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Improving Process Flow

Key Learning Points

1. Describe the importance of flow and why improvement is necessary.
2. Explain how to improve process flow.
3. Utilize process flow improvement in improvement projects.

What Process Flow?

Flow is how work progresses through a system. When a system is working well, meaning synchronous flow, work tends to move with a steady and predictable pace, whereas, improper flow means work starts and stops. Every time there is a breakdown in the flow, chances of accumulating waste increase. The goal is to ensure consistent flow which generates more reliable delivery, and greater value to customers, teams, and stakeholders. Value is one of the most important, and first, principles of lean manufacturing.

Customer

Define value in the eyes of the customer.

Ideal State

Map the value stream and envision the ideal state.

Remove and Rethink

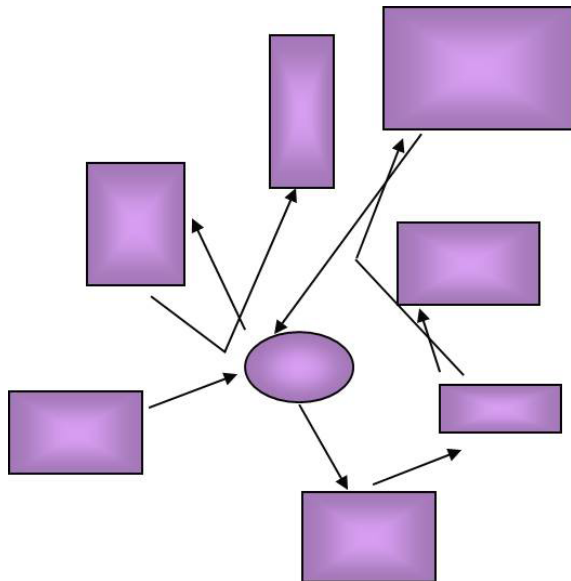
Remove all impediments to synchronous flow, and rethink work processes to optimize flow of materials, work in process, finished items, operators, machines,

and information.

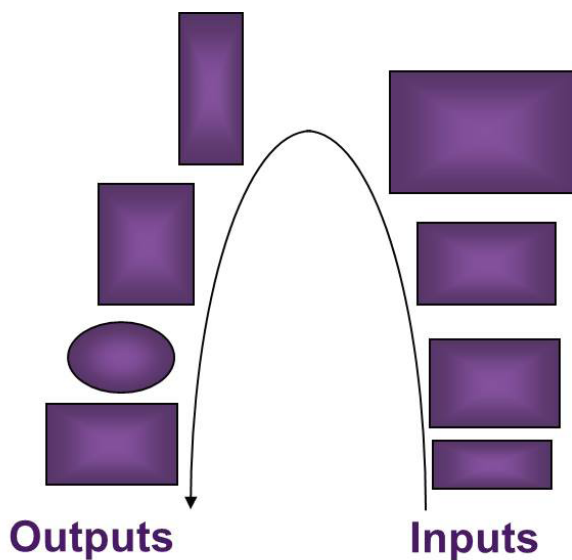
Proximity

Geographically concentrate process steps into a “cell” or “line.”

Before Improvement



After Improvement



Sequence

Design the process and cell so that products/services are produced in the same sequence of operations.

- Simplifies cell operation
- Minimizes WIP

Notes:

- Allows for smaller batch sizes

Interdependence

Make process steps interdependent—they must be run to the same Takt time—with no independent process operation.

- Synchronizes processing
- Highlights the bottleneck
- Removes queues between process steps
 - Leads to reduced cycle time
 - Provides immediate quality feedback

Monuments

Monuments are large, difficult to move equipment or process components that force batching and queuing to optimize efficiency—a monument is often shared by multiple value streams. Strategies to deal with monuments include:

- Eliminate: Remove the monument if another way of processing without it can be devised.
- Break-up: Sometimes monuments can be replaced by several smaller, more flexible processing methods.
- Isolate: Plan and build safety stocks (planned waste) to minimize the impact of the monument.
- Do nothing: Just live with it and do the best you can (usually not the best option).

