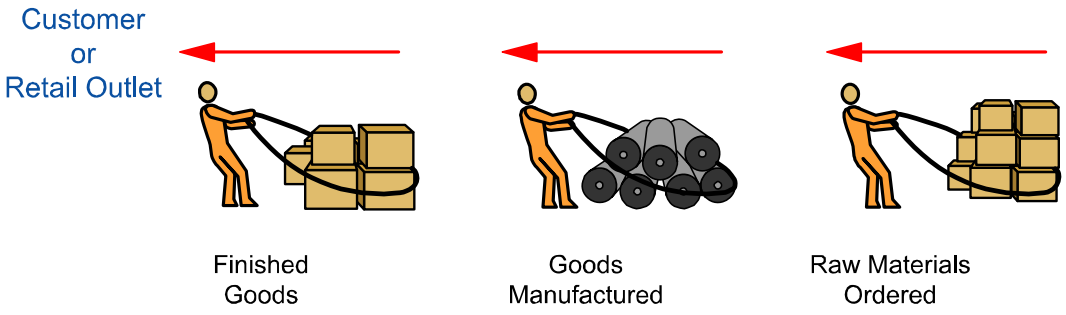
Pull Systems

DIRECT the participants to the section titled "Pull Systems" in the Participant Guide.

STATE: "A 'pull' system is where orders for an end item are 'pulled' through the distribution system to satisfy demand for the end items. This kind of system can be used in manufacturing or throughout the distribution process."

EXPLAIN that in a Distribution Pull System, the ordering decisions are made in the field.

A retail outlet or distribution center can quickly order more from the supplier to maintain their inventory levels and satisfy customer demand.



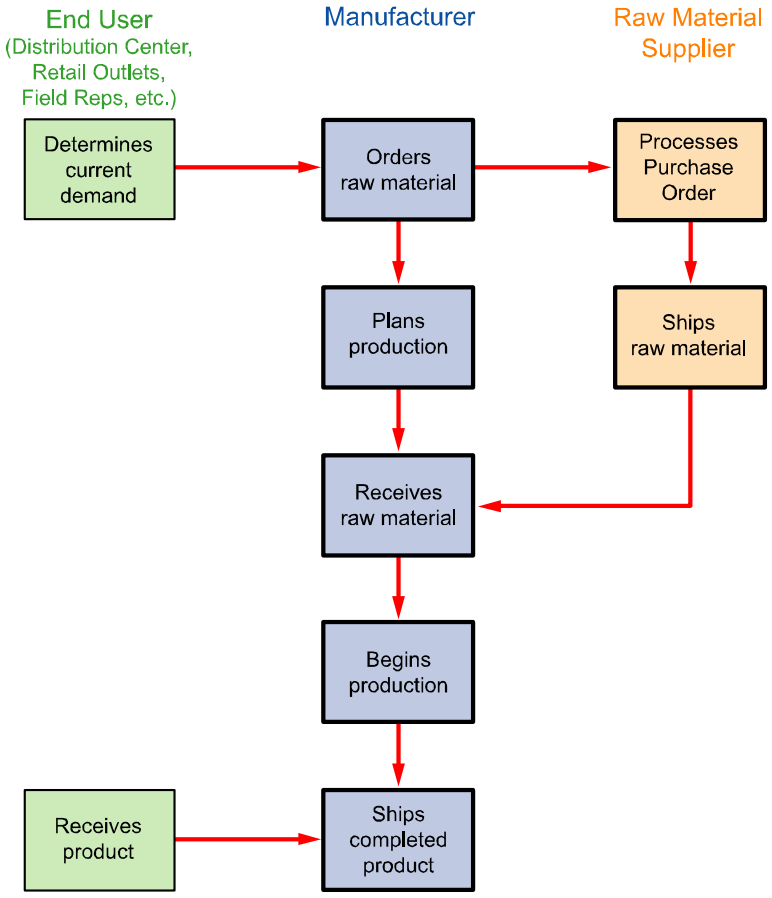
Pull System

DISPLAY the slide titled "Pull Distribution System."

STATE: "The advantage of this system is that those doing the ordering are close to the customer and, presumably, better understand the customers' needs."

EXPLAIN that the disadvantage of a "pull" system is that there is a potential lack of visibility between the field warehouses.

One field warehouse may have excess quantities sitting unused on their shelves. Another field warehouse is placing new orders with the supplier. This could result in excess inventory.



Pull Distribution System

DISPLAY the slide titled "Pull System in Manufacturing."

STATE: "In manufacturing, a 'pull' system is where the raw material ordering decisions are made on the assembly line."

