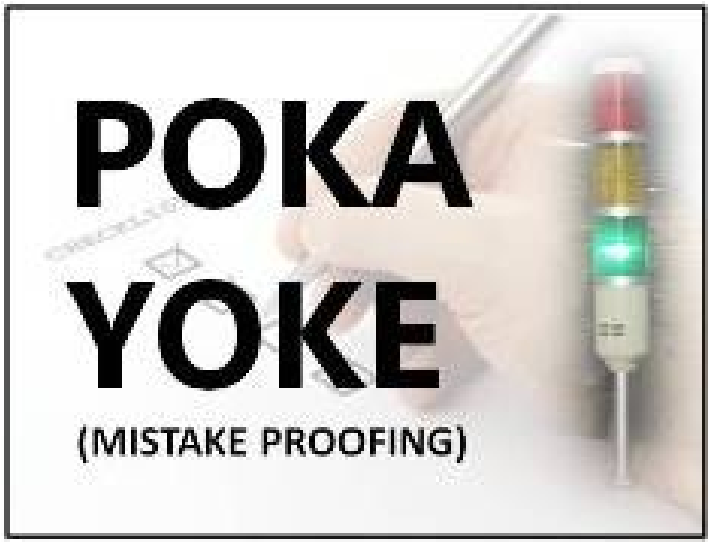
Poka-Yoke Mistake Proofing

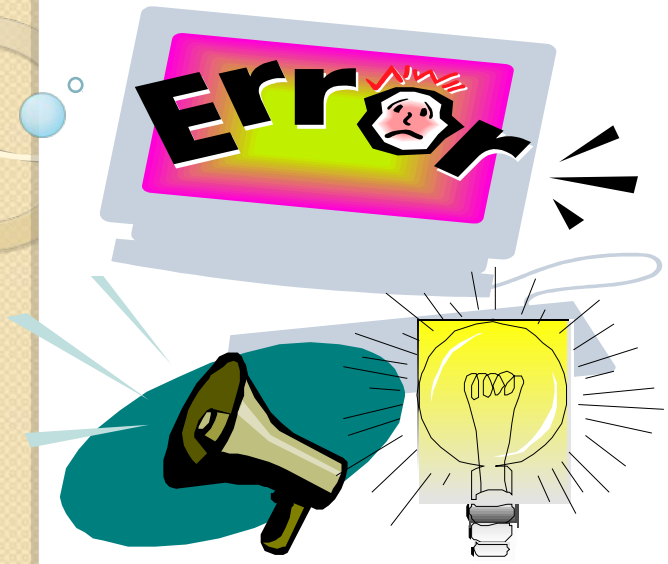
Definition

Poka-yoke (ポカヨケ) is a Japanese term that means "mistake-proofing". A poka-yoke is any mechanism in a lean manufacturing process that helps an equipment operator avoid (*yokeru*) mistakes (*poka*).



A Lean Strategy in Human Error Prevention.

Objective of Poka-Yoke



- Understand definition of Poka-Yoke add its application in Lean management to identify & eliminate WASTE.
- Build Quality into process through early detection & prevention of Defects.
- Know the three basic functions of a Poka-Yoke device.
- Understand Approach of Poka-Yoke & its application in Defect Prevention.
- See examples of Poka-Yoke devices in Defect management.
- Learn to implement different Poka-Yoke approach.

Why Poka-Yoke

Poka-Yoke was developed by Shigeo Shingo from Toyota Motors as a tool to achieve Zero Defects.

- The process of Zero Defects is also known as "Mistake Proofing" or "Fail-Safe".

- By taking over repetitive tasks or actions that depend on vigilance or memory, Poka-Yoke can free workers' time and mind to pursue more value added activities.

Poka-Yoke Mistake Proofing

Day I Poka - Yoke

Introduction- *Origin, Objective & Purpose*

Toyota & Lean Production System

Pillars of Lean Production System

JIT & JIDOKA – Autonomation

Building Quality into Process

Transferring Human Intelligence,

Stop line authority,

Poka-Yoke Mistake Proofing

POKA-YOKE APPROACH

System, *Types & Rules of Poka-Yoke*

Poka-Yoke Mistake Proofing

Day 2 Poka - Yoke

All about Poka-Yoke (Continuous Improvement)

Usage & Examples of Poka-Yoke

KISS guide to Poka-Yoke, 7 Steps

Workshop – Application of Poka-Yoke in Production Line

Debrief & Summary

Origin of Poka - Yoke

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.