Steps to Improve Process Flow

Use Lean Layout-Just in Time

Develop Lean Layout to:

- Keep FIFO (first in, first out)
- Minimize WIP (work in process)
- “Pull” work
- Smooth production
- Meet demand

Accomplish this by:

- Using continuous flow, one piece processing
- Designing safety stocks to compensate for minimal setup/changeover times

Notes:

- Using point-of-use storage
- Calculating and using Takt time

Feed the Process Appropriately

There are two basic types of strategic inventory:

- Safety Stock to compensate for process inefficiencies (internal)
- Buffer Stock to compensate for customer demand fluctuations (external)

Determine “Standard Work”

Standard work in Process is the amount of inventory which must exist in the process to make the process sustain the line based on the demand. It includes units actually being worked on or serviced, units in test, units curing, stabilizing, healing, etc.

It does not include units waiting, units stored, or staged (unless it is strategic inventory). Units may be the customer in a service process (e.g. airlines, restaurants, education, etc.).

Create a Supermarket

A supermarket is a group of products or materials that is stored to respond to instantaneous demand. Supermarket stock levels are determined through an understanding of typical demand patterns, service policy, and the time it takes to replenish stock. Supermarkets are one type of strategic inventory.

Supermarket “Pull” Signal

- A strategic inventory approach creates a buffer of planned inventory after an operation to mitigate lead time and potential capacity constraints.
- A variation of a min/max approach; this approach would typically include a Kanban signaling device pointing back to the prior operation.

How to “Pull”

1. Begin at the end of the value stream at a process step that you can control. This is referred to as the pacemaker.
2. Alleviate bottlenecks (constraints) at the pacemaker step, therefore creating capacity to pull items from further up the value stream.
3. Signal upstream process steps when capacity is free or scheduled to be available.
4. Pull items to the available capacity in a single piece flow if possible.

Pulling in Service Organizations

Pull is a method of controlling the flow of resources based on actual demand or consumption. In its most basic sense it is a decision tool. In manufacturing, it

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helps organizations decide what to make and when to make it, and what to buy and when to buy it. In offices and service organizations the resources that need to be controlled often are information and people. The same pull concepts used in manufacturing can be applied to office and service organizations. They can help office and service workers decide what to work on, and when to work on it in order to maintain customer service, while preventing overproduction.

With pull production, a signal is sent to trigger work (value creation) in sync with customer demand. In sequential processing, this often means the signal is sent back to previous steps in the process to pull forward sufficient work to replenish only what has been consumed or moved forward in the process. In some service processes, a signal is sent to pull resources to enable timely delivery of service to the customer.

Examples of Pull Production in Service Value Streams:

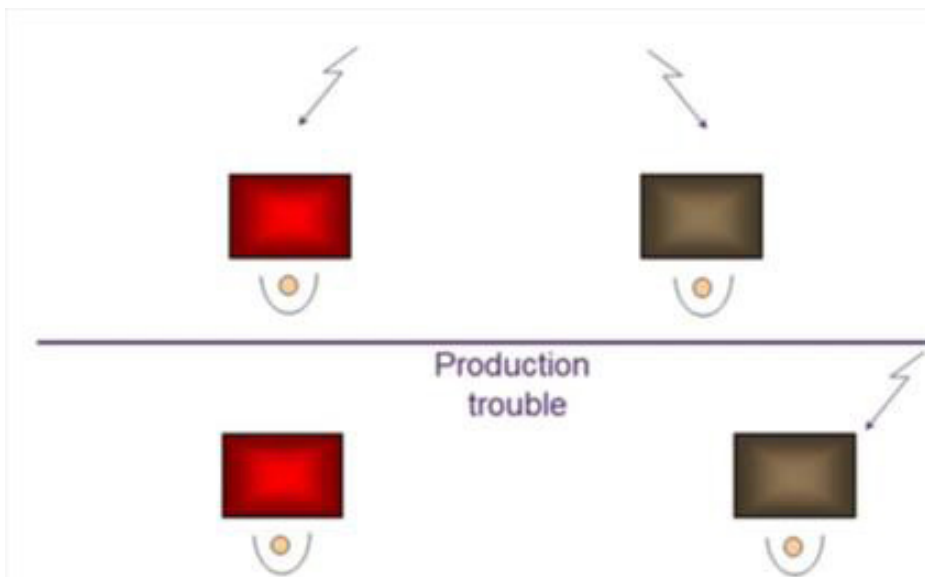
- Sending a signal to restock a product in a retail store
- Positioning of airline staff in advance of plane arrival at an airport gate based upon predicted arrival time
- Sending reports or information based upon a signaled request/need rather than through automatic distribution

Production Systems

Geographically concentrate process steps into a “cell” or “line.”

