

Production Planning & Control BMM4823

Just in Time

by

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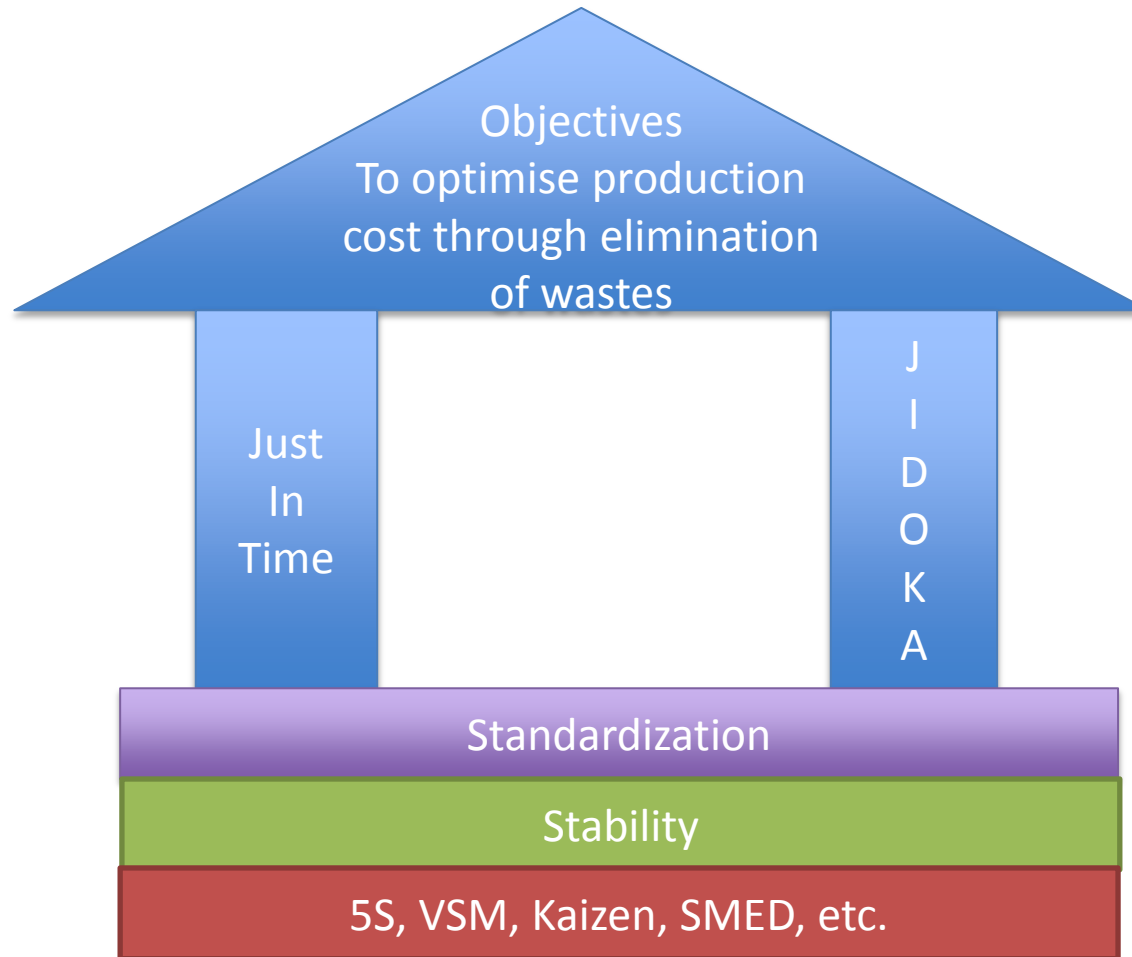
Chapter Description

- Aims
 - To understand the concepts of application Just in Time (JIT)
 - To apply various tools and techniques in JIT
 - To determine number of Kanban for JIT scheduling
- Expected Outcomes
 - Able to apply the tools and techniques of JIT in cell layout, Kanban, kaizen, production levelling.
 - Able to determine types of non value added activities in production
 - Able to determine the influence factors for the successful of JIT
- Other related Information
 - Heizer, J and Render,B. 2011. Principles of Operations Management, 8th Edition, Pearson Prentice Hall, Inc.