EXPLAIN that the assembly line workers:

- Receive the production orders
- Review their on-hand inventory of raw material.
- Order only what they need when they need it.

STATE: "The advantage of this system is that it minimizes inventories throughout the supply chain because those doing the ordering are in the production area and better understand their raw material requirements."

EXPLAIN that if machines are down for extended periods or there are quality or personnel issues, material flow can be halted until the problems are resolved.

DISCUSS the advantages of a "pull" system in manufacturing by asking, "What other advantages might a 'pull' system have in manufacturing?"

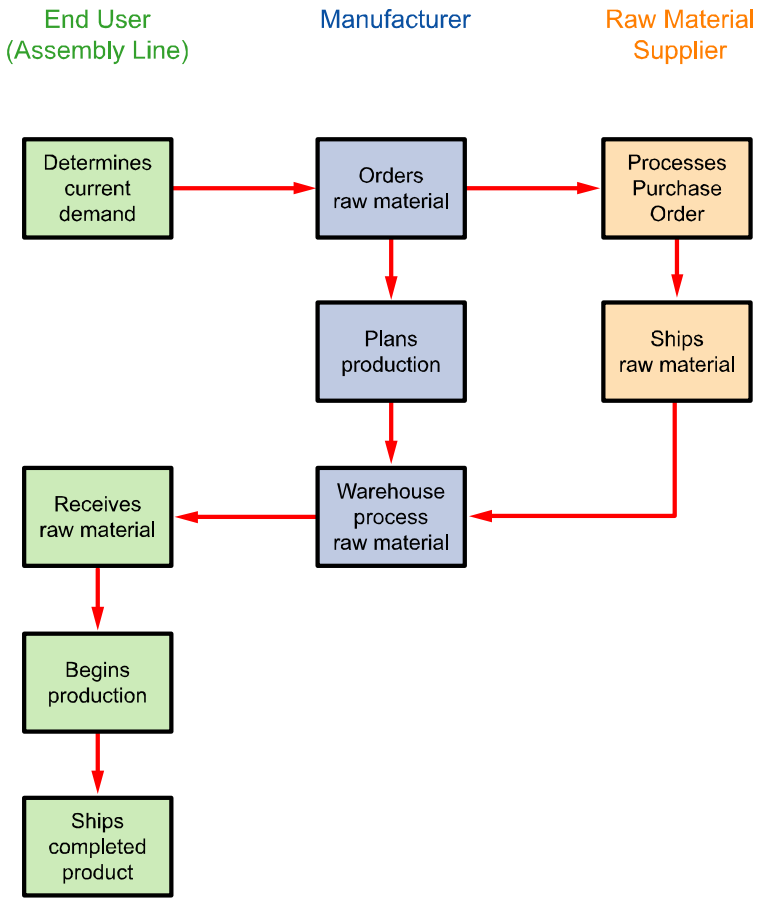
Anticipated responses:

Saves space in the production area.

Empowers employees.

Relieves management of ordering responsibilities.

EXPLAIN that the disadvantage is that line workers may overcompensate for unknown supply-chain lead times by ordering too much raw material. This could result in excess inventory.



Pull System in Manufacturing

Progress Check #1

DIRECT the participants to the section titled "Progress Check #1" in the Participant Guide.

ALLOW them enough time to complete the Progress Check and then review the answers.

1. List the two classifications of inventory control systems.

   Push systems and pull systems.

2. Which of the following is an advantage of a "push" system?

   a. Increased inventory

   b. Increased safety stock

   c. Increased cost

   d. Economies of scale

3. Which of the following is a disadvantage of a "push" system?

   a. The forecast could be wrong

   b. Decreased inventory

   c. Economies of scale

   d. Larger order sizes

4. Which of the following is an advantage of a "pull" system?

   a. Lack of visibility between field warehouses

   b. Better understanding of customers' needs

   c. Maximum inventory

   d. Workers can order anything they want

5. Which of the following is a disadvantage of a "pull" system?

   a. Line workers may order too much inventory

   b. Machines may break down

   c. Minimizes inventory

   d. Those doing the ordering are closer to the customer

Material Requirement Planning

DIRECT the participants to the section titled "Material Requirement Planning" in the Participant Guide.