Origin of Poka - Yoke

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.

Purpose of Poka-Yoke

Poka-Yoke overcome the inefficiencies of inspection through the use of automatic devices that seek to do three things;

1.Not accept a defect for the process

2.Not Create a Defect

3.Not Allow a Defect to be passed to the next process

They do this in a number of different ways but can be categorized as being either;

Control – they take physical action to prevent a defect

Warning – They sound an alarm or light up to tell us a mistake has been made.

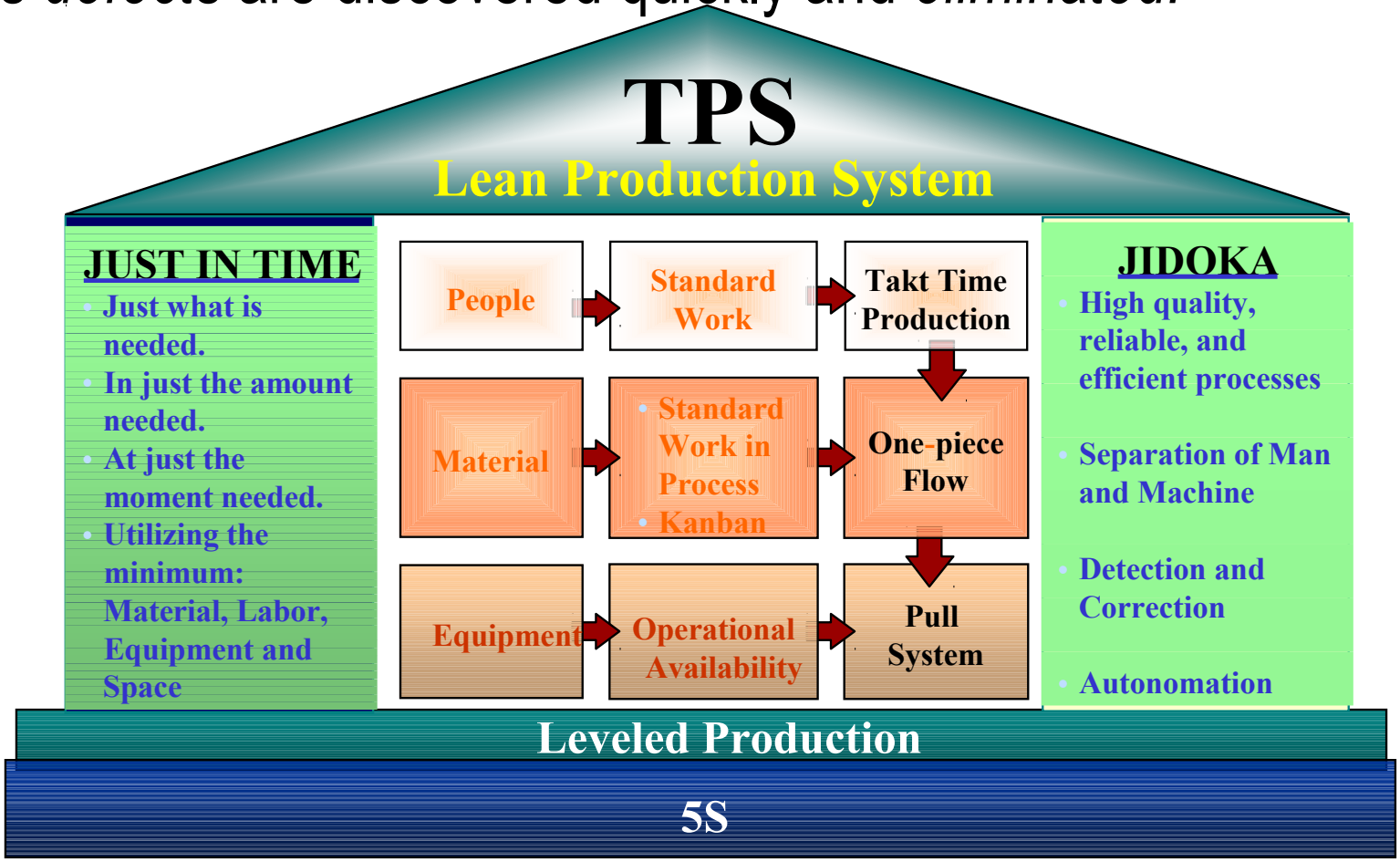
Poka-Yoke Mistake Proofing

Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur.

