Poka Yoke

= Mistake-Proofing

Poka yoke strategies eliminate human error from your processes so that defects never get to customers, meaning that your processes are more productive and profitable.

What does ‘Poke-Yoke’ mean?

MADE

Poka

“Mistake”

Yoke (yokeru)

“Avoid”

History

This term Poka-Yoke was adopted by Dr Shigeo Shingo as part of the Toyota Production System in 1960.

It was originally described as “baka-yoke”

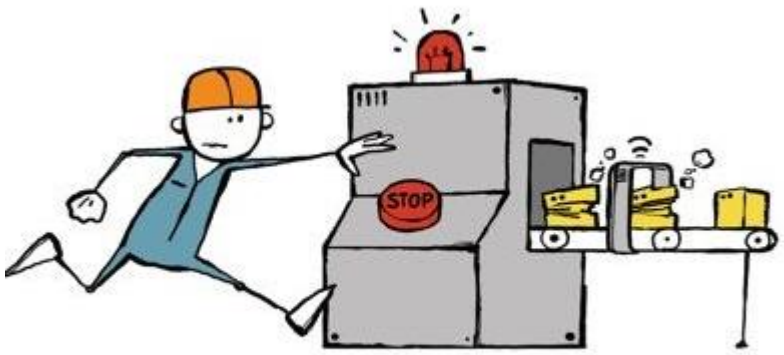
This name means “Fool Proofing", so the name was changed to the Poka-Yoke.

Jidoka

Defects, rework, and scrap add cost and represent waste that must be eliminated.

Lean factories apply a Jidoka to detecting and eliminating the sources of defects.

As a result lean factories simultaneously reduce cost and improve quality.

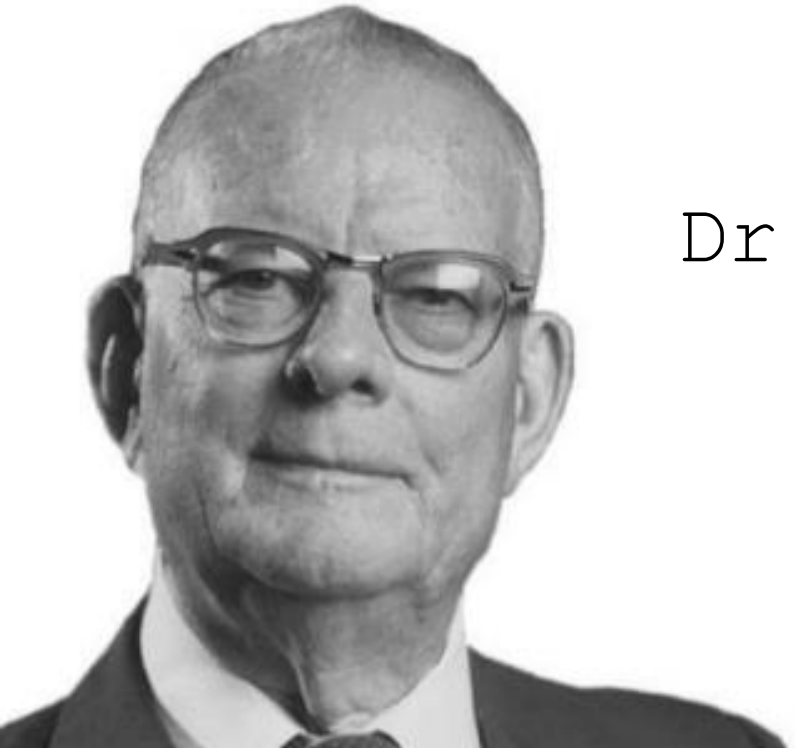


The principle of stopping work immediately when a problem occurs.

"Automation with human element"

Build Quality into the Processes

“Defects are not free. Somebody makes them and gets paid for making them.”



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Origins

- Shigeo Shingo applied Poka-yoke in the 1960s to industrial processes designed to prevent human errors.

- Shingo redesigned a small switch assembly process in which factory workers, often forget to insert a spring under the switch buttons.

- In the redesigned process, the worker would perform the task in two steps, first preparing the two required springs and placing them in a placeholder, then inserting the springs from the placeholder into the switch.