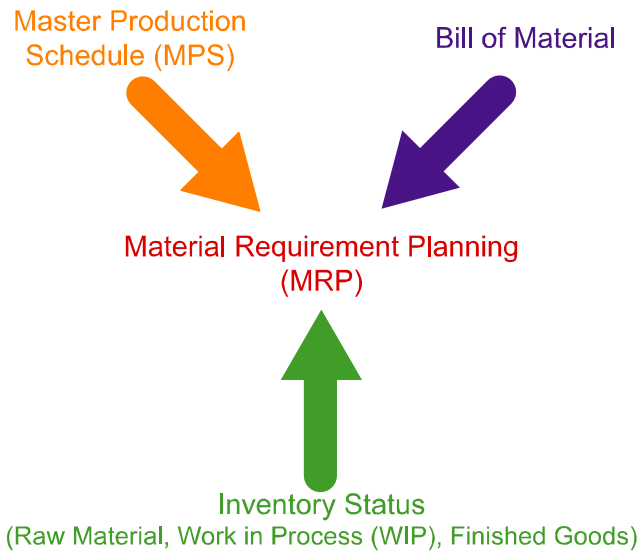
STATE: "Material Requirement Planning (MRP) is a computer-based system that supports manufacturing organizations by controlling the release of production and purchase orders."

EXPLAIN that it uses the production plan for end-items to determine the materials and time required to make the product. Customer orders are phased in over time to ensure the flow of raw materials matches the production schedule for the product.

DISPLAY the slide titled "Material Requirement Planning Inputs."

EMPHASIZE that the three key inputs to MRP are:

- The Master Production Schedule
- Inventory Status
- Product Bills of Material



Material Requirement Planning Inputs

Master Production Schedule

STATE: "The Master Production Schedule includes customer orders and the dates the customers expect the product. It also takes into account the production lead time."

EXPLAIN that production lead time is the time it takes the manufacturer to produce an end-item after the customer order is received until the item is available for packing. Production lead-time may include setting-up machines, assembling, curing and testing the product.

DISCUSS production lead time by asking, "What other factors may be included in production lead time?"

Anticipated responses:

Time for parts to be delivered from the warehouse.

Time for product to be moved between workstations.

Time to rework product with problems.

Employee breaks.

Inventory Status

STATE: "Another key input is the inventory status of all material needed to manufacture the items. This includes raw material, Work-in-Process (WIP), and finished goods in the warehouse."

EXPLAIN that information concerning raw material lead times is critical to MRP. Raw material lead time is the time between the decision to purchase an item of raw material and its actual addition to manufacturing's stock.

DISCUSS raw material lead time by asking, "What factors might effect raw material lead times?"

Anticipated responses:

Lengthy ordering process.

Ordering quantities that exceed the vendor's normal capabilities.

Shipping delays.

STATE: "WIP is the total amount of work currently in processing between production stages. "

DISCUSS WIP by asking, "Why do we need to know the amount of WIP before ordering raw material?"

Anticipated responses:

There is material in the WIP that has not been unaccounted for.

Completing the WIP may fulfill all or part of the order.

STATE: "Finished Goods are completed end-items available for distribution."

DISCUSS finished goods by asking, "Why do we need to know the amount of finished goods before ordering raw material?"

Anticipated responses:

It may fulfill all or part of the customer requirement.

Slight modification of the finished goods may fulfill all or part of the customer requirement.

Bill of Material

STATE: "The product Bill of Material (BOM) is a listing of components, parts, or other items needed to manufacture a product."

EXPLAIN that

It shows the quantity of each item required to produce each end-item.

It is similar to a parts list except it usually shows how the product is fabricated and assembled.

It is sometimes referred to as product structure record, formula or recipe.

It may also be called an ingredients list.

MRP: A Pull System

STATE: "By taking the customer's required delivery date and production lead-times into account, MRP can calculate precisely when the production order should begin. By taking the raw material lead times into account, MRP plans the raw material to arrive just as the production is scheduled to start."

EXPLAIN that because we are only ordering what is needed, as it is needed and we are only manufacturing items ordered by customers, MRP is considered a "pull" system.

CONTINUE by saying, state-of-the-art MRP systems (MRP II) can provide the user with simulation capabilities. This enables the user to explore a series of "What if…?" situations.

Progress Check #2

DIRECT the participants to the section titled "Progress Check #2" in the Participant Guide.

ALLOW them enough time to complete the Progress Check and then review the answers.

1. What is the purpose of MRP?

   Material Requirement Planning (MRP) is a system that supports manufacturing organizations by controlling the release of production and purchase orders.

2. What are the three key inputs to MRP?

   The Master Production Schedule

   Inventory Status

   Product Bills of Material

3. MRP includes

   a. Customer lead times

   b. Production lead times

   c. Machine downtime

   d. Employee absenteeism rates

4. Raw material, WIP and finished goods are included in the

   a. Production lead time

   b. Supplier lead time

   c. Bill of Material

   d. Inventory status

5. A listing of all components, parts, or other items needed to manufacture a product is:

   a. A BOM

   b. A WIP

   c. An MRP

   d. An Inventory Control System

6. MRP is a ***pull*** (push/pull) system.

Just-in-Time Philosophy

DIRECT the participants to the section titled "Just-in-Time Philosophy" in the Participant Guide.