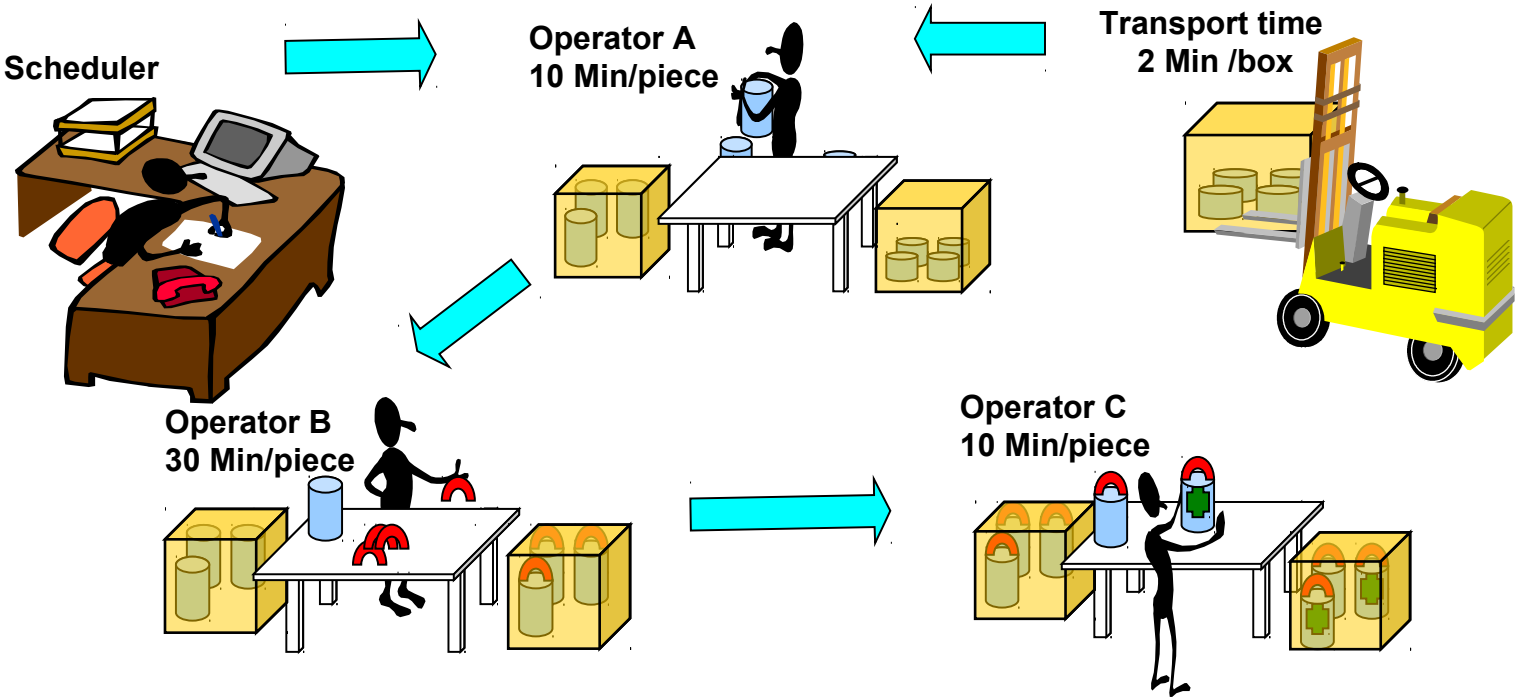
The concept was formalized, and the term adopted, by ***Shigeo Shingo*** as part of the ***Toyota Production System***.