Origins

- When a spring remained in the placeholder, the workers knew that they had forgotten to insert it and could correct the mistake effortlessly.

- Shingo distinguished between the concepts of inevitable human mistakes and defects in the production. Defects occur when the mistakes are allowed to reach the customer.

- **The aim of poka-yoke is to design the process so that mistakes can be detected and corrected immediately, eliminating defects at the source.**

Poka Yoke Approach

Proactive Approach	Reactive Approach
• A fully implemented 'Zero Defect' system requires Poke Yoke usage at or before the inspection points during the process. • Poka Yoke will catch the errors before a defective part is manufactured 100% of the time.	• Check occurs immediately after the process. • Can be an operator check at the process or successive check at the next process. • Not 100% effective, will not eliminate all defects. • Effective in preventing defects from being passed to the next process

Three Ways of Preventing Mistakes

- When an error is predicted or detected, there are three ways of prevention:

1. Shutdown the process
2. Control to prevent an error going ahead or a mistake occurring
3. Warning is sent to indicate an error may occur

Control

Eliminates the possibility of a mistake occurring (automatic machine shutdown)

Warning

Signals that a mistake can occur (strobe light, audio alarm etc.)

Control

- Takes human element out of the equation; does not depend on operator or assembler.
    - Has a high capability of achieving zero defects.
    - Machine stops when an irregularity is detected.

A simple Poka-Yoke ‘control’ is demonstrated when a driver of the car equipped with an Automatic gearbox must have the gear in the "Park" or "Neutral" position before the car can be started (a process step, therefore a poka-yoke) prior to starting . The interlock serves to prevent unintended movement of the car.

office essentials
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office essentials
2
office essentials
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office essentials
4
office essentials
5
office essentials
6

記録表
記録表
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記録表
各月毎に箱に保管
2011
2012

Warning ‘Poka-Yoke’ in Prevention

- Sometimes an automatic shut off system is not an option.
- A warning or alarm system can be used to get an operator's attention.
- Alarm system using dials.
- Colour coding is also an effective non automatic option.
- Lights and sounds are also used as warning to bring attention to the problem.

nutes – Target: 70
150
75
225
0
Action

Top 10 Errors that Cause Defects

1. Processing omissions (a step was forgotten)
2. Processing errors (something was done incorrectly)
3. Error in setting up the work piece
4. Assembly omissions (a part was forgotten)
5. A wrong part / item was included
6. Wrong work piece
7. Operations errors (incomplete information, procedures not followed)
8. Adjustment, measurement, dimensional errors
9. Equipment maintenance errors
10. Errors in preparation of tools, fixtures, blades, etc

Other Defect Causes

- Forgetfulness
- Language Barriers- (i.e. English as a second language)
- Misunderstanding instruction or procedure
- Errors in identification (e.g.: part and/or placement recognition)
- Errors made through lack of experience
- Pace (too fast or too slow)
- Lack of standards, expectations, procedure, or instructions
- Incomplete information
- Incorrect or incomplete processing (parts, dwell times, etc)
- Out of tolerance tools, fixtures, and jigs - adjustment or placement errors

Poke Yoke Philosophy

- The mistake-proofing philosophy recognizes that people sometimes forget and make errors. The approach uses common-sense ideas and methods in both process and product to eliminate human and mechanical errors.

- Historically, great efforts have been made in applying these concepts to Safety and accident prevention.

- The same approach must drive intolerance for scrap and rework.

A good 'Poka-Yoke' implementation makes it impossible to make a mistake

Poka-Yoke Culture

Focus on building quality into the process.

Remember to consider the sources of variation, engage GB and BB support.

Make it impossible to create a defect.

Believe that inadvertent errors can be eliminated.

Engage the people in the process.10 heads are better than one.

Implement the best ideas after you find the root cause

Chase through the five ‘why’s’, then ….brainstorm to get to the best solution to attack root cause.