STATE: "Just-in-Time (JIT) is an inventory control philosophy which views production as a system in which all operations, including the delivery of materials needed for production, occur just at the time they are needed."

EXPLAIN that JIT strives for a level of zero inventories by producing end-items at the rate required by the customer.

CONTINUE by saying many companies have made a commitment to JIT production. Many other are doing so.

EXPLAIN that it is generally recognized that effective implementation of JIT will result in significant reductions of inventories.

EMPHASIZE that inventory levels are a key indicator for measuring JIT performance.

The Goals of Just-in-Time

DISPLAY the slide titled "Goals of Just-in-Time Philosophy."

STATE: "The JIT inventory control philosophy is simple. The goals of JIT are:

1. Eliminate all unnecessary lead times.
2. Reduce setup costs.
3. Optimize material flow.
4. Ensure high quality from suppliers.
5. Ensure dependable just-in-time deliveries from suppliers.
6. Implement a strong Quality Control program.
7. Minimize safety stocks."

DISCUSS each of the JIT goals:

STATE: "Eliminating unnecessary lead times."

EXPLAIN that this includes production lead times as well as raw material lead times.

ASK: "How can lead times be reduced or eliminated?"

Anticipated responses:

Eliminate multiple signatures on material orders.

Group like products together on production lines.

Computerize the order processing procedures (Use EDI, Internet).

STATE: "Reduce setup costs."

EXPLAIN that the goal is to the smallest economical lot size, ideally, a quantity of one.

ASK: "How can setup costs be reduced?"

Anticipated responses:

Combine setups so like-items require only one "group" setup.

Correct root-causes of setup problems.

Train setup personnel.

STATE: "Optimize material flow."

EXPLAIN that this will minimize inventories from suppliers through production to the point of sale of the end-item.

ASK: "How can we optimize material flow?"

Anticipated responses:

Reduce space between machines.

Reduce travel time for material delivery.

Automate material movement (conveyors, Automatic Storage and Retrieval Systems, Remote Guided Vehicles.)

Straighten production lines.

STATE: "Ensure high quality from suppliers."

EXPLAIN that this reduces the need for receiving inspections. It also minimizes quality issues during production.

ASK: "How can we improve supplier quality?"

Anticipated responses:

Provide immediate feedback to suppliers.

Ensure suppliers understand material requirements.

Verify supplier's processes (on-site inspections).

STATE: "Ensure dependable just-in-time deliveries from suppliers."

EXPLAIN that holding suppliers accountable for late (or early) deliveries provides an incentive for them to deliver when the material is needed.

ASK: "How can we ensure suppliers deliver on time?"

Anticipated responses:

Fine them for late deliveries.

Order within their lead-time.

STATE: "Implement a strong Quality Control program."

EXPLAIN that this will minimize rework and scrap. It also reduces the resultant time delays in production. Working with suppliers minimizes quality issues with raw materials.

ASK: "How can we improve our quality control?"

Anticipated responses:

Develop effective measurements.

True root cause analysis.

Implement effective corrective actions.

STATE: "Minimize safety stocks."

EXPLAIN that safety stocks are materials held to protect against the difference between forecast and actual demand. They are also held to account for other factors such as service levels and variations in lead-time.

ASK: "How can we minimize safety stock?"

Anticipated responses:

Eliminate lead times.

Minimize supplier quality issues.

Implementing Just-in-Time

DISPLAY slide titled "Implementing Just-in-Time."

STATE: "While the JIT philosophy is simple, implementing it is not. To implement the JIT philosophy we must:

STATE: "Determine the types of inventory."

EXPLAIN that these are classified by inventory segments: raw materials, purchased components, manufactured subassemblies, work in process, packaging materials and finished goods.

ASK: "Are there any other types of inventory?"

Anticipated response:

MRO (maintenance, repair and office supplies)

STATE: "Determine how many different items there are in each segment."

EXPLAIN that this lets us know how complex the effort will be.

ASK: "Why do we need to know the scope of the effort?"

Anticipated responses:

To know how many people to assign.

To know how long it will take.

To know if we need more assets (scales, counters).

STATE: "Determine the unit cost of each item."

EXPLAIN that the cost of inventory is a major consideration regarding order quantities and safety stock.

ASK: "Why is the cost of inventory items important?"

Anticipated responses:

We don't want to waste a lot of time on inventory that doesn't effect our bottom line.

Allows us to focus on high-cost items.

STATE: "Determine the anticipated annual demand."

EXPLAIN that previous sales history will help us target our efforts on actual requirements.

