Inventory Management/JIT and Lean Manufacturing

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Outline

Chapter Outline
JIT, Production systems, and Lean operations
• JIT – Just In Time
• JIT Layout
• JIT Inventory
• JIT Scheduling
• JIT Quality
What is JIT Manufacturing?

- A production strategy that strives to improve a business return on investment by reducing work-in-process (WIP) Inventory and associated carrying costs.
  - Pull Items when needed
  - Less Inventory

When Implementing JIT:
- Materials arrive where they are needed, when they are needed
- Identifying problems and driving out waste reduces costs and variability and improves throughput
- Requires maintaining meaningful buyer-supplier relationship
JIT/Lean Operations

Good production systems require that managers address three issues that are pervasive and fundamental to operations management:

• eliminate waste
• remove variability
• improve throughput
Main Benefits & Advantages of JIT:

• Funds that were tied up in inventories can be used elsewhere.
• Areas previously used to store inventories can be used for other more productive uses.
• Throughput time is reduced, resulting in greater potential output and quicker response to customers.
• Defects are reduced, resulting in less waste and greater customer satisfaction.

http://www.youtube.com/watch?v=8WEzijywHNg
Reduction in (WIP) has many Advantages

- Reduces set-up times in the material flow process
- Increases supplier Quality
- Goods (Inventory) from the warehouse to the floor flows smoother
- Consistently receive and then supply goods
- Allows employees to work more efficiently
- Better scheduling and forecasting
Eliminate Waste

Waste is anything that does not add value from the customer point of view:

- Storage, inspection, delay, waiting in queues, and defective products do not add value and are 100% waste

Example **Ohno’s 7 Wastes** from **TPS** – Toyota Production Systems

- Overproduction
- Queues – *lines or buildup*
- Transportation
- Inventory
- Motion
- Over processing
- Defective products
Eliminate Waste

Other resources; energy, water, and air are often wasted

5 Ss Model: “Lean Production Checklist”

- Sort/segregate – when in doubt, throw it out
- Simplify/straighten – methods analysis tools
- Shine/sweep – clean daily
- Standardize – remove variations from processes
- Sustain/self-discipline – review work and recognize progress

- Safety – build in good practices
- Support/maintenance – reduce variability and unplanned downtime
Remove Variability

JIT systems require managers to reduce variability caused by both internal and external factors:

- Variability is any deviation from the optimum process that delivers perfect product on time, every time

- Inventory hides variability, so JIT eliminates unnecessary inventory and removes the variability

- Less variability results in less waste & more value to each step of the production process
Sources of Variability

Variability is another word for problem in the manufacturing industry.

• Incomplete or inaccurate drawings or specifications for product(s):
  - Takes away useful time and delays production

• Poor production processes result in incorrect quantities, and late, or non-conforming units

• Unknown customer demands
Improve Throughput

The time it takes to move an order from receipt to delivery

• Time between the arrival of raw materials and the shipping of the finished order is called the **manufacturing cycle time**

• A **pull system** increases throughput by pulling items when needed

• By pulling material in small lots, inventory cushions are removed
  - Allows funds to be used elsewhere
  - emphasizes the need for continual improvement

• Manufacturing cycle time is reduced
## JIT and Competitive Advantage

### JIT Techniques:

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suppliers</td>
<td>Few vendors; Supportive supplier relationships; Quality deliveries on time, directly to work areas.</td>
</tr>
<tr>
<td>Layout</td>
<td>Work-cells; Group technology; Flexible machinery; Organized workplace; Reduced space for inventory.</td>
</tr>
<tr>
<td>Inventory</td>
<td>Small lot sizes; Low setup time; Specialized parts bins</td>
</tr>
<tr>
<td>Scheduling</td>
<td>Zero deviation from schedules; Level schedules; Suppliers informed of schedules; Kanban techniques</td>
</tr>
<tr>
<td>Preventive maintenance</td>
<td>Scheduled; Daily routine; Operator involvement</td>
</tr>
<tr>
<td>Quality production</td>
<td>Statistical process control; Quality suppliers; Quality within the firm</td>
</tr>
<tr>
<td>Employee empowerment</td>
<td>Empowered and cross-trained employees; Training support; Few job classifications to ensure flexibility of employees</td>
</tr>
<tr>
<td>Commitment</td>
<td>Support of management, employees, and suppliers</td>
</tr>
</tbody>
</table>
JIT and Competitive Advantage

WHICH RESULTS IN:

- Rapid throughput frees assets
- Quality improvement reduces waste
- Cost reduction adds pricing flexibility
- Variability reduction
- Rework reduction