Introduction

- As part of Toyota Production System
- Just in Time is introduced by Taichi Ohno in 1937.
- It was introduced as to cope with the limited of capital at that time.
- Every part must come in on time as scheduled earlier
- Any delays will cause others delay as well

Toyota House



Types of waste

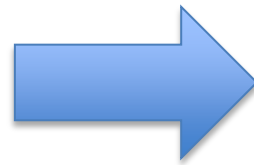
- There are 7 wastes normally incurred in the production line;
- Transport
- Motion
- Over processing
- Overproduction
- Waiting
- Defects
- Inventory

JIT Techniques

- 5S
- VSM
- Kaizen
- SMED
- Small lot size
- Heijunka
- Cellular layout
- Pull
- Kanban
- Poka yoke

JIT- layout strategies

- Reduce travel distance
- Reduce motion
- Reduce lead time



Reduce movement



Cellular layout

Cellular layout

- The machines are arranged based on product family
- To facilitate small lot and continuous flow
- It was arranged very closed to each other as to reduce movement
- Often in U shape, easy to control machine
- Multi skill operator

How to make cellular layout

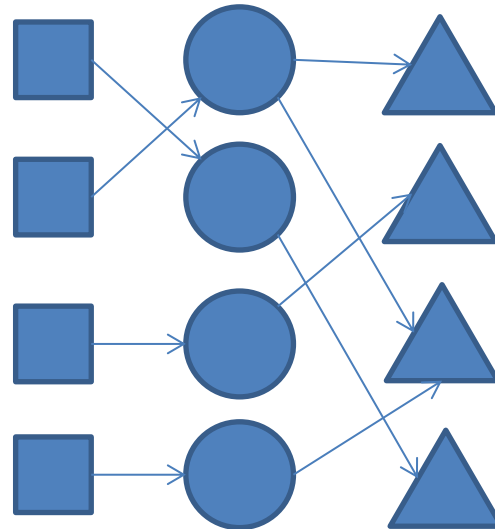
- Identify part family with same flow paths
- Group each family with machines into cells
- Arrange each cell as to reduce movement