ASK: "What other input might we use to determine demand?"

Anticipated responses:

Forecast.

STATE: "Run an ABC Analysis for each inventory segment."

EXPLAIN that this enables us to apply selective inventory management controls. The inventory value of each item is obtained by multiplying the unit cost by the annual demand. The values are then ranked from most costly to least costly.

WRITE the following example so all of the participants can view:

Screws = $.03 each.

Anticipated Annual Demand = 35,000 screws.

35,000 x $.03 = $1,050

EXPLAIN that this calculation is performed for each inventory item.

DISPLAY slide titled "ABC Analysis."

STATE: "Classify the items."

EXPLAIN that using the ABC Analysis, place each inventory item into one of three basic groups.

Classification	Percentage of Inventory	Percentage of Inventory Value
"A"	20%*	80%*
"B"	30%*	15%*
"C"	50%*	5%*

* Approximately

ABC Analysis

DISCUSS each "ABC" group

STATE: "'A' Items: The 80/20 Rule is often used: 20% of the inventory items account for 80% of the inventory value."

EXPLAIN that "A" items are a small group of items with high inventory value. These items may also have strategic importance to the business. The greatest management attention is paid to "A" items.

ASK: "Consider a computer manufacturer; what might be examples of 'A' items?"

Anticipated responses:

Computer hard drives.

CD drives.

Monitors

STATE: "'B' Items: Approximately 30% of the inventory items will account for about 15% of the inventory value."

EXPLAIN that "B" items require less management attention.

ASK: "Considering a computer manufacturer, what might be examples of 'B' items?"

Anticipated responses:

Microprocessor chips.

Power cords.

STATE: "'C' Items: Approximately 50% of the inventory items will account for about 5% of the inventory value."

EXPLAIN that the least management attention is paid to "C" items.

ASK: "Considering a computer manufacturer, what might be examples of 'C' items?"

Anticipated responses:

Screws.

Nuts.

Wire.

STATE: "Establish inventory and reporting policies for each item based on the method of inventory control."

EXPLAIN that "A" items will have stricter controls that "B" or "C" items.

STATE: "Establish blanket purchase orders for selected items with qualified vendors."

EXPLAIN individuals in production should be authorized to release vendor deliveries against the blanket purchase orders.

ASK: "Why do we want to allow production personnel to release the orders?"

Anticipated responses:

They better understand production's immediate needs.

Reduces lead-time.

STATE: "Establish Economical Order Quantities (EOQ)."

EXPLAIN that EOQ is the size of an order that minimizes the inventory cost and that it is based on a trade-off between the cost of placing an order and the cost of holding stock.

STATE: "Establish minimum Safety Stocks."

EMPHASIZE "minimum."

STATE: "Continually measure inventory performance."

Explain that the reason is to determine the effectiveness of JIT production and inventory control. We will monitor inventory levels and inventory turns.

Progress Check #3

DIRECT the participants to the section titled "Progress Check #3" in the Participant Guide.

ALLOW them enough time to complete the Progress Check and then review the answers.

1. Explain the JIT philosophy.

   Just-in-Time (JIT) is an inventory control philosophy which views production as a system in which all operations, including the delivery of materials needed for production, occur just at the time they are needed.

2. Circle the goals of JIT:

   a. Increased inventory

   b. Reduce setup costs

   c. Ensure high quality from customers

   d. More WIP

   e. Optimize material flow

   f. Eliminate lead-times

   g. Strong QC program

   h. Minimize safety stock

   i. No MRP

   j. A "push" system

   k. Maximizing safety stock

   l. Ensure JIT deliveries from suppliers

   m. Increased incoming inspection

   n. Increase lead-times

3. Match the "ABC" classification to the amount of management attention it requires:

b.	"A" Items	a.	The least management attention
c.	"B" Items	b.	The most management attention
a.	"C" Items	c.	Neither the least nor the most management attention

Reordering Systems

DIRECT the participants to the section titled "Reordering Systems" in the Participant Guide.

STATE: "Since demand and lead-times are variable, businesses have two basic options:

Order fixed quantities of stock and variable times, or

Order variable quantities of stock and fixed times."

Fixed Quantities System (Reorder Levels)

DISPLAY slide titled "Fixed Quantity System."

STATE: "A fixed-quantities system is also referred to as a re-order level method."

EXPLAIN that whenever an inventory item falls below a predetermined level, a replenishment order is initiated.

EXPLAIN that this is:

Easy to manage.

