

For Techno India NJR Institute of Technology
पंकज पोखरेल
Dr. Pankaj Kumar Porwal
(Principal)

Mistake-Proofing

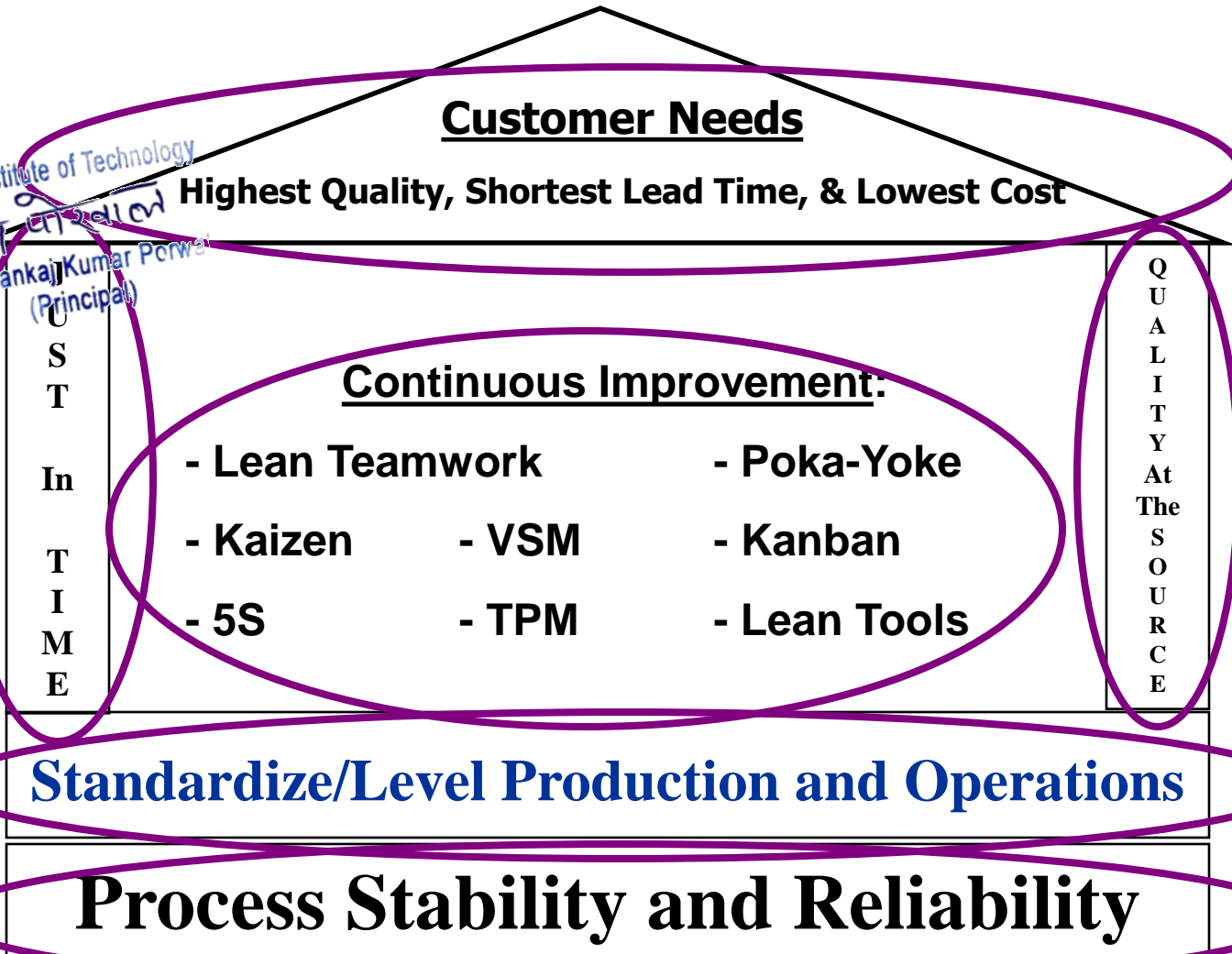
Poka-Yoke

Poka-Yoke Training Objectives

- Gain a basic understanding of Poka-Yoke procedures and how they fit into the Lean process improvement
- **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

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Which Lean Tools to Use?