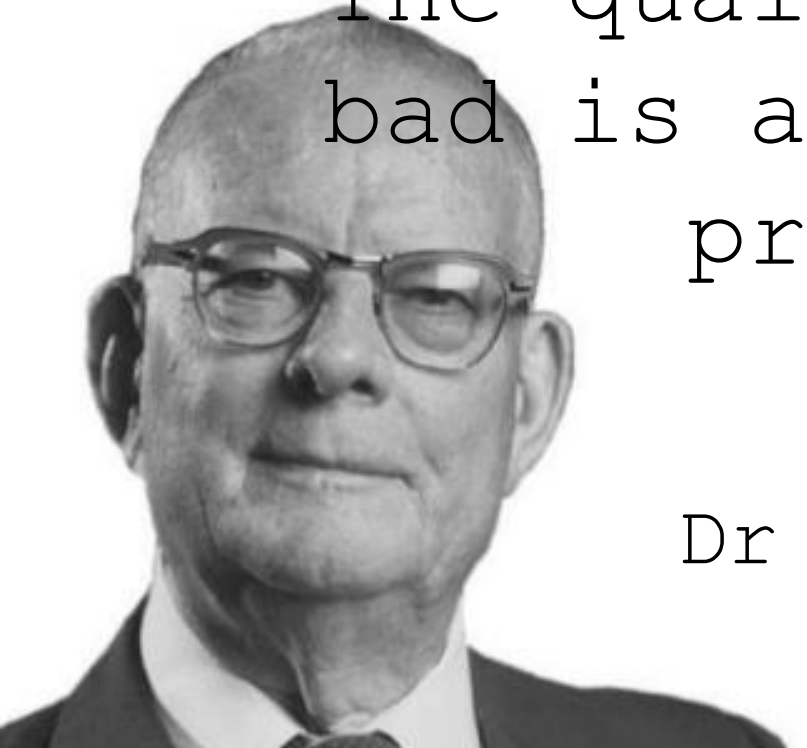
Some Background on Inspection

- Traditionally, quality has been synonymous with inspected quality…

- **Judgment Inspection**: Separating good from bad after processing.
- **Informative Inspection**: Inspect then take action to eliminate future occurrence.
- **100% or Sampling Inspection**: based on SPC (Statistical Process Control) methodologies.

- Inspection
  - assumes defects are inevitable.
  - believes the process of inspection will reduce defects.
  - can reinforce ‘quality’ is responsibility of the quality department.
  - May be required (regulatory compliance)
  - is not 100% effective

“Inspection does not improve quality nor guarantee quality. Inspection is too late. The quality, good, or bad is already in the product."



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“Self-Check” Inspection

- ROI (reliance on operator inspection) emerged in the 1980’s. A self-check occurs when the person performing the work checks the work before the work moves to the next process step.

- On the downside...
  - sometimes compromises are made & corrective action skipped.
  - blind to your own mistakes.
  - compliance can be marginal if not part of standard work.
  - key features, characteristics, interface relationships not always understood.

- On the upside …
  - 100% coverage is likely.
  - instant learning and correction are possible.
  - potentially less resistance when self-discovered.

“Successive-Check” Inspection

- A successive-check occurs when the previous work is completed, and that work is checked by the next person in the process.

- On the downside …
  - corrective action still required and happens after the point of error.
  - compliance can be marginal if not part of standard work.
  - can create friction between workers

- On the upside…
  - often catches errors overlooked by self-checking process.
  - can build a sense of cooperation between process participants.

Self-check and successive-checks are only required because the process allows errors to occur.