Cellular layout

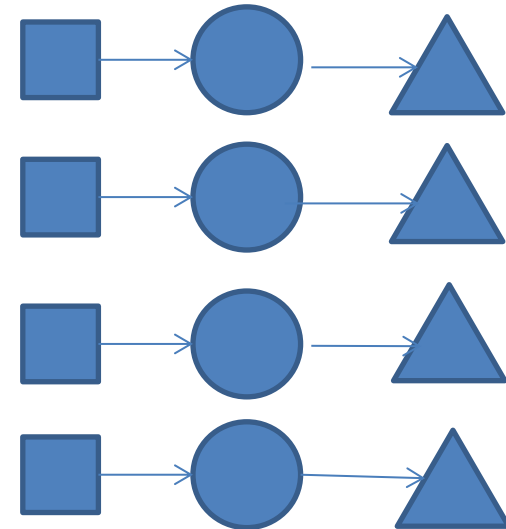
Product



Before



After



Advantages

Reduce travel distance

Reduce work in process

Reduce lead time

Reduce product defects

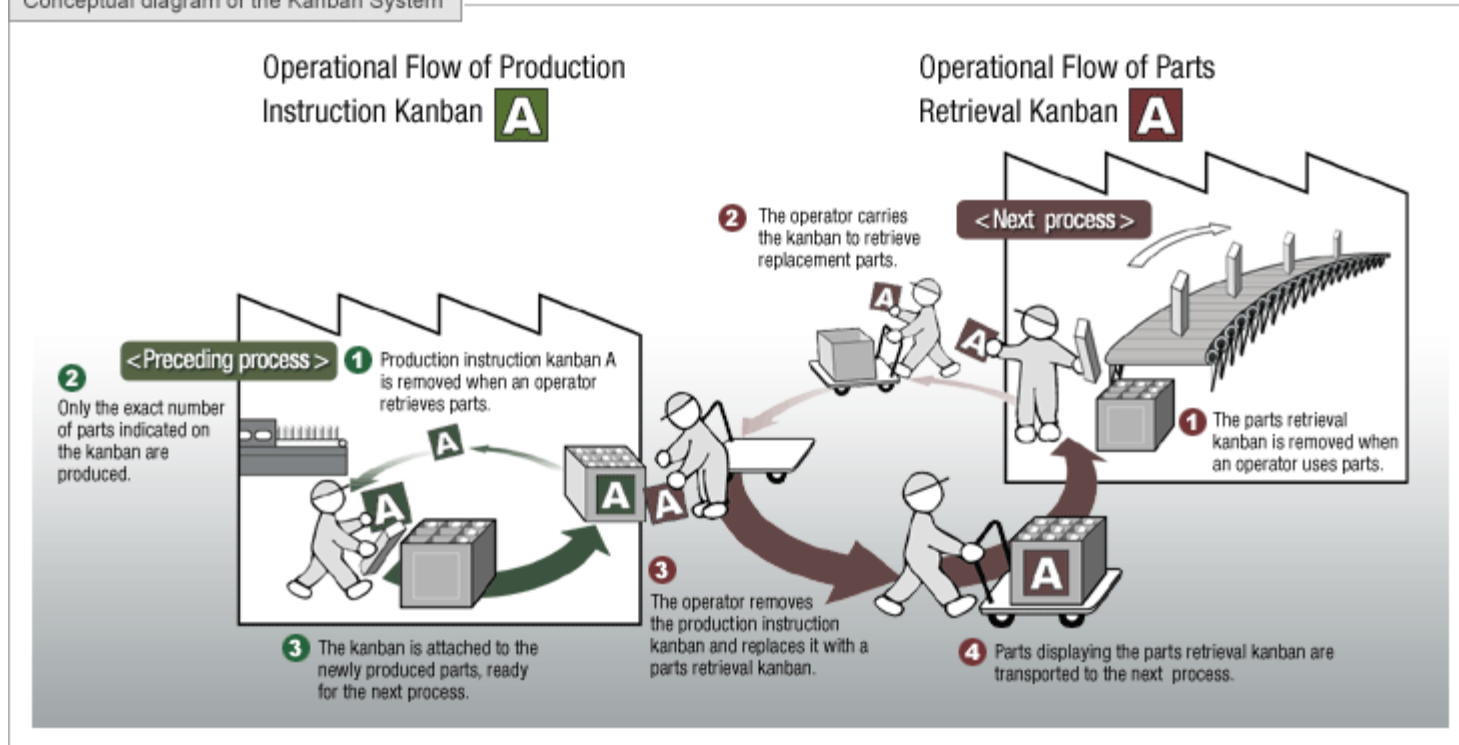
Reduce set up time

Reduce labour idle time

Kanban

- Meaning “signal” or “visible record”
- As an information card
- No Kanban no production
- Part name, part no., quantity, model, customer, container/shelve.
- Single card or dual card

Conceptual diagram of the Kanban System



Source:http://www.toyota-global.com/company/vision_philosophy/toyota_production_system/just-in-time.html

Advantage of Kanban

- Easy to be implemented
- Minimum cost
- Visible to everybody
- Quick response
- Increased output
- Reduced work in process
- Increased efficiency

No of Kanban

Control number of Kanban

Each card control specific quantity and parts

Kanban could control work in process by limiting the quantity

Provide multiple card based on lot sizes and several components

Container size

Should know the lead time to produce a container of parts

Should know the level of safety stock

Number of Kanbans =

$$\frac{\text{Demand during lead time} + \text{Safety stock}}{\text{Size of container}}$$

Kanban Size

Daily demand	= 400 units
Production lead time	= 2 days
Safety stock	= 1/2 day
Container size	= 200 units

Demand during lead time = 2 days x 400 units = 800

$$\text{Number of Kanbans} = \frac{800 + 200}{200} = 5$$

* Production lead time included waiting time, material handling time and processing time

Exercise

Keela Sdn Bhd. is moving to Kanban system to support its production at assembly lines. You are required to assist this company to determine the size of the Kanban for sub-assemblies and the number of Kanban needed.

Setup cost	= RM30
Annual holding cost	= RM120 per assembly
Daily production	= 20 sub assemblies
Annual usage	= 2500 (50wks x 5 days each x daily usage of 10 subassemblies)
Lead time	=16 days
Safety stock	= 4 days' production

Kaizen

- Continual improvement
- It is never ending improvement
- Formation of multidiscipline of skill or workplace
- Lead by a team leader
- Improvement of design, process, system and etc.

Goals

Arranging the job become easier

Removing all non added values

Think safety

Increase productivity

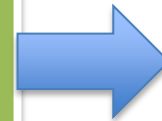
Reduce complexity

Reduce cost

Reduce time

Inventory

Use pull system
Small lot size
JIT delivery systems
Reduce set up time
Cellular layout