<u>Problem to Address</u>	<u>Lean Tool to Use</u>
Lack of a plan	Value Stream Mapping
Problem Solving	Kaizen Events
Workplace Organization	The 5S System
Material Flow Issues	Spaghetti Diagram
Stability Issues, Defects, Errors, Accidents	TPM (Total Productive Maintenance), Poka-Yoke (Mistake Proofing), Quick Changeovers
Process Flow Issues	Takt/Cycle Times, Standardized Work, Lean Cell Design, Workload Balancing, Batch Size, One-Piece Flow, Quality at the Source
Supply (Pull) Issues	Kanban, Point-Of-Use-Storage (POUS)
Pursuit of Perfection	Kaizen Principles, Workplace Practices

Review of 8 Wastes (Mudas)

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

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

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“Poka-Yoke”

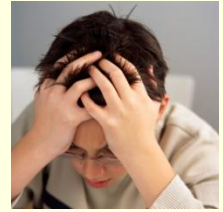
Mistake-Proofing

- ❖ 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

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



**"I'm just having
a bad hair day!"**

Can't = The dirtiest
4 letter word

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

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.

<u>Activity</u>	<u>Cost</u>
Order entered correctly	\$ 1
Error detected in billing	\$ 10
Error detected by customer	\$ 100

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
- Mislabeling
- 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**

The Second Step of Poka-Yoke is

“Root Cause Analysis”

The 5 Why's

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- ~~Lost 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

Description of the Incident:		
Why did the incident occur?		
<i>For Techno India NJR Institute of Technology</i> <i>ਪੰਜ ਕਿਸਤੀ</i> <i>Dr. Pankaj Kumar Porwal</i> <i>(Principal)</i>	Why?	Why?
Why?	Why?	Why?
Why?	Why?	Why?
Why?	Why?	Why?

The 5 Why's Worksheet Example

Description of the Incident:	Finger cut on razor blade at work station	
Why did the incident occur?		
Loose razor blade on work table	Loose razor blade on work table	Not wearing safety gloves
Why?	Why?	Why?
Blade used cutting wraps off roll	Blade not disposed of properly	Gloves not available
Why?	Why?	Why?
Yarn wraps on roll	Blade disposal container too far away	Supply cabinet not stocked
Why?	Why?	Why?
Roll surface is rough		Lack of a 5S and Kanban system for cabinet
Why?	Why?	Why?
Roll is worn over time		No one is responsible for supply cabinet

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

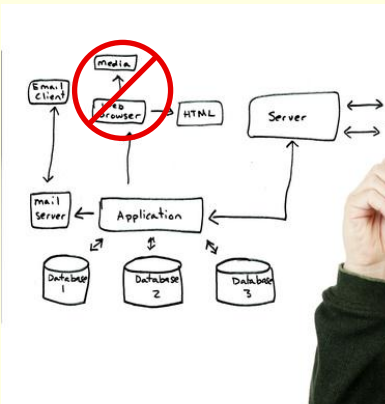
➤ Description:

~~Eliminate~~ **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

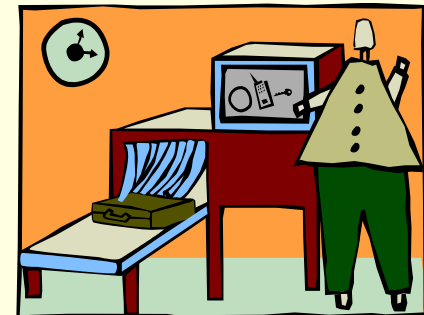
Description:

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

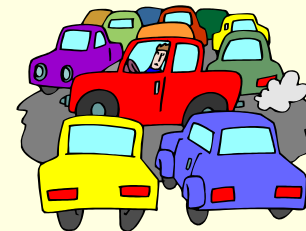
Description:

- 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:

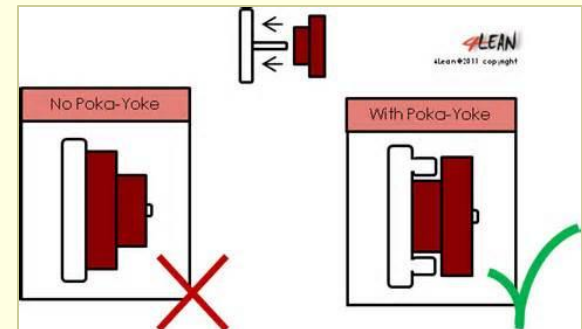
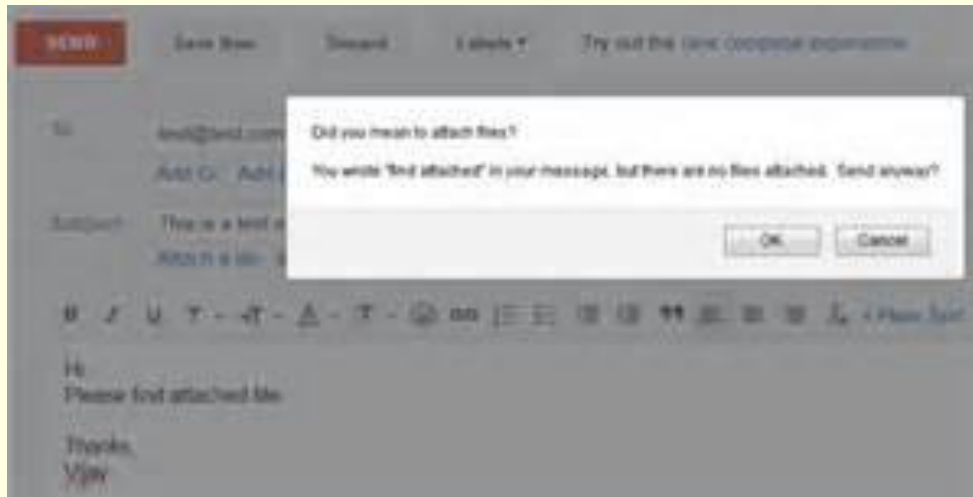
- Personal protective equipment
- Air bags in cars
- Electrical fuses
- An eraser on a pencil



Poka-Yoke Examples



Poka-Yoke Examples



Poka-Yoke Examples

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Poka Yoke

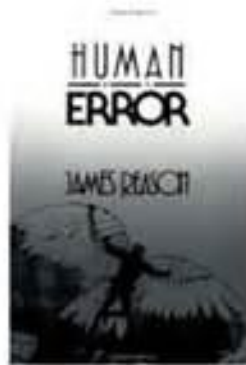


Possible to use too little or too much.
Even possible to forget if dose given at all.

Fixed Dose.
Empty Packet as
Evidence of Use



This toilet will not flush unless the lid is down




Human Error (Paperback)

By (author) James Reason

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Poka-Yoke Examples



Poka-Yoke Worksheet

Description of the Incident:	
Top three Causes for the Incident	
Poka-Yoke Solutions	
<u>Elimination</u> : Can the activity be eliminated?	
<u>Replacement</u> : Can the activity be automated?	
<u>Prevention</u> : Can the mistake be physically prevented?	
<u>Facilitation</u> : Can visual controls be utilized?	
<u>Detection</u> : How can the mistake be immediately detected?	
<u>Mitigation</u> : How can the effect of the mistake be minimized?	

Poka-Yoke Worksheet

Description of the Incident:	Finger cut on razor blade at work station
Top three Causes for the Incident	<ol style="list-style-type: none"> 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	
Elimination: Can the activity be eliminated?	Determine roll life and replace before worn; eliminate wraps and the need for razors
Replacement: Can the activity be automated?	
Prevention: Can the mistake be physically prevented?	Investigate new blade design to prevent finger cuts
Facilitation: Can visual controls be utilized?	Relocate blade disposal container to point of use
Detection: How can the mistake be immediately detected?	
Mitigation: How can the effect of the mistake be minimized?	Assign responsibility of supply cabinet to day shift supervisor; set up kanban with 5S audits

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Question & Answer Time

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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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