Poka Yoke Approach

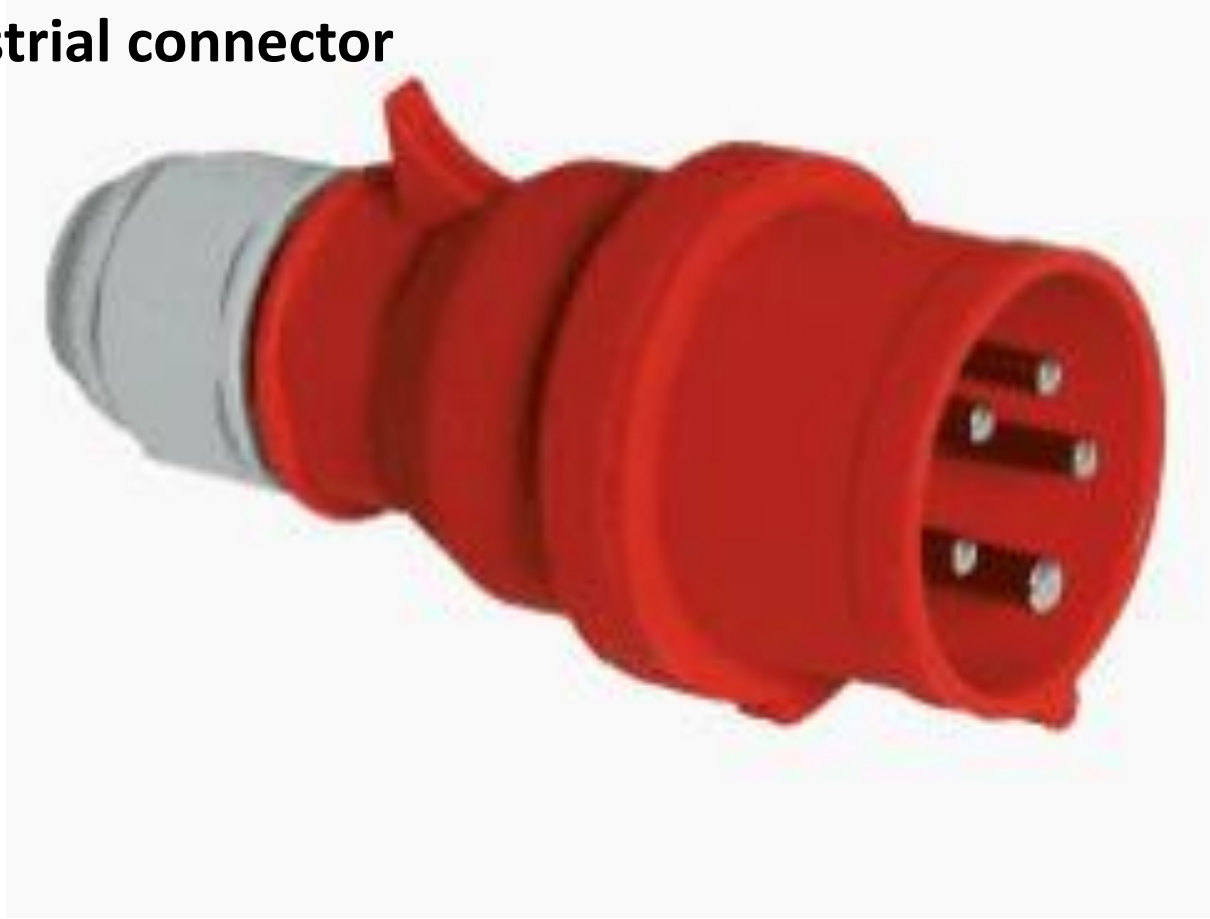
Negative Approach *Mistakes are Inevitable*	**Positive Approach** *Mistakes Can Be Eliminated*
✗ people make mistakes ✗ place blame ✗ detect at final inspection ✗ sampling inspection ✗ errors are inevitable ✗ no time, no money ✗ no support	✓ create the ‘right’ environment ✓ focus on the process deficiency ✓ ask “why?”, then “how?” ✓ learn from the opportunity ✓ apply mistake-proofing methods ✓ train everyone to challenge errors ✓ show them it’s possible; share examples