It was originally described as baka-*yoke*, meaning "fool-proofing“ or “idiot proofing” but the name was later changed to the milder ***poka-yoke.***

The ***Toyota Production System*** strives for efficient use of resources (people, materials, and equipment) by continually **eliminating waste**. *Quality* improves along with productivity as *defects* are discovered quickly and *eliminated.*



Traditional Batch Production



- Process (or departmental) Factory Layout
- Production processes separated by long distances.
- Items are transported in batches with high work-in-process (WIP) inventory levels.
- Long lags between defect creation and detection at next process
- Long lead times from raw materials to finished product.
- Waste of labor and equipment loading/un-loading and moving batches.
- Requires complex system for scheduling an accounting for inventory.

Take a Closer Look at Waste

Overproduction:
Producing too much; producing too soon; batch processing

Intellect:
Failure to fully utilize the time and talents of people; lack of training; no avenue for suggestions

Transportation:
Any nonessential transport or handling

Motion:
Any motion that does not add value; chasing parts, signatures, tools, etc

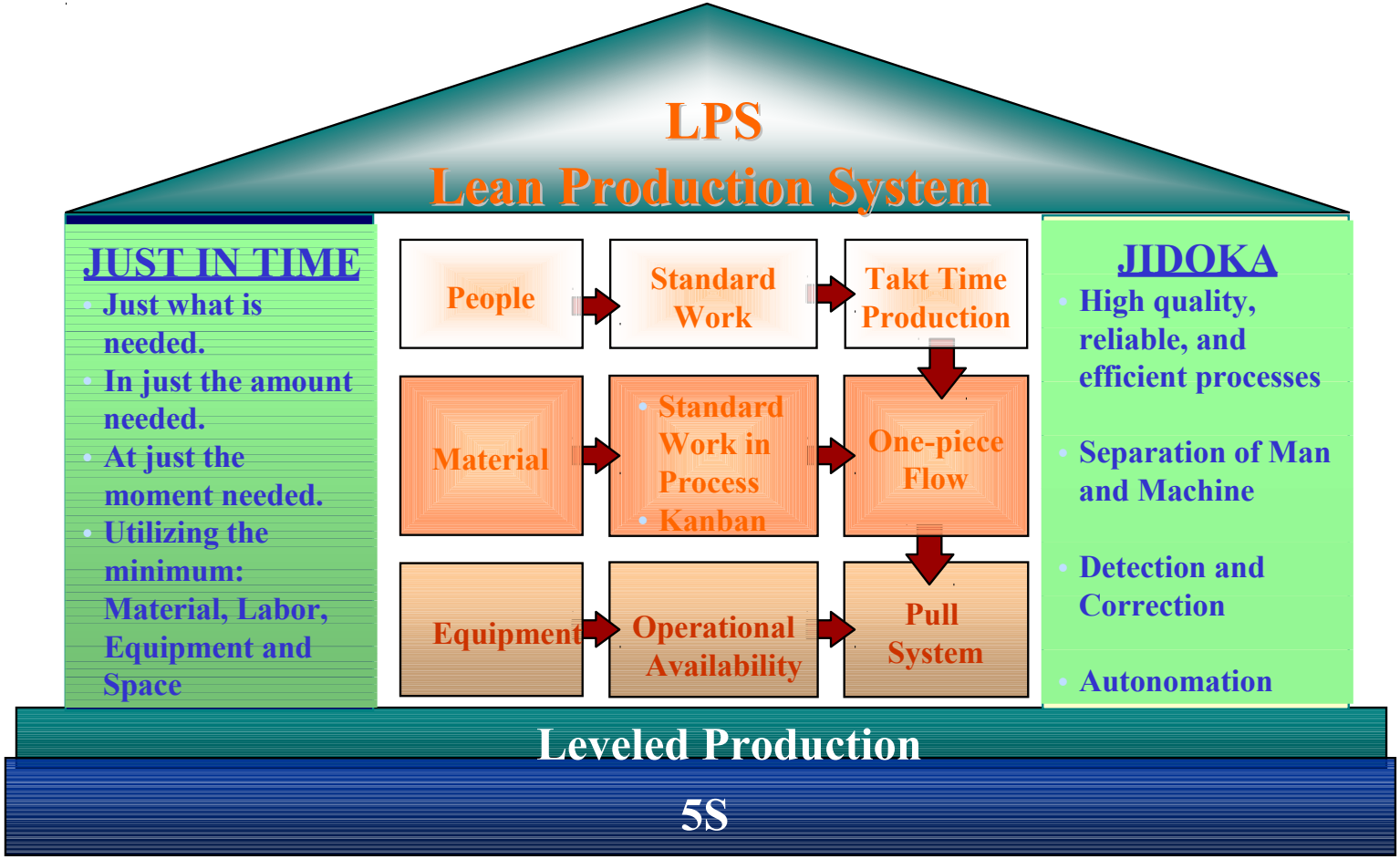
Inventory:
High supply stores; finished product stores; in-work materials

