Mistake-Proofing

Poka-Yoke
Poka-Yoke Training Objectives

- Gain a basic understanding of Poka-Yoke procedures and how they fit into the Lean process improvement culture
- Learn skills to identify causes for mistakes by applying problem solving tools and nominal group techniques
- Understand the six Poka-Yoke Techniques to eliminate mistakes or to make them immediately apparent if they occur
- Apply skills learned to current brainstormed mistake sources
- Have Fun!
The House of Lean

Customer Needs
Highest Quality, Shortest Lead Time, & Lowest Cost

Continuous Improvement:
- Lean Teamwork
- Kaizen
- 5S
- Poka-Yoke
- VSM
- Kanban
- TPM
- Lean Tools

Standardize/Level Production and Operations

Process Stability and Reliability
## Which Lean Tools to Use?

<table>
<thead>
<tr>
<th>Problem to Address</th>
<th>Lean Tool to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of a plan</td>
<td>Value Stream Mapping</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>Kaizen Events</td>
</tr>
<tr>
<td>Workplace Organization</td>
<td>The 5S System</td>
</tr>
<tr>
<td>Material Flow Issues</td>
<td>Spaghetti Diagram</td>
</tr>
<tr>
<td>Stability Issues, Defects, Errors, Accidents</td>
<td>TPM (Total Productive Maintenance), Poka-Yoke (Mistake Proofing), Quick Changeovers</td>
</tr>
<tr>
<td>Supply (Pull) Issues</td>
<td>Kanban, Point-Of-Use-Storage (POUS)</td>
</tr>
<tr>
<td>Pursuit of Perfection</td>
<td>Kaizen Principles, Workplace Practices</td>
</tr>
</tbody>
</table>

Identify and eliminate muda!
# Review of 8 Wastes (Mudas)

<table>
<thead>
<tr>
<th>Muda</th>
<th>Manufacturing</th>
<th>Office</th>
<th>Healthcare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defects/Errors</td>
<td>Scrap, rework</td>
<td>Incorrect data</td>
<td>Incomplete forms</td>
</tr>
<tr>
<td>Overproduction</td>
<td>Pushing production</td>
<td>Filling other’s in-box</td>
<td>Extra tests</td>
</tr>
<tr>
<td>Waiting</td>
<td>Waiting on __________</td>
<td>Waiting on __________</td>
<td>Waiting on __________</td>
</tr>
<tr>
<td>Non-Utilized People</td>
<td>No Input from workers</td>
<td>No Input from workers</td>
<td>No Input from workers</td>
</tr>
<tr>
<td>Transportation</td>
<td>Moving product, etc.</td>
<td>Multiple reviews</td>
<td>Patient transfer</td>
</tr>
<tr>
<td>Inventory</td>
<td>WIP, materials, etc.</td>
<td>Full files; extra copies</td>
<td>Awaiting service</td>
</tr>
<tr>
<td>Motion</td>
<td>Searching, retrieving</td>
<td>Hand carry documents</td>
<td>Reaching and bending</td>
</tr>
<tr>
<td>Extra Steps</td>
<td>NVA steps</td>
<td>Repetitive data entry</td>
<td>Repetitive data entry</td>
</tr>
</tbody>
</table>

Muda = Non-Value Added Waste = “Anything the customer is unwilling to pay for”

Bob Olson  
OlsonPE.com  
803-517-6078
“Poka-Yoke”

Mistake-Proofing

- Poka-Yoke is a system to prevent mistakes from happening or immediately catches any mistake that has happened so that it can be corrected.

- Human errors are inevitable in any process, but for every error, there is a cause(s) that can be corrected or a system implemented to detect the error for correction.

- Defects occur when mistakes are allowed to reach the customer; the aim of Poka-Yoke is to design processes so that mistakes are prevented or corrected immediately, thus eliminating defects at the source.

Murphy’s Law: “Whatever can go wrong, will go wrong.”
What is Your Organization’s Culture?

Wrong Attitude:
- You’re always going to have mistakes
- Blame someone or something else (excuses)
- Better training is the answer

Right Attitude:
- Any kind of mistake people make can be reduced and even eliminated
- People make fewer mistakes if they are supported by a system based on the principle that errors can always be prevented

“Whether you believe that you CAN or can’t, you’re right!”

