INTERNATIONAL COLLEGE OF AUTOMOTIVE

INSTRUCTIONAL NOTES

PRINCIPLE 5 – PULL SYSTEM

POWERING AMBITIONS

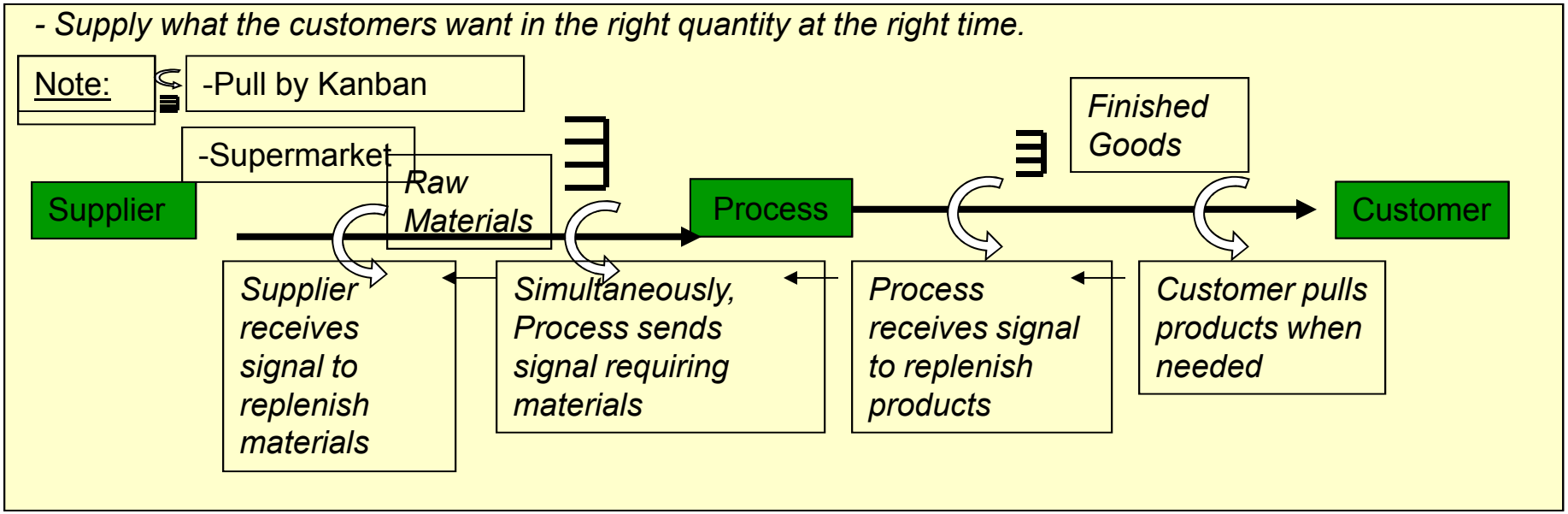
INTRODUCTION

1. Just-In-Time Manufacturing evolves from implementation of Pull System. In Pull System each processes treated as "customer"- When on demand, to be supplied with what is needed only at the right quantity at the right time.

2.. To avoid the tendency of product being pushed to the process before it is needed, rules and signals are established to regulate the supply of products or information.

3. In Pull System, minimum buffer stock is allowed to ensure no disruption of supply to the process when required.

PRINCIPLE OF PULL SYSTEM



OBJECTIVE

Avoid overproduction

Force improvement of processes

Avoid shortage of supplies

Reduce inventory cost

INITIATIVES / TOOLS

- Kanban
- Supermarket
- Milk Run
- Small Batch
- Takt Time
- One Piece Flow Work Cell
- Production Leveling (Heijunka)

JUST IN TIME

JIT Philosophy

Supply the right material or information, at the right time, at the right place, and in the right quantity when it is needed by customer.