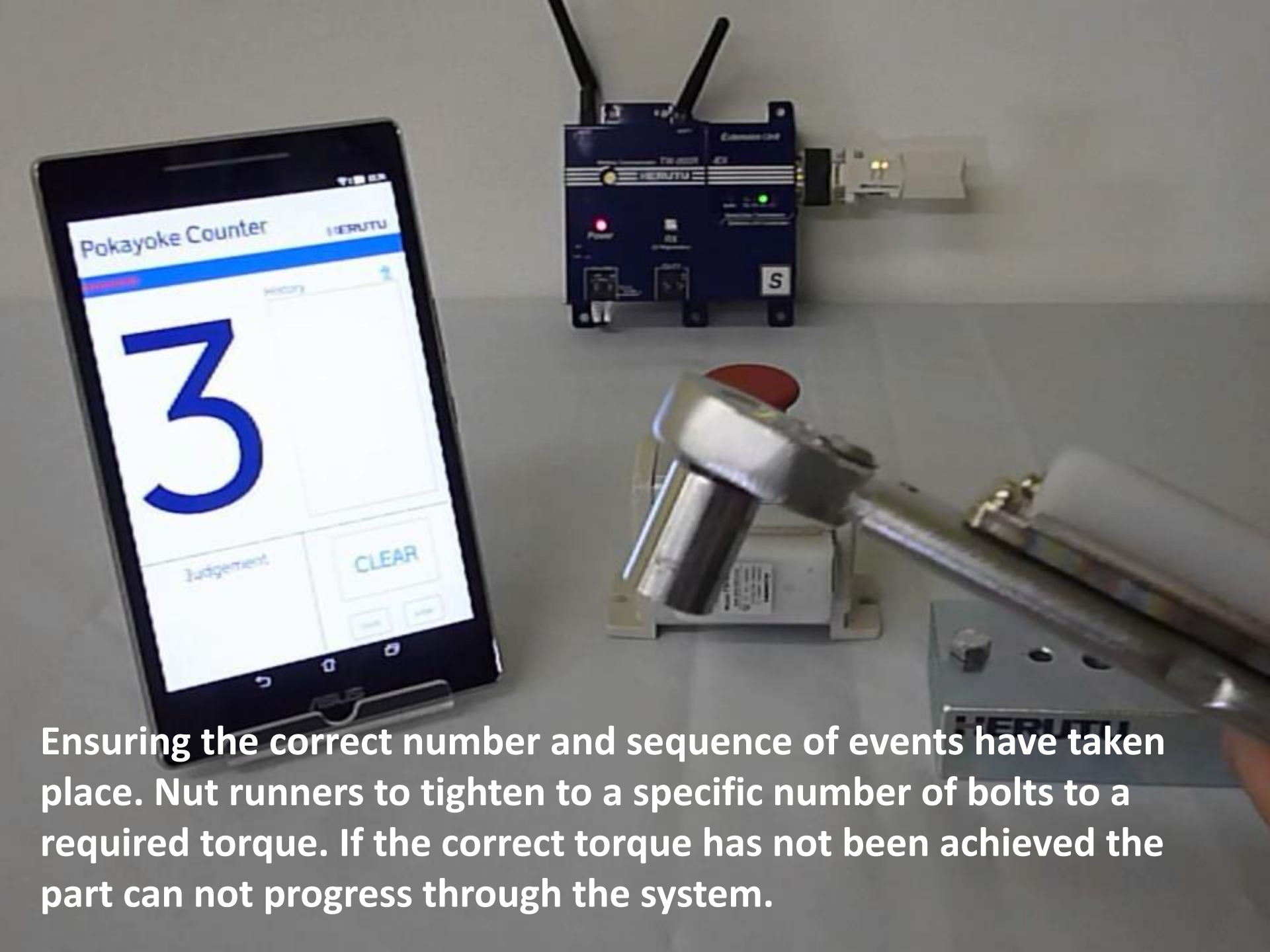
Contact type Poka Yoke devices that have physical shapes that are used to prevent the use of incorrect components, pins that have to fit into holes from previous operations and so on, they physically make contact with the product and highlight when a mistake has been made or physically make it impossible to make the mistake.

SIM Card in your Smartphone can only be fitted one way around.

Electrical Connectors that can only be fitted one way around

Electrical Connectors that can only be fitted one way around – 415v 3ph industrial connector





Ensuring the correct number and sequence of events have taken place. Nut runners to tighten to a specific number of bolts to a required torque. If the correct torque has not been achieved the part can not progress through the system.