Defects:
Any rework; errors

Extra Processing:
Adding inspections; approvals; reviews

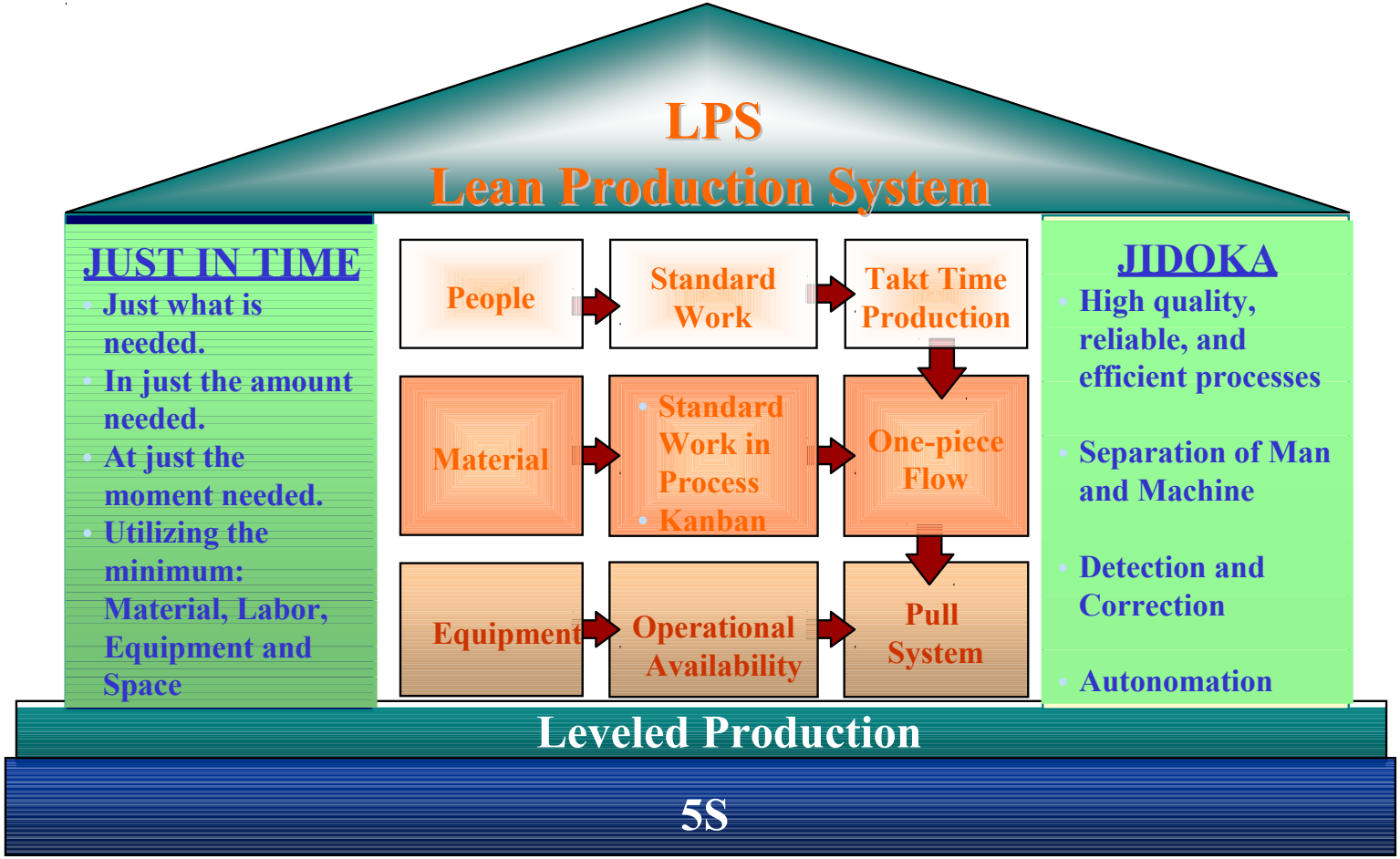
Waiting:
Waiting on parts or documents, waiting for other workers or a machine