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Error Prevention is better than Defect Detection

- Errors are the Cause
- Defects are the Result
- Defects are Prevented If:
  - Errors are prevented from happening
  - Errors are discovered and corrected
- The 1-10-100 Rule: As activities progress through a value stream, the cost of correcting an error increases by a factor of 10.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order entered correctly</td>
<td>$ 1</td>
</tr>
<tr>
<td>Error detected in billing</td>
<td>$ 10</td>
</tr>
<tr>
<td>Error detected by customer</td>
<td>$ 100</td>
</tr>
</tbody>
</table>

“An ounce of prevention is worth a pound of cure.”
Classroom Exercise

➢ Brainstorm mistakes/errors that have occurred (or that could occur) in your organization

➢ Mistake and Error Examples:
  - Accidents
  - Data Entry
  - Communications
  - Procedures
  - Computer Glitches
  - Scrap/Rework Situations
  - Safety Audit Findings
  - Analysis of Past Accidents
  - Mislabling
  - Wrong Shipments
  - Quality Problems
  - Not Following Procedures
The Poka-Yoke System for Mistake Proofing

A. Awareness
   (Brainstorming, Communication, Measurement)

B. Root Cause Analysis
   (The Five Why’s, Brainstorm & Prioritize Causes)

C. Six Poka-Yoke Techniques
   1. Elimination
   2. Replacement
   3. Prevention
   4. Facilitation
   5. Detection
   6. Mitigation
The First Step of Poka-Yoke is

“AWARENESS”

- Brainstorm what has gone wrong and/or could go wrong
- Communicate possible errors
- Measure actual errors and post on communication boards
  - Run charts on safety performance, quality issues, scrap, rework, customer complaints, etc.
  - Pareto Analysis (80/20 Rule) of Past Performance
- Routinely review performance and ask for ideas for improvement

“Shine a light on it.”

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The Second Step of Poka-Yoke is

“Root Cause Analysis”

The 5 Why’s

- List the mistake/error at the top
- Ask why the problem occurs and record answers (if too many answers are generated, prioritize the list to a manageable number)
- For each answer, ask why it occurs and record answers
- Keep asking why (approximately 5 levels) for each answer to get to the true root cause(s) of the problem
- Stay within range of possible solutions by continually asking, “Can we fix this problem?”
- Be alert to drifting away from practical solutions
The Five Why’s Example

Problem: “Why are we replacing the tires?”
- They get flat all the time.
  Why do they get flat?
- They get nails in them.
  Why do they get nails?
- There are nails on the floor.
  Why are there nails on the floor?
- Nails fall out of their wet cartons.
  Why are the cartons wet?
- There is a hole in the roof.

Solution: Fix the hole in the roof.
The 5 Why’s Worksheet

<table>
<thead>
<tr>
<th>Description of the Incident:</th>
<th>Why did the incident occur?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Why?</td>
</tr>
<tr>
<td></td>
<td>Why?</td>
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<tr>
<td></td>
<td>Why?</td>
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<table>
<thead>
<tr>
<th>Description of the Incident:</th>
<th>Finger cut on razor blade at work station</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Why did the incident occur?</strong></td>
<td></td>
</tr>
<tr>
<td>Loose razor blade on work table</td>
<td>Loose razor blade on work table</td>
</tr>
<tr>
<td>Why?</td>
<td>Why?</td>
</tr>
<tr>
<td>Blade used for cutting wraps off roll</td>
<td>Blade not disposed of properly</td>
</tr>
<tr>
<td>Why?</td>
<td>Why?</td>
</tr>
<tr>
<td>Yarn wraps on roll</td>
<td>Blade disposal container too far away</td>
</tr>
<tr>
<td>Why?</td>
<td>Why?</td>
</tr>
<tr>
<td>Roll surface is rough</td>
<td></td>
</tr>
<tr>
<td>Why?</td>
<td>Why?</td>
</tr>
<tr>
<td>Roll is worn over time</td>
<td></td>
</tr>
</tbody>
</table>
The Third Step of Poka-Yoke is
“Solutions to Address Causes”

The Six Mistake-Proofing Techniques:

1. Elimination
2. Replacement
3. Prevention
4. Facilitation
5. Detection
6. Mitigation
Poka-Yoke Technique #1: Elimination

**Description:**
- Eliminate the step that causes the mistake
- Remove Non-Value Added activities
- Redesign the product or process