Always keep at
minimum
inventory

Production Levelling- Heijunka

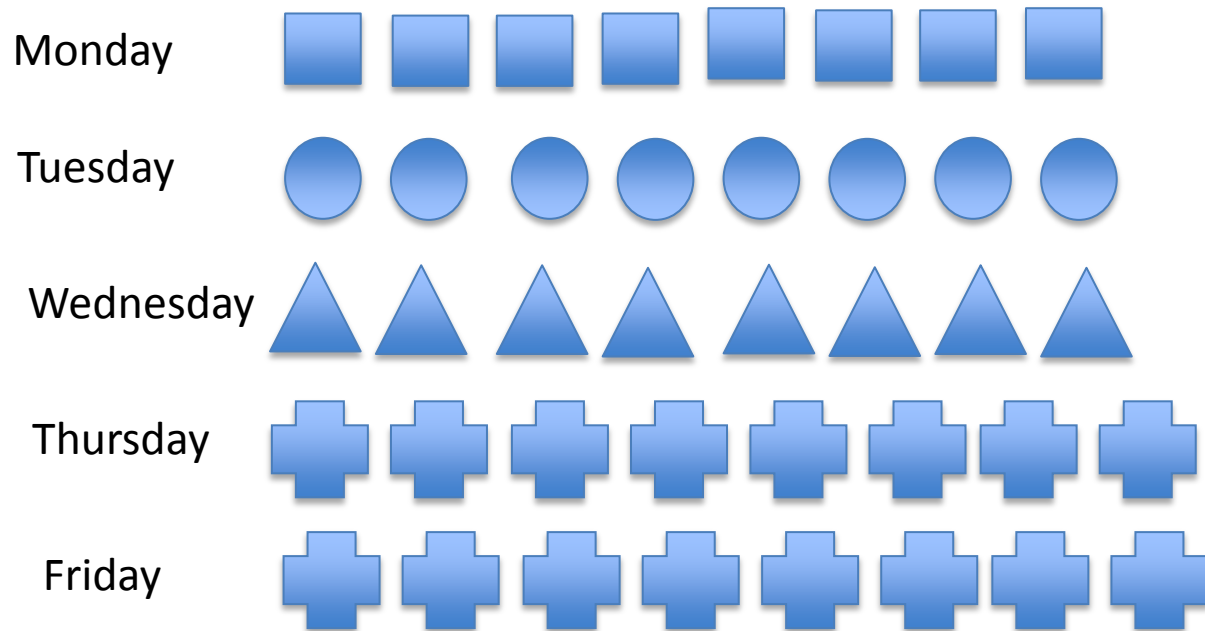
Mix production evenly with various model.

Distribute evenly customer order

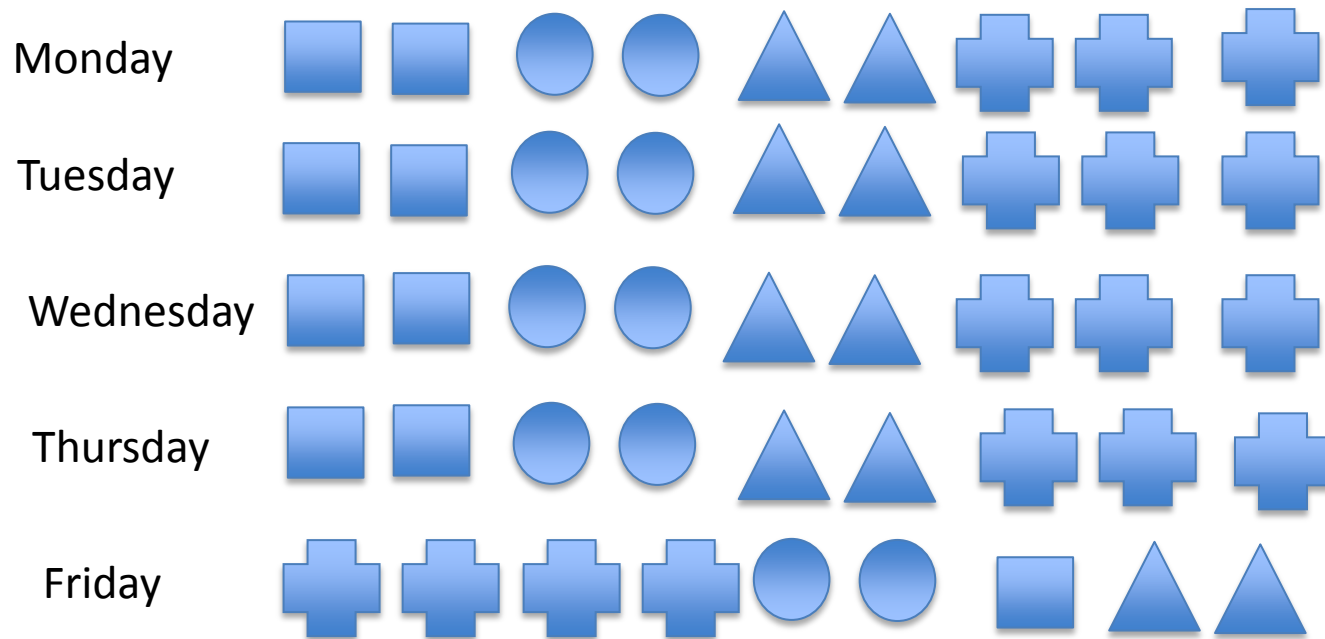
Must have good JIT system on machine usability, 5S, set up time

Must comply the process stability

Scheduling



Scheduling- Production Levelling



Benefits of JIT

Particulars	Explanation
Stocks reduction	Through JIT implementation the company could reduce raw material, parts, work in progress.
Productivity	The company could increase labor productivity after eliminating all wastes such as motion, over processing etc.
Quality	Always produce a product with right quality at first time. Built in quality system such as poka yoke to detect any failure product.
Lead time	Improved lead time through elimination all wastes such as over processing, motion, waiting, defects etc.
On time delivery	Delivered on time when all requirements met after elimination of all wastes