The 5S system eliminates ***waste*** in the workplace making it easy to identify abnormal conditions. It also establishes the discipline to practice ***Just-In-Time*** and ***Jidoka.***



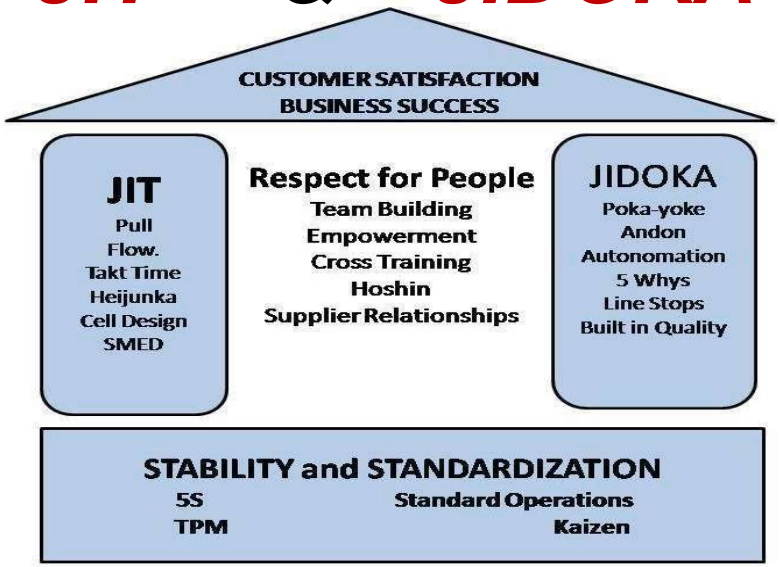
Leveled Production is the ability to produce *different* product models simultaneously on the *same* production line.

Distributing the production of many models evenly enables the efficient use of manpower and equipment.



Pillars of Lean Production System

JIT & *JIDOKA*

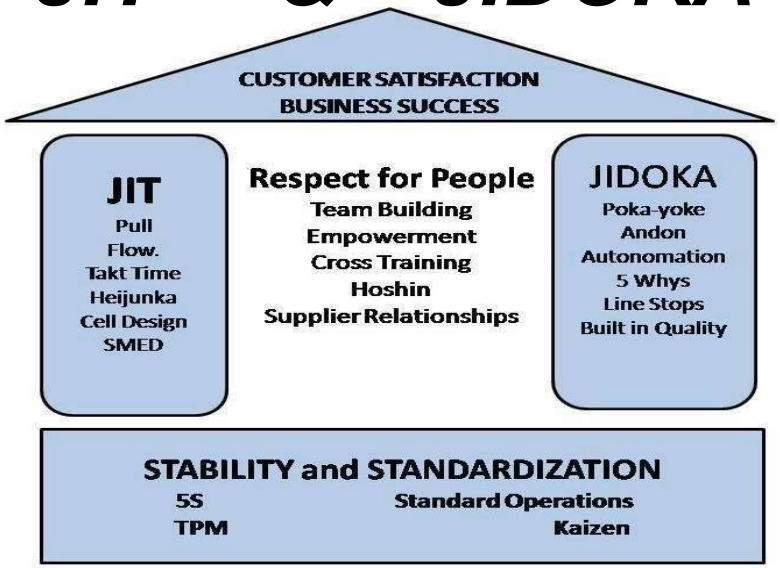


Just-in-time: making only what is needed, only when it is needed, and only in the amount needed; though simple in principle, requires dedication and careful, hard work to implement properly. Just-in-time production ***eliminates*** traditional Production kind of ***Waste.***

It eliminates the need for maintaining large inventories, which reduce financing costs and storage costs. JIT eliminates the waste of stock rendered worthless by changes in specifications or customer demand. It also eliminates the waste that occurs when defects go undetected in large batches of idle inventory.

Pillars of Lean Production System

JIT & JIDOKA