JIT Objective

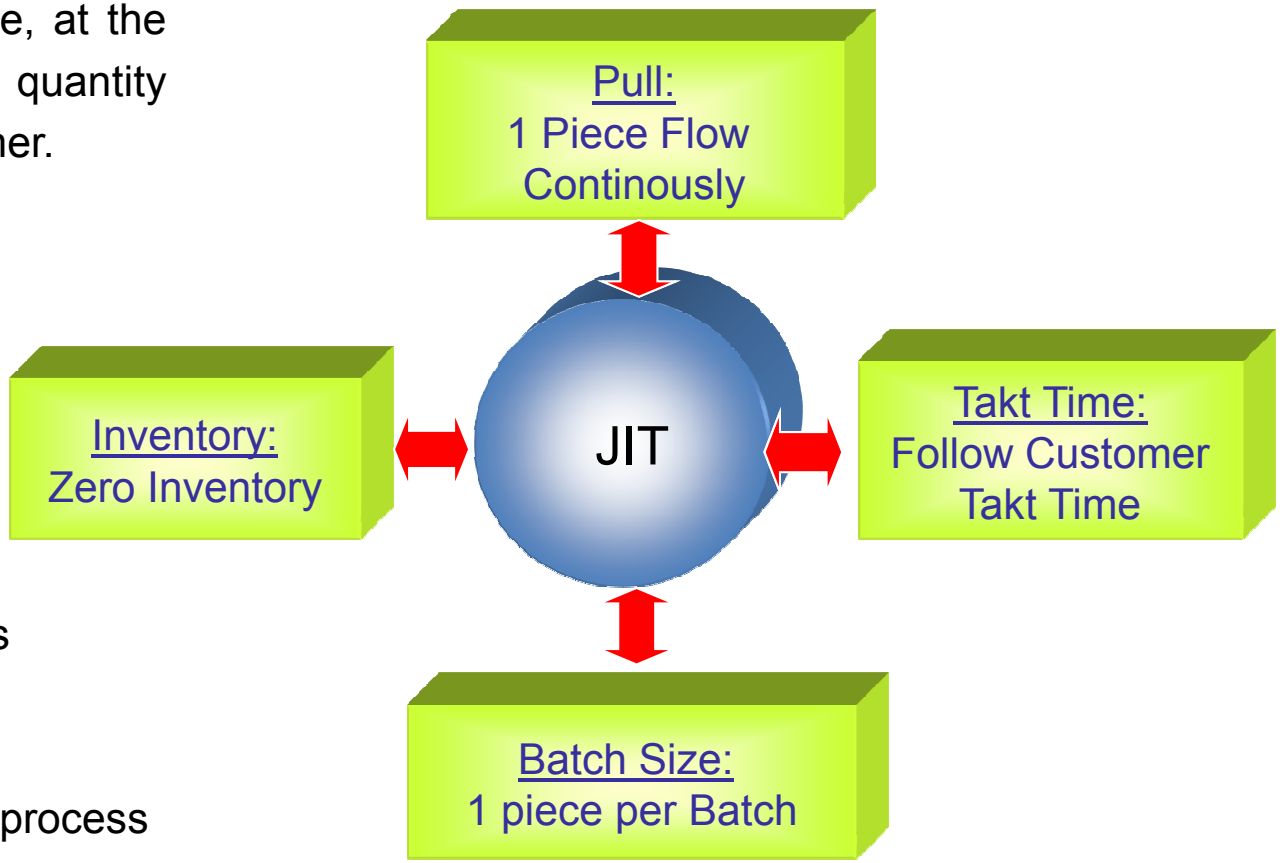
Reduce inventory

"*Flow whenever possible, Pull whenever must*".

JIT Benefits

- Avoid shortage of supplies
- Avoid overproduction
- Reduce inventory cost
- Force improvement of the process

