Lecture 8: Jidoka
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Toyota Production System

Goal: Highest Quality, Lowest Cost, Shortest Lead Time

Just-in-Time
- Continuous Flow
- Takt Time
- Pull System

Jidoka
- Stop and notify of abnormalities
- Separate human work and machine work

Heijunka

Standardized Work

Kaizen

Stability

Toyota Production System “House.”
Jidoka

自 僱 化

Self Movement -ization

AUTONOMATION
Jidoka

AUTONOMATION VS AUTOMATION

Quality Improvement

Reduces Technicality

Labour Reduction

Increases Technicality
## Jidoka

<table>
<thead>
<tr>
<th></th>
<th>Autonomation</th>
<th>Automation</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>Production improve when people are multi-process handler</td>
<td>Work is easier but people still “Machine Watching”</td>
</tr>
<tr>
<td>Machine</td>
<td>Machine can detect errors and stop autonomously</td>
<td>Machine run to end of cycle until stop button is pressed</td>
</tr>
<tr>
<td>Quality</td>
<td>Defects and Machine crashes are prevented by auto-stop</td>
<td>Machines crashes and mass production of defects can occur</td>
</tr>
<tr>
<td>Response to Problem</td>
<td>Errors cause machine to stop &amp; root cause can be found quicker</td>
<td>Errors are found later &amp; root cause correction takes longer</td>
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</table>
JIDOKA

- **One of the two pillars** of the Toyota Production System (TPS) along with Just-In-Time

- Provide machines and operators the **ability to detect** when an **abnormal condition** has occurred and **immediately stop work**.

- Enables operations to **build-in quality** at each process and to **separate men and machines** for more efficient work.

- Jidoka is also called **Autonomation**, which means “Automation with Human Touch”.

JIDOKA

- Adds human judgment to automated equipment
- Minimizes poor quality
- Makes the process more dependable
- Gives the employee responsibility and authority to stop production
Build in Quality

M1 → M2 → M3 → Inspect → Ship
Build in Quality

M1 ➔ M2 ➔ M3 ➔ Ship
Steps in Jidoka

1. Detect Abnormality
2. Stop
3. Fix or Correct the immediate condition
4. Investigate the root cause and install a countermeasure
Steps in Jidoka

A situation deviates from the normal workflow

The line is stopped

A machine detects a problem and communicates it

Manager/Supervisor remove cause of the problem

Improvements incorporated into the standard workflow
Role of Jidoka

Autonomation is an important component of Lean Manufacturing Strategy for **high-volume** production, **low-variety** operations, particularly where **product life cycles** are measured in **years** or decades.
Benefits of Jidoka

• Increase Quality
• Lower Costs
• Improve Customer Service
• Reduce Lead Time
Challenges of Jidoka

• Design to operate with the bare minimum (just enough, *just in time*) in order to detect abnormal conditions or system changes that might otherwise go unnoticed.

• Visual controls are *just decoration unless they trigger action*.

• Bringing all *production to a halt* until it is resolved can be difficult. Producing *rejected parts does not equal to productivity*. 
Techniques for Jidoka

- **Pokayoke**
  - Visual control of Quality
  - Prevents Defects from happening
- **Andons**
  - Lights to signal production line status
  - Stop production when defects found
- **Separate Man from Machine**
  - Elimination of waiting waste of man waiting for machine
Pokayoke (Mistake-Proofing)

“Device that literally prevents defects from being made”

**Pokayoke Types**

<table>
<thead>
<tr>
<th>Contact</th>
<th>Control</th>
<th>Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking height bars</td>
<td>• Parking height bars</td>
<td>• Staff mirror</td>
</tr>
<tr>
<td>Armrest on seats</td>
<td>• Armrest on seats</td>
<td>• Shop entrance bell</td>
</tr>
<tr>
<td>Fixed- Value</td>
<td>• French fry scoop</td>
<td>• Trays with indentations</td>
</tr>
<tr>
<td>Pre-dosed medication</td>
<td>• Pre-dosed medication</td>
<td></td>
</tr>
<tr>
<td>Motion- Step</td>
<td>• Airline lavatory doors</td>
<td>• Spellcheckers</td>
</tr>
<tr>
<td>Airline lavatory doors</td>
<td></td>
<td>• Beepers on ATMs</td>
</tr>
</tbody>
</table>
Pokayoke (Mistake-Proofing)

“Asymmetrical joints to prevent misalignment!”
Pokayoke (Mistake-Proofing)

“Different size standards to prevent wrong input!”

“Tether to prevent misplacement!”

“Ratchet to prevent overtightening!”
Pokayoke (Mistake-Proofing)

Prevent

“Overload!”

“Overflow!”

“Overheat!”
Pokayoke (Mistake-Proofing)

“Stop operations when door is open!”
Pokayoke (Mistake-Proofing)
Pokayoke (Mistake-Proofing)

How to open the safe?

How to set a new pin?
Pokayoke (Mistake-Proofing)

1. Key “1234” then “#”
2. Turn the knob to open
3. To change pin, Press the red button, Key “NEW PIN” then “#”
Pokayoke (Mistake-Proofing)
Exercise

**FMEA (Failure Modes and Effects Analysis)**

- Identify failure modes and their effects
- Identify causes of the failure modes and controls
- Prioritize
- Determine and assess actions
Exercise

1. For each process input (start with high value inputs), determine the ways in which the input can go wrong (failure mode)
2. For each failure mode, determine effects
   Select a severity level for each effect
3. Identify potential causes of each failure mode
   Select an occurrence level for each cause
4. List current controls for each cause
   Select a detection level for each cause
Exercise

5. Calculate the Risk Priority Number (RPN)
6. Develop recommended actions, assign responsible persons, and take actions
   Give priority to high RPNs
   MUST look at severities rated a 10
7. Assign the predicted severity, occurrence, and detection levels and compare RPNs
Exercise

Severity
1 = Not Severe, 10 = Very Severe

Occurrence
1 = Not Likely, 10 = Very Likely

Detection
1 = Easy to Detect, 10 = Not easy to Detect
Separate Man from Machine

“Waiting for machine to process is waste. Unfortunately, most machine don’t know that you are waiting.”

“Does the pot boil faster being watched?”
Separate Man from Machine

- Two general approaches to address the 3 rules
  - Purchase or rent machines with shorter cycle times.
  - Create an environment conducive to flexible employees performing other tasks while the machine cycle. *Eg. Cell layout of multiple machines where the operator can attend to other machines while waiting for one to complete.*

- Because the waste of waiting is so easily detectable, converting the other six types of waste into it will enable problems to become more visible, and hence, easier to address and solve.
Separate Man from Machine
Separate Man from Machine
Separate Man from Machine
Separate Man from Machine

The Evolution toward Jidoka

Manual feed and watch machine cycle.

Watch machine cycle.

Self-monitoring machine.
Questions?
Thank You