Poka Yoke Implementation Hints

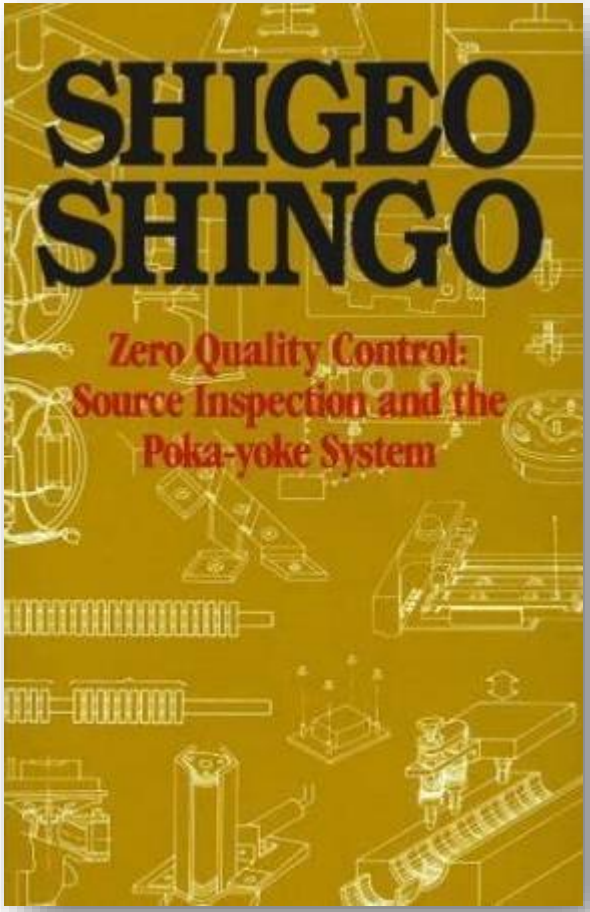
Poka Yoke Implementation Hints

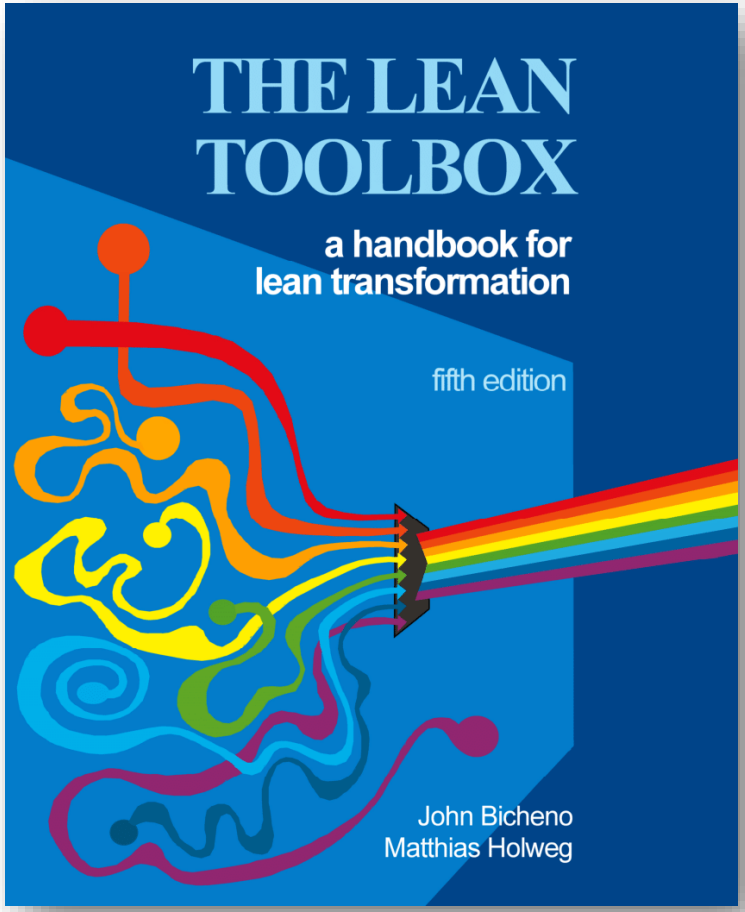
- Think about how to verify items by their characteristics
  - weight, dimension, shape etc,.

- Think about process sequence
  - can’t perform next step if prior step not done
  - process flags if steps are omitted

- Detect deviations from fixed values
  - counters, scales, odd part out, critical condition detection; pressure, temperature, current, time

Further literature…





- Electronic Source?

- Pages 237-240
- Journal Articles onto Moodle.