JIT's 4 Principles – At Leanest State



JUST IN TIME

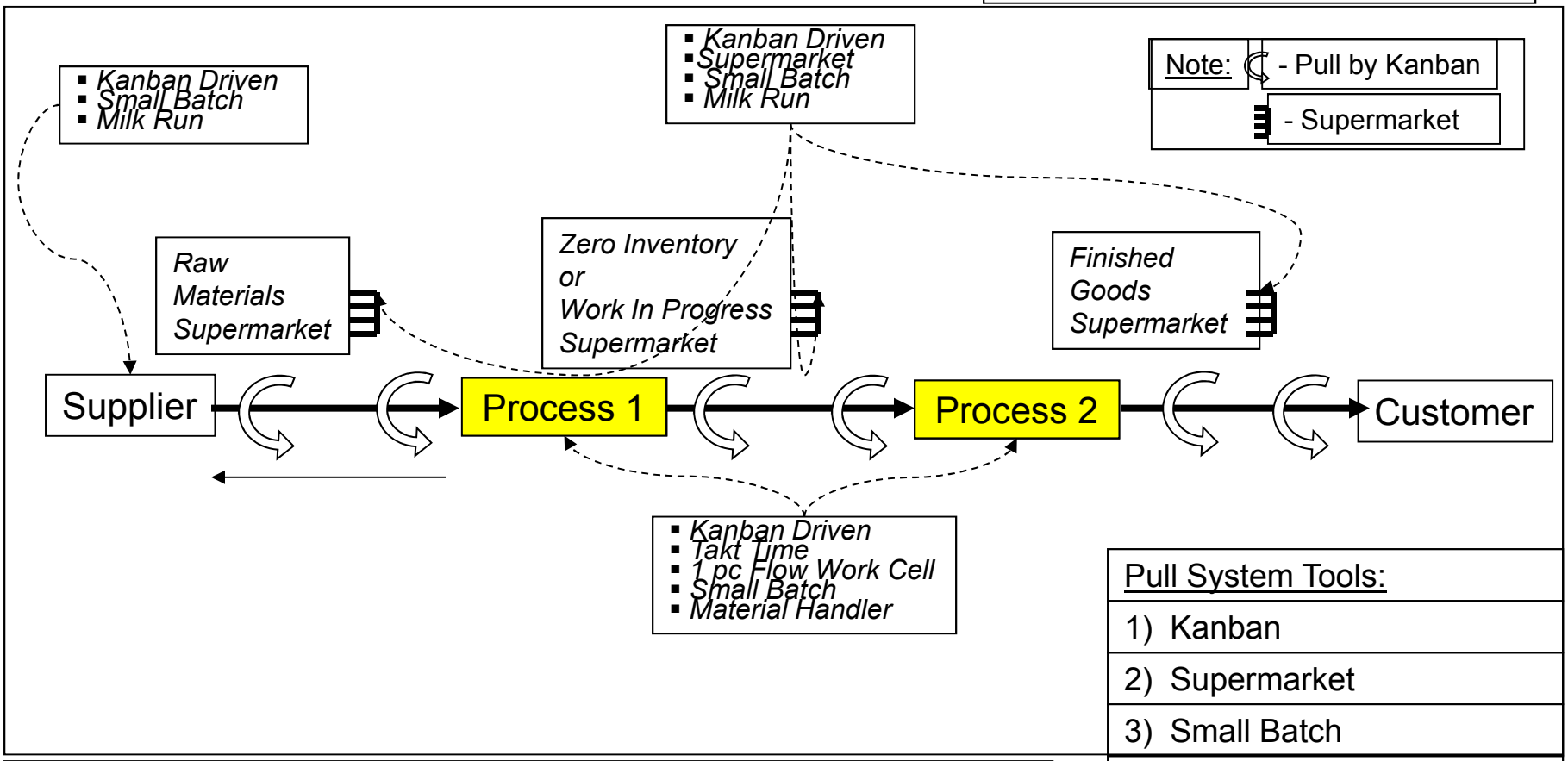
Conceptually, JIT is a shift from Traditional Batch & Queue Production to 1 Piece Continuous Flow Production. Ideally JIT is when products are 100% on-demand with zero inventory.

Traditional Batch & Queue → Ideal State of Lean

Push or Scheduled	Supermarket Pull (Kanban)	Sequenced Pull (Broadcast)	FIFO Sequenced Flow	Continuous Flow (1 pc Flow)
Schedule each process and push to the next.	Upstream process replenishes what downstream customer took away.	Pull from a feeder in sequence.	Defined lane with d standard WIP between unlinked processes in FIFO sequence.	Physically link process steps with no inventory between.

JUST IN TIME

Pull between Process 1 and 2:.



Pull System Tools:
1) Kanban
2) Supermarket
3) Small Batch
4) Milk Run
5) Material Handler
6) Takt Time
7) One piece Flow Work Cell

- Process 1 should not make its components until Process 2 uses up its original supply of components from Process 1.
- When original supply at Process 2 is down to safety stock, a signal is triggered to Process 1 to start producing.

KANBAN

- Pull system deploys "signal" called *"Kanban"* to trigger production and delivery of parts.
- Rules and regulations are developed to regulate the sending of replenishment signal.
- "Kanban" is a Japanese word for signal card. In general it means sign, signboard, door plate, poster, bill board, card.
- Simple signals can be in the form of cards, empty containers, empty bins, empty carts.
- Returning an empty bin is also a Kanban; a signal to refill it with specific number of parts. Similarly, sending back a card with detailed information regarding the part and its location.