**Examples:**
- Replace manual data entry with computerized download
- Eliminate unneeded processing step that is allowing contamination to occur
Poka-Yoke Technique #2: Replacement

Description:
- Replace the step with a more reliable mistake-proof one
- Automation of repetitive motion activities

Examples:
- Welding robotics for automobile manufacturers
- Automatic letter scanners and sorters
- Copy machines with collating and stapling features
Poka-Yoke Technique #3: Prevention

- **Description:**
  - Change product or process so that mistake is impossible
  - Physical barrier or fit to prevent undesired action

- **Examples:**
  - Guards on moving equipment
  - Plugs for 110V & 220V
  - Printer cartridges
  - Go/No Go Gauges
Poka-Yoke Technique #4: Facilitation

**Description:**
- Make the correct action far easier than the mistake
- Visual controls like color coding, labels, lines, and signs

**Examples:**
- Warning signs
- Checklists
- Traffic lane markings
- Color coded parts or tools
Poka-Yoke Technique #5: Detection

- **Description:**
  - Make mistakes obvious for immediate correction
  - Sensors, limit switches, light sensors

- **Examples:**
  - Safety guard limit switches to prevent machine running when open
  - Set number of parts to install; if there are any left over, then it was missed
  - Computer warning if all information is not filled in
Poka-Yoke Technique #6: Mitigation

- **Description:**
  - Minimize the effects of mistakes
  - For when the mistake cannot be eliminated

- **Examples:**
  - Personal protective equipment
  - Air bags in cars
  - Electrical fuses
  - An eraser on a pencil
Poka-Yoke Examples

In order for my wife to remember to turn the oven off, she wears the rubber band whenever the oven is on as a constant reminder.
Poka-Yoke Examples
Poka-Yoke Examples

This toilet will not flush unless the lid is down.
Poka-Yoke Examples
# Poka-Yoke Worksheet

<table>
<thead>
<tr>
<th>Description of the Incident:</th>
<th></th>
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<tbody>
<tr>
<td>Top three Causes for the Incident</td>
<td></td>
</tr>
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</table>

## Poka-Yoke Solutions

<table>
<thead>
<tr>
<th><strong>Elimination</strong></th>
<th>Can the activity be eliminated?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Replacement</strong></td>
<td>Can the activity be automated?</td>
</tr>
<tr>
<td><strong>Prevention</strong></td>
<td>Can the mistake be physically prevented?</td>
</tr>
<tr>
<td><strong>Facilitation</strong></td>
<td>Can visual controls be utilized?</td>
</tr>
<tr>
<td><strong>Detection</strong></td>
<td>How can the mistake be immediately detected?</td>
</tr>
<tr>
<td><strong>Mitigation</strong></td>
<td>How can the effect of the mistake be minimized?</td>
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# Poka-Yoke Worksheet

<table>
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<tr>
<th>Description of the Incident:</th>
<th>Finger cut on razor blade at work station</th>
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</table>
| **Top three Causes for the Incident** | 1. Roll wear causes rough surface that causes wraps  
2. Blade disposal container too far away  
3. Gloves are not reliably available from supply cabinet |

## Poka-Yoke Solutions

<table>
<thead>
<tr>
<th><strong>Elimination</strong>: Can the activity be eliminated?</th>
<th>Determine roll life and replace before worn; eliminate wraps and the need for razors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Replacement</strong>: Can the activity be automated?</td>
<td></td>
</tr>
<tr>
<td><strong>Prevention</strong>: Can the mistake be physically prevented?</td>
<td>Investigate new blade design to prevent finger cuts</td>
</tr>
<tr>
<td><strong>Facilitation</strong>: Can visual controls be utilized?</td>
<td>Relocate blade disposal container to point of use</td>
</tr>
<tr>
<td><strong>Detection</strong>: How can the mistake be immediately detected?</td>
<td></td>
</tr>
<tr>
<td><strong>Mitigation</strong>: How can the effect of the mistake be minimized?</td>
<td>Assign responsibility of supply cabinet to day shift supervisor; set up kanban with 5S audits</td>
</tr>
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- Learn skills to identify causes for mistakes by applying problem solving tools and nominal group techniques
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Question & Answer Time

Any Interest in Process Improvements?

- Lean
- Kaizen
- Six Sigma
- Value Stream Mapping
- Other Lean Tools
- Problem Solving
- 5S
- SPC
- Poka-Yoke

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