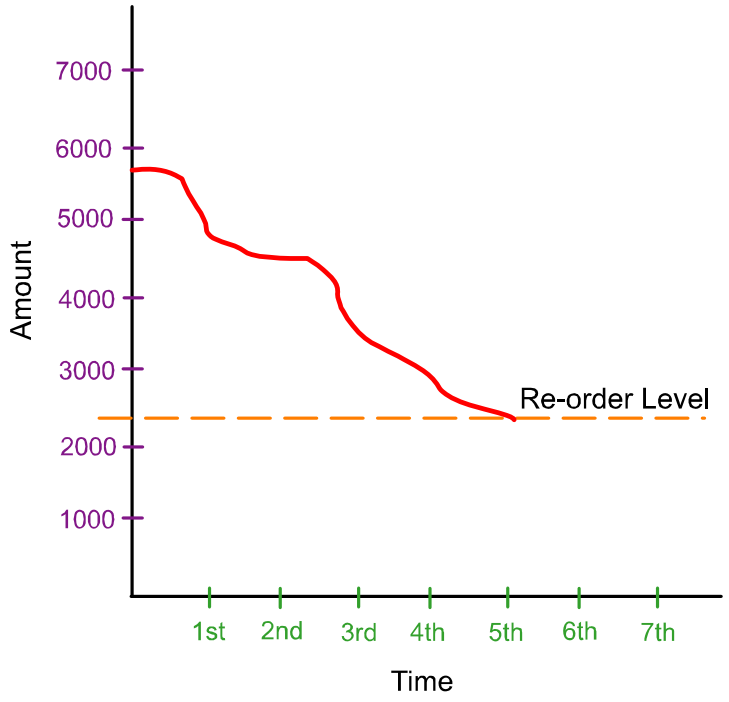
Adjusts well to changes in demand.

If production slows, they will order fewer times.

If production increases, the fixed quantities will be ordered more often.

CONTINUE by saying that even if demand increases dramatically, the only concern is the supplier lead-time. And, if there is an outstanding order, it has the opportunity of being expedited.

EXPLAIN that because it is so adaptable, it also keeps inventory low. Orders can be grouped together to obtain supplier discounts.



Fixed Quantity System

Two-Bin Replenishment System

STATE: "A variation of the Fixed Quantity System is the Two-Bin Replenishment System."

EXPLAIN that this system uses two equally sized bins of the same item.

EXPLAIN the two-bin replenishment process:

- Items are used from the first bin until it is empty.
- The empty bin is then sent to the warehouse (or supplier) to be refilled.
- Meanwhile, the items from the second bin are being used.
- The newly filled bin is returned and placed behind the bin in use.
- The process is repeated when the in-use bin empties.
- The re-order level is visual.
- The people using the items do not have to keep track of them.
- They simply wait until the first bin is emptied.

EXPLAIN that this method is well suited for items that require large quantities and where bin size can be checked easily.

ASK: "What items might be well suited for this method?"

Anticipated responses:

Screws, nuts, bolts.

Inexpensive hardware.

EXPLAIN that with proper rotation the two-bin replenishment system is very efficient and requires little paperwork.

CONTINUE by saying in a computerized environment the bins can be bar-coded and their movement/location and batch numbers can be traced.

Computerized Inventory Systems

STATE: "With many stock items, the two-bin system is inappropriate."

EXPLAIN that some items (high value, important items) require more detailed control so a stock record showing precise receipts/issues and on-hand balances is required. This is especially true for high dollar-value items or items susceptible to damage.

ASK: "Considering a computer manufacturer what items might be well suited for this method?"

Anticipated responses:

Computer hard drives.

CD drives.

Monitors.

CONTINUE by saying that it is also true when dealing with large inventories where there are often differences between the book stock (what the computer says is in stock) and the actual on-hand quantities. With large inventories, you will often hear, "The system says we have five in stock. I can only find three and one of those is damaged!"

STATE: "Computerized systems enable replenishment orders to be raised as soon as an item falls below its predetermined reorder level."

Fixed Time (Order Cycle System)

DISPLAY slide titled "Fixed Time System."

STATE: "With a fixed-time system some low value, low bulk items can be estimated and ordered on a routine order cycle. This "Order Cycle" may be annually, monthly, or weekly.

EXPLAIN the fixed-time system by saying:

- A maximum stock level is set (Average usage + Safety Stock).
- At the routine order time, current stock is counted.
- The amount of current stock is subtracted from the maximum stock level
- This gives us the reorder quantity.
- If production slows, they will order fewer items.
- If production increases, the safety stock will be used.

EMPHASIZE: "When using the fixed-time method, it is critical that the safety stock is able to accommodate unexpected increases in demand."

CONTINUE by saying that this is even more critical if the order cycle is monthly or yearly. This forces a business to maintain high levels of safety stocks.