Example of Kanban cards in use

SUPERMARKET

- Simple user friendly rack are used to keep minimal inventory buffer. Applicable to store incoming materials, WIP and FG.
- Minimal inventory allows sufficient time for a process to replenish the consumed quantity.
- Inventory level is determined by historical demand based on a trailing 3 months average. Inventory level are reviewed regularly as the demand sometimes change drastically.
- Stock is replenished when it reaches the re-order level before it runs out.
- The concept “dock to factory floor” in which incoming materials are not warehoused before going to production requires effective freight management system.
- The ultimate goal of JIT is to eliminate the “supermarket” and move to true one-piece flow wherever possible.

SMALL BATCH

Size of the batch may vary based on:
- Process cycle time
- Location of suppliers
- Weight or size of the raw materials or products.

- As a basic rule, the batch size should be easily handled by single material handler. He should be able to do manual loading and unloading of the packing to site.
- If purchasing and receiving of huge quantity is unavoidable, it is recommended that the raw materials be packed in small batches which are packed in a lot.

<u>Small batch size means:</u>

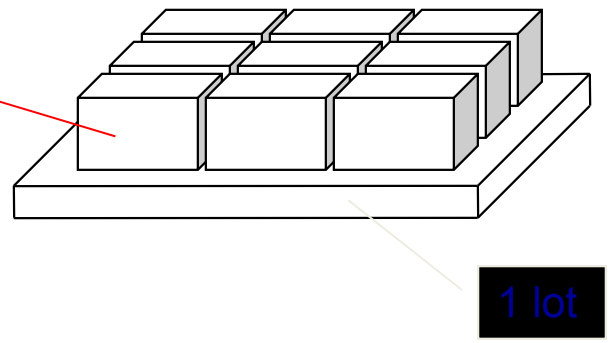
= frequent supply

= lesser space consumed

= material/product moves quicker

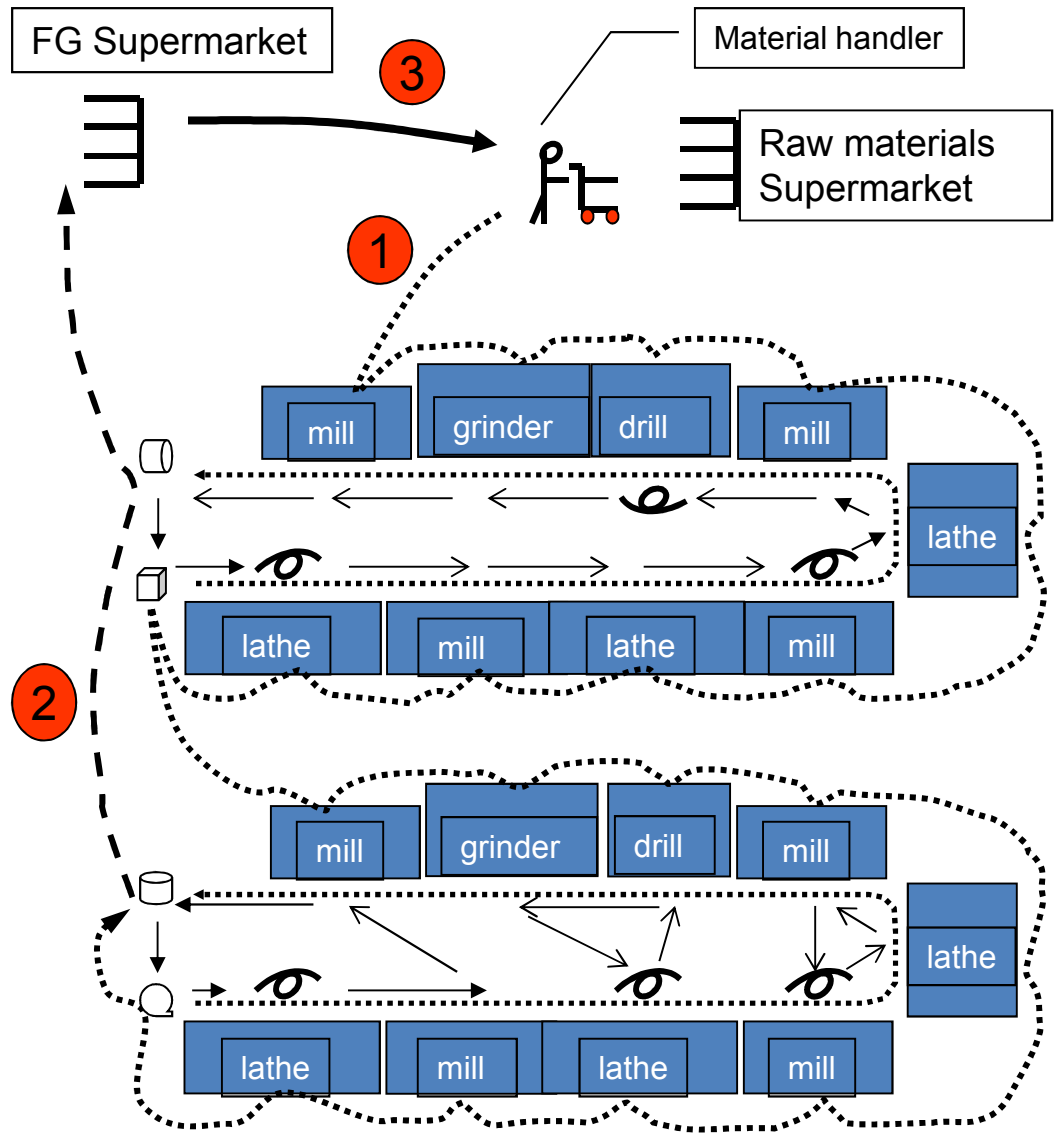
= better cashflow

1 small batch consist of standard quantity of raw materials or products



MILK RUN

- The function of Material Handlers are to replenish the required materials to the processes and collect FG.