WHICH WINS ORDERS BY:

- Faster response to the customer at lower cost and higher quality—
  A Competitive Advantage
JIT Partnerships

- JIT partnerships exist when a supplier and purchaser work together to remove waste and drive down costs

**Four goals** of JIT partnerships are:
- Removal of unnecessary activities
- Removal of in-plant inventory
- Removal of in-transit inventory
- Improved quality and reliability

* Consistency*
JIT Partnerships

Suppliers
- Locate near buyer
- Extend JIT techniques to their suppliers
- Include packaging and routing details
- Detail ID and routing labels
- Focus on core competencies

Shipping
- Seek joint scheduling and shipping efficiencies
- Consider third-party logistics
- Use advance shipping notice (ASN)
- Ship frequent small orders

Mutual Understanding and Trust

Quantities
- Produce small lots
- Deliver with little overage and underage
- Meet mutually developed quality requirements
- Produce with zero defects

Buyers
- Share customer preferences and demand forecasts
- Minimize product specifications and encourage innovation
- Support supplier innovation and price competitiveness
- Develop long-term relationships
- Focus on core competencies
- Process orders with minimal paperwork (use EDI or Internet)
Suppliers Concerns

- **Diversification** – ties to only one customer increases risk
- **Scheduling** – don’t believe customers can create a smooth schedule
- **Lead time** – engineering or specification changes can create problems with short lead times
- **Quality** – limited by capital budgets, processes, or technology
- **Lot sizes** – small lot sizes may transfer costs to suppliers

* Share preferences and meet mutually on requirements
JIT Layout

**JIT Layout Tactics** – Reduces Waste Movement

- Build work cells for families of products
- Include a large number operations in a small area
- Minimize distance
- Design little space for inventory
- Improve employee communication
- Use poka-yoke devices – automatic or impossible to make mistake
- Build flexible or movable equipment
- Cross-train workers to add flexibility
Distance Reduction

- Large lots and long production lines with single-purpose machinery are being replaced by smaller flexible cells
- Often U-shaped for shorter paths and improved communication
- Often using group technology concepts
Increase Flexibility

• Cells designed to be rearranged as volume or designs change
• Applicable in office environments as well as production settings
• Facilitates both product and process improvement
Impact on Employees

• Employees may be cross trained for flexibility and efficiency
• Improved communications facilitate the passing on of important information about the process
• With little or no inventory buffer, getting it right the first time is critical
Reduced Space and Inventory

- With reduced space, inventory must be in very small lots
- Units are always moving because there is no storage

**Inventory is at the minimum level necessary to keep operations running**
- Use a pull system to move inventory
- Reduce lot sizes
- Develop just-in-time delivery systems with suppliers
- Deliver directly to point of use
- Perform to schedule
- Reduce setup time
- Use group technology
Reduce Setup Costs

• High setup costs encourage large lot sizes
• Reducing setup costs reduces lot size and reduces average inventory
• Setup time can be reduced through preparation prior to shutdown and changeover
JIT Scheduling

Better scheduling improves performance – (each day’s production meets the demand for that day)

• Schedules must be communicated inside and outside the organization
• Level schedules:
  - Process frequent small batches rather than few large batches – (Jelly Bean Scheduling)
  - Freezing the schedule helps stability
• Kanban
  - Signals used in a pull system
  - Kanban is not an inventory control system; it is a scheduling system that helps determine what to produce, when to produce it, and how much to produce.
JIT Scheduling – Small Lots

JIT Level Material-Use Approach

A A B B B C A A B B B C

Large-Lot Approach

A A A A A B B B B B B B B C C C

Time

Figure 16.7
JIT Scheduling

Kanban system – (TPS)

• Signals used in a pull system
• Kanban is not an inventory control system; it is a scheduling system that helps determine what to produce, when to produce it, and how much to produce.
Kanban

- Usually each card controls a specific quantity or parts
- Multiple card systems may be used if there are several components or different lot sizes
Kanban Replenishment Cycle
JIT Quality

Depends on Strong relationships

• JIT cuts the cost of obtaining good quality because JIT exposes poor quality
• Because lead times are shorter, quality problems are exposed sooner
• Better quality means fewer buffers and allows simpler JIT systems to be used
The Advantages Of JIT - Continued

- http://www.youtube.com/watch?v=8WEzijywHNg
Inventory Management

• The objective of inventory management is to strike a balance between inventory investment and customer service.
• One of the most expensive assets of many companies representing as much as 50% of total invested capital.
• Operations managers must balance inventory investment & WIP with customer service.