STATE: "If demand increases dramatically, there is a serious concern of stock outages. In a fixed-time method the concern is not only supplier lead-time but also reorder cycle lead-time."

January						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	(31)			

February						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	(28)			

March						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	(30)		

April						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	(29)	30

May						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	(31)				

June						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	(30)		

July						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	(29)	30
30						

August						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	(31)			

September						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	(30)	

October						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	(31)					

November						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	(30)			

December						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	(30)	31

◯ Order Cycle

Fixed Time System

Reorder Level or Order Cycle…Which is better?

DISCUSS the following examples:

Example #1: A business has a dramatic increase in orders on the 1st of the month (Monday) and the supplier lead-time for material is 14 days. Using a fixed-quantity system, the business' material falls below its reorder level on Tuesday (2nd). It orders a fixed quantity from its supplier. It runs out of material on Thursday (4th) before the delivery arrives. It must wait 10 days for the delivery to arrive.

Example #2: A business has a dramatic increase in orders on the 1st of the month (Monday) and the supplier lead-time for material is 14 days. Using a fixed-time system, the business only orders material on Monday mornings. It runs out of material on Thursday (4th). It orders the material on Monday (8th), four days after it ran out of stock. It has to wait those four days plus the supplier's lead-time of 14 days. It may have to wait a total of 18 days for the delivery to arrive.

EMPHASIZE the additional lead-time in a fixed-time system.

EXPLAIN that the fixed-time method works well with low usage items and when demand is stable and predictable. The fixed-quantity works well with high usage items, is easy to manage and is more suited to sudden changes in demand.

Vendor Managed Inventory (VMI)

STATE: "Vendor-managed inventory is a process by which the supplier controls the flow of inventory into a customer's production area based on inventory, demand and/or a forecast provided by the customer."

DISCUSS the following example:

Case Study: A manufacturer of paint had difficulty maintaining paint cans for its production line. Fluctuations in its production schedule caused the manufacturer to be overstocked or not have enough. Because of this, it had several vendors supplying cans. Each vendor had different lead-times and different prices for its cans. After an analysis of the problem, the manufacturer decided to select one vendor as its sole-source supplier and have it provide on-site management of its can inventory. The manufacturer set aside an area in its warehouse for the vendor-managed inventory. The vendor assigned one employee to provide on-site support. Because of the sole-source agreement, the vendor agreed not to increase its prices. The manufacturer only pays for the cans it uses, not the ones in inventory. Since the agreement was signed, the manufacturer has reduced its inventory costs and has never run out of cans.

Progress Check #4

DIRECT the participants to the section titled "Progress Check #4" in the Participant Guide.

ALLOW them enough time to complete the Progress Check and then review the answers.

1. What are the two basic options relating to reordering systems?

   a. MRP & WIP

   b. Fixed-time & Fixed-quantity

   c. Safety Stock or Raw Material

   d. One-bin or Two-bin

2. When might a two-bin system be inappropriate?

   Some items (high value, important items) require more detailed control.

3. What is the advantage of a fixed-time system?

   I*f production slows, they will order fewer items.*

   If production increases, the safety stock will be used.

4. What is the advantage of a fixed-quantity system?

   Easy to manage.

   Adjusts well to changes in demand.

5. Explain how vendor-managed inventory can benefit both the supplier and the customer.

   The customer only pays for material it uses and the vendor has a guaranteed customer.

Kanban

DIRECT the participants to the section titled "Kanban" in the Participant Guide.

STATE: "Kanban is a Japanese term for 'visual record.' 'Kan' means card. 'Ban' means signal."

EXPLAIN that Kanban is a simple inventory control system developed by Toyota Corporation for coordinating the movement of material to feed the production line.

EXPLAIN that Kanban is a chain operation that is used to "pull" raw material, as well as manufactured parts, through the production process.

- It uses standard containers or lot sizes.
- A single card is attached to each.
- The supplying work centers signal with the card that they wish to withdraw parts from suppliers.

EXPLAIN that the supplier may be a vendor, a stockroom or a preceding operation.

The vendor or the stockroom fill the container and reissue it to production.

In the case of preceding operations, the work centers produce enough material to fill the container, then stop.

Advantages of Kanban

DISPLAY slide titled "Advantages of Kanban."

EXPLAIN that the advantages of Kanban over traditional "push" systems are:

- It is a simple and understandable process.
- It provides a quick response to changes.
- It avoids over production.
- It minimizes waste.
- It is low-cost and easy to maintain.
- It delegates responsibility to the line workers.

Kanban – More than Inventory Control

STATE: "Kanban is much more than a simple inventory control system."

EXPLAIN that the entire Japanese Kanban process takes form on the production floor, in close interaction between the work force and management. More importantly, it involves both internal and external customers.