- Material handlers prevent the operators from leaving the production work cell in search of materials causing unnecessary production downtimes.



Milk Run Routine:

1 -Replenish needed materials

2 -Collect FG

3 -Return for step 1

-Materials

-FG

DRB-HICOM

TAKT TIME

- Continuous flow system's pace is designed based on customer's takt time.
- "Takt Time" is a German word for rhythm or meter describing the pace of production required to meet the customer demand. It is the rate at which the customer is drawing the product from supplier.
- If the process pace is faster than takt time, the tendency is products overproduced.
- If the process pace is slower than takt time, the process becomes bottle-neck.

Example of Takt Time Calculation

$$\text{Takt} = \frac{\text{Available time per period (second)}}{\text{Customer demand per period (unit)}}$$

Example:

Daily working hour = 8 hours 50 minute/day
= 530 minute/day

Working day per month = 22 day/month

Customer buy per month = 20,000 unit/month

Daily production requirement = 910 unit/day

Thus, Takt Time = 530/910 min/unit

= 0.59 minute per unit

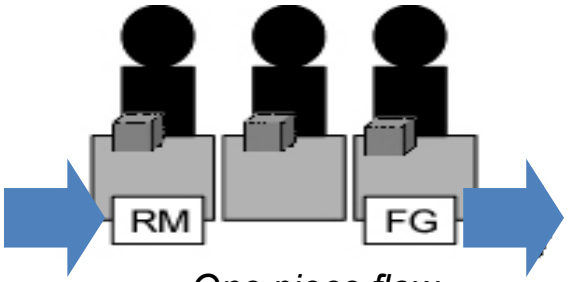
= 35 second per unit

ONE PIECE FLOW WORK CELL

A true one piece flow system would be a zero inventory system where products are made and delivered only when they are ordered by the customer.

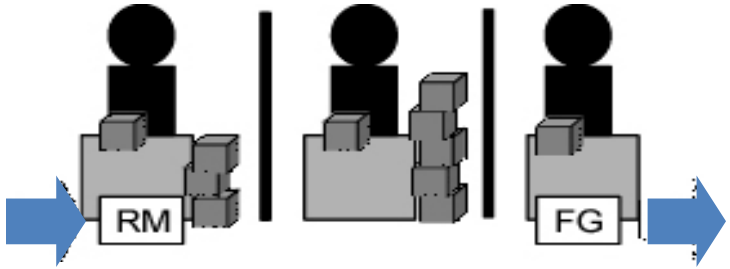
- Flow means, upon receiving customer's order, there is a mechanism to trigger the process to obtain materials needed as per the customer's order and subsequently process to produce and deliver the products in shortest time to the customer.
- Number of operators assigned to the production cell is determined by the output produced at takt time.