Push Production System

A push production system continues to make a product to schedule as long as resources and materials are available.

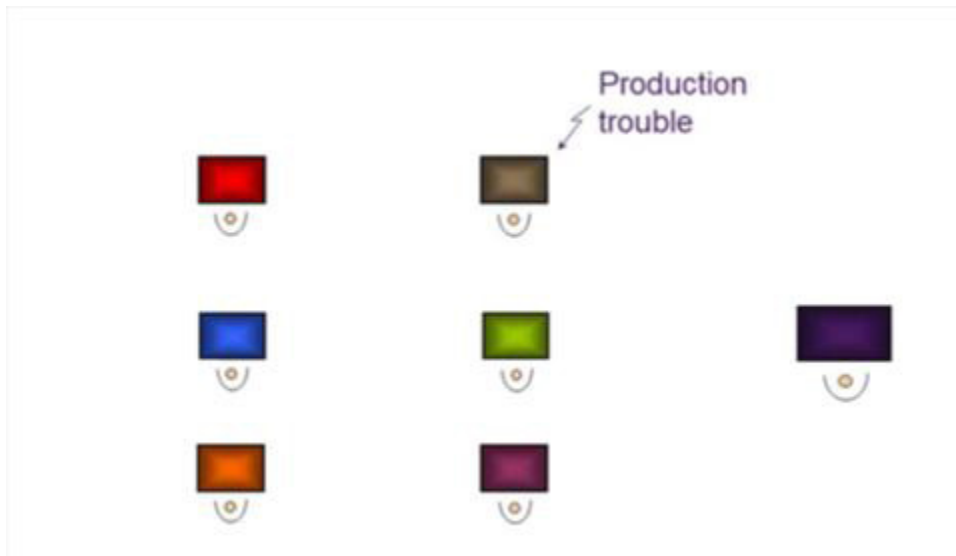


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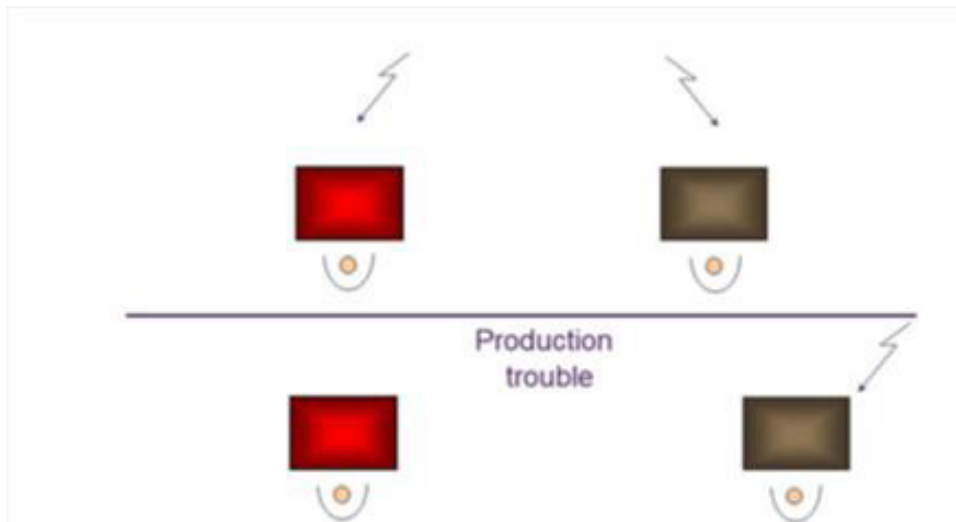
Push Production Trouble

A push production system continues to make a product to schedule as long as resources and materials are available.