CONTINUE by saying that the Kanban process involves industrial re-engineering as well as the human factors of production.

DISPLAY slide titled "Key Factors Addressed by Kanban."

Industrial Re-Engineering

STATE: "Industrial re-engineering includes modular/cell production."

EXPLAIN that this means organizing machinery so related products can be manufactured continuously.

STATE: "Layouts of processes and machines that are oriented around the product."

EXPLAIN that product will flow smoothly from start to finish and there should be no items waiting to be worked on.

STATE: "U-shaped production lines."

EXPLAIN that this increases focus on both ends of the production line and increases supply accessibility to the lines.

STATE: "Total preventative maintenance."

EXPLAIN that this will prevent machines from breaking down during production time.

STATE: "Mass production of mixed models."

EXPLAIN that this is possible if processes are fully integrated with the product.

Human Factors of Production

STATE: "Human factors of production include breaking down administrative barriers."

EXPLAIN that workers have greater input.

STATE: "Teamwork."

EXPLAIN that companies practicing Kanban believe that productivity and quality come from people rather than systems.

STATE: "Quality Circles."

EXPLAIN that Quality Control provides the framework where employees are able to discuss and find solutions to production problems.

STATE: "Increased worker authority."

EXPLAIN that workers have the authority to shut down production; cross training and job-rotation are encouraged.

STATE: "Continuous improvement."

EXPLAIN that companies practicing Kanban believe quality leads to lower costs and that systems cause most defects.

STATE: "Housekeeping."

EXPLAIN that workplace cleanliness leads to improved morale and better quality.

STATE: "Kanban is an organizational change that decentralizes responsibility. Simply stated, advocates of the Kanban process believe that 'It's organizations that need to be changed. Not hardware."

Progress Check #5

DIRECT the participants to the section titled "Progress Check #5" in the Participant Guide.

ALLOW them enough time to complete the Progress Check and then review the answers.

1. Kanban uses standard containers or lot sizes with a single *card* attached to each.

2. Kanban is a *pull* (push/pull) system.

3. List three advantages of the Kanban process.

   Any three of the following are acceptable:

   It is a simple and understandable process.

   It provides a quick response to changes.

   It avoids overproduction.

   It minimizes waste.

   It is low-cost and easy to maintain.

   It delegates responsibility to the line workers.

4. What are the two key factors that Kanban addresses?

   Industrial re-engineering

   Human factors of production.

5. Those who advocate the Kanban process believe in:

   a. Centralized responsibility

   b. Breaking down administrative barriers

   c. Straight production lines

   d. U-shaped Quality groups

Glossary

"ABC" Analysis	A form of analysis applied to a group of items in order to apply selective inventory management controls.
Bill of Material	A listing of components, parts, or other items needed to manufacture a product.
BOM	Bill of Material
Economical Order Quantities	The size of an order that minimizes the inventory cost. It is based on a trade-off between the cost of placing an order and the cost of holding stock.
Economies of Scale	The ability to save money due to many factors relating to the size of the operation.
EOQ	Economical Order Quantities
Forecast	The estimation of expected demand over a specified time period in the future.
JIT	Just-in-Time
Just-in-Time	An inventory control philosophy which views production as a system in which all operations, including the delivery of materials needed for production, occur just at the time they are needed.

Kanban	A simple inventory control system developed by Toyota Corporation for coordinating the movement of material to feed the production line. The method 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 suppliers.
Lead Time	The cycle time needed for raw-material-to-market cycle.
Master Production Schedule	A listing of all the production orders required to fill all outstanding customer orders.
Material Requirement Planning	A system that supports manufacturing organizations by controlling the release of production and purchase orders.
MRP	Material Requirement Planning
MRP II	A method for the effective planning of all resources of a manufacturing company.
Order Cycle	A method of reordering material at a fixed-time. See Reorder Levels.
"Pull" System	A system where orders for an end item are pulled through the facility to satisfy demand for the end item.

"Push" System	A system where orders are issued for completion by specified due dates, based on estimated lead-times or forecast.
Raw Material	Items purchased from suppliers, to be input to a production process and modified into finished goods.
Reorder Levels	A method of reordering material at fixed quantities whenever an inventory item falls below a predetermined level. See Order Cycle.
Safety Stock	Inventory that is used to guard against fluctuations in supply or demand.
Vendor Managed Inventory	A process by which the supplier controls the flow of inventory into a customer's distribution network based on inventory, demand and other relevant product movement data provided by the customer to the supplier.
VMI	Vendor Managed Inventory
WIP	Work in Process
Work in Process	The total amount of work in processing between production stages or subject to waiting time.