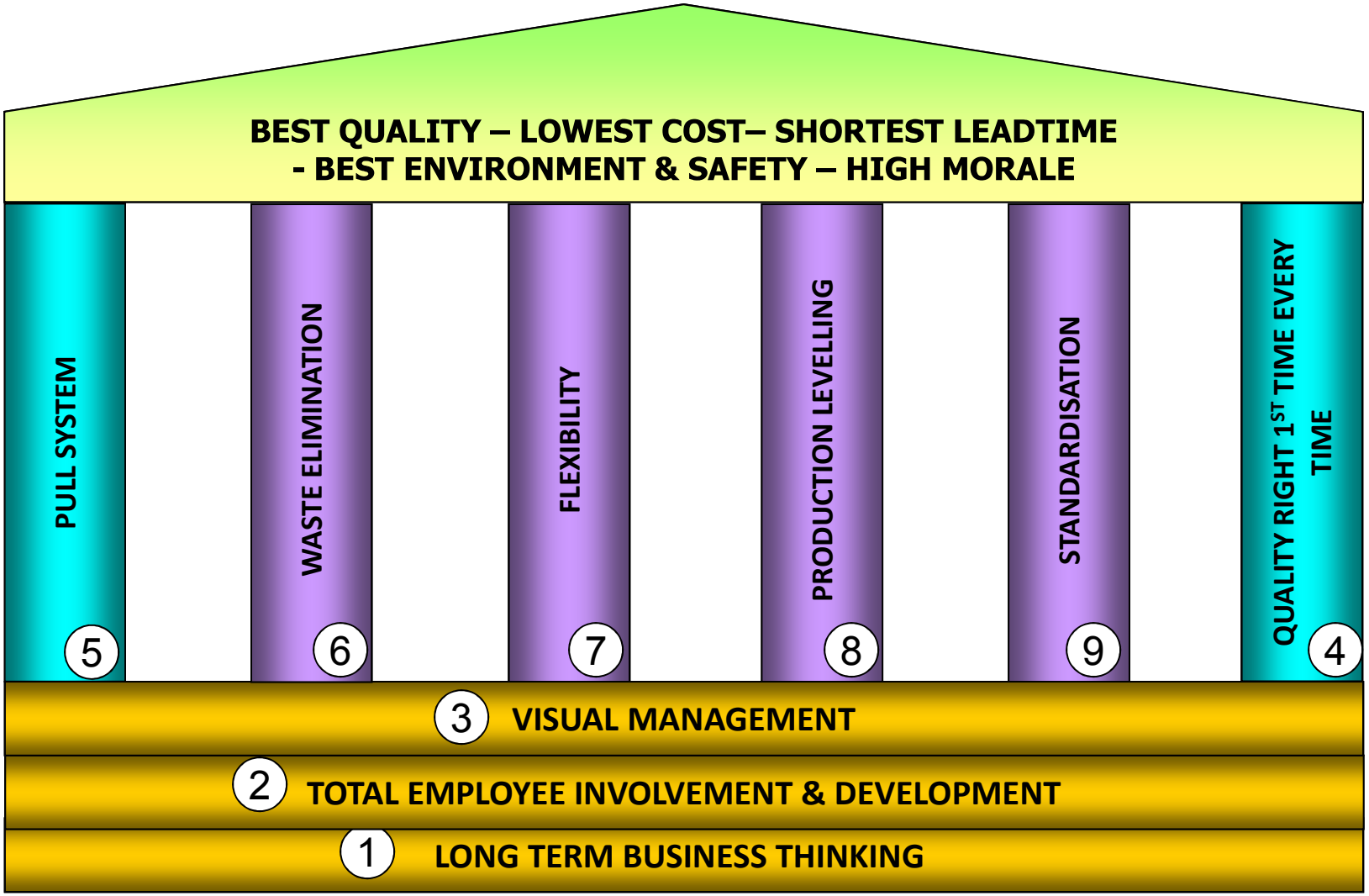
Lean Production:



- One piece flow
- Pull
- Compact cell

Traditional Production:



- Large batch flow piece flow - Push
- Occupied big space

AMS 9 PRINCIPLES