Pull Production System

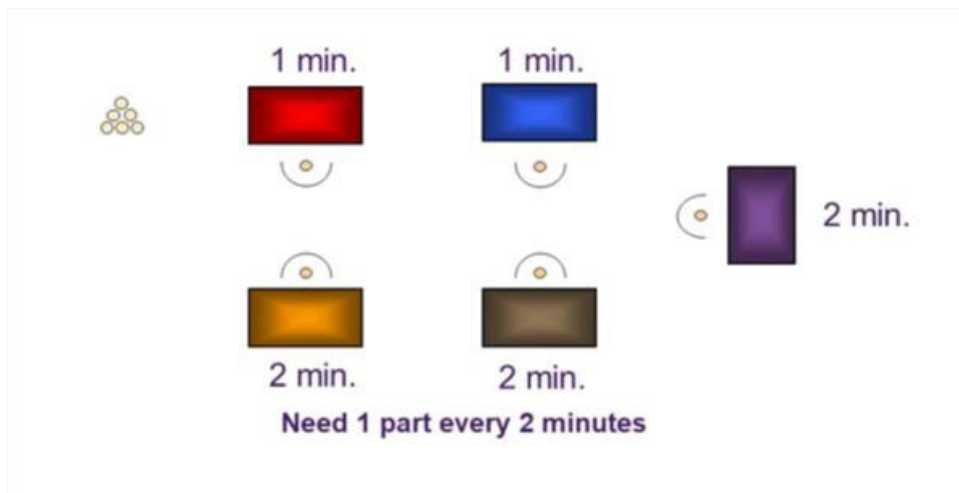
A pull production system only makes a product when the upstream customer needs it.



Balancing the Process

Geographically concentrate process steps into a “cell” or “line.”

Unbalanced Process



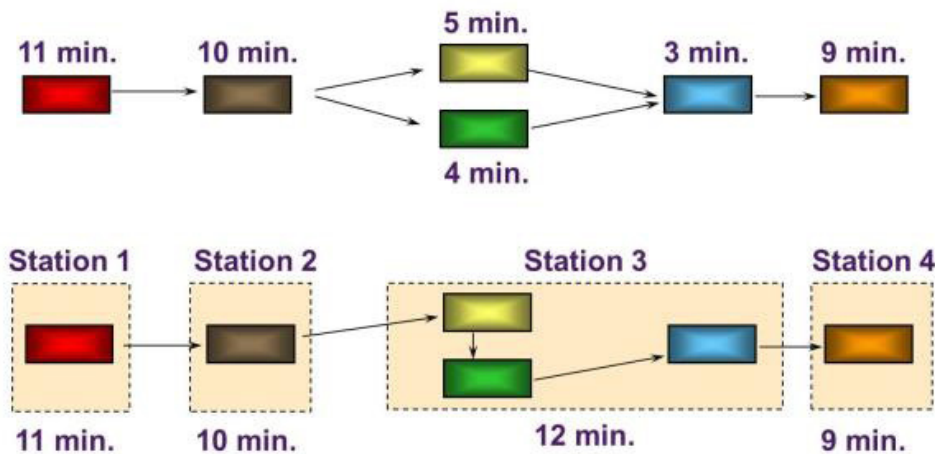
Balanced Process



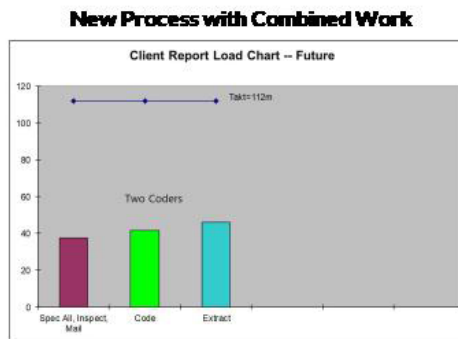
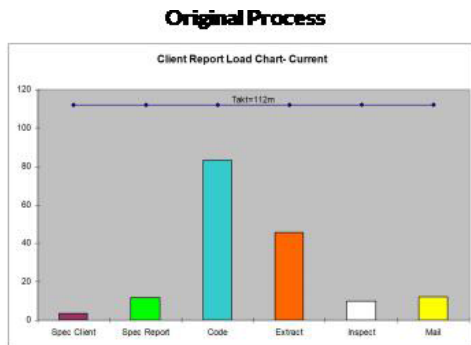
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Balancing the Flow

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Load Charts



When Should Improving Process Flow be Done?

Most processes will benefit from analysis and improvement of flow, process balance, inventory placement and replenishment, and workflow timing.

Pitfalls to Avoid

- Distance: Not co-located or at least in propinquity to supply base
- Long Setup Times: When changing over tooling takes a long time, larger batches are run
- Batch-Oriented Machines: Some machines are designed to be most efficient with large runs (ECQ-economic order quantity)

- Poor Maintenance: Machines that break down frequently disrupt flow (lack of RCM/TPM)
- Unreliable Deliveries: When there is no trust that parts will arrive on time, extra materials are kept on hand (cash flow)
- Unreliable Quality: Poor supply base with high PPM adversely affects flow
- Resistance to Change: Some people think flow might work, but want to “old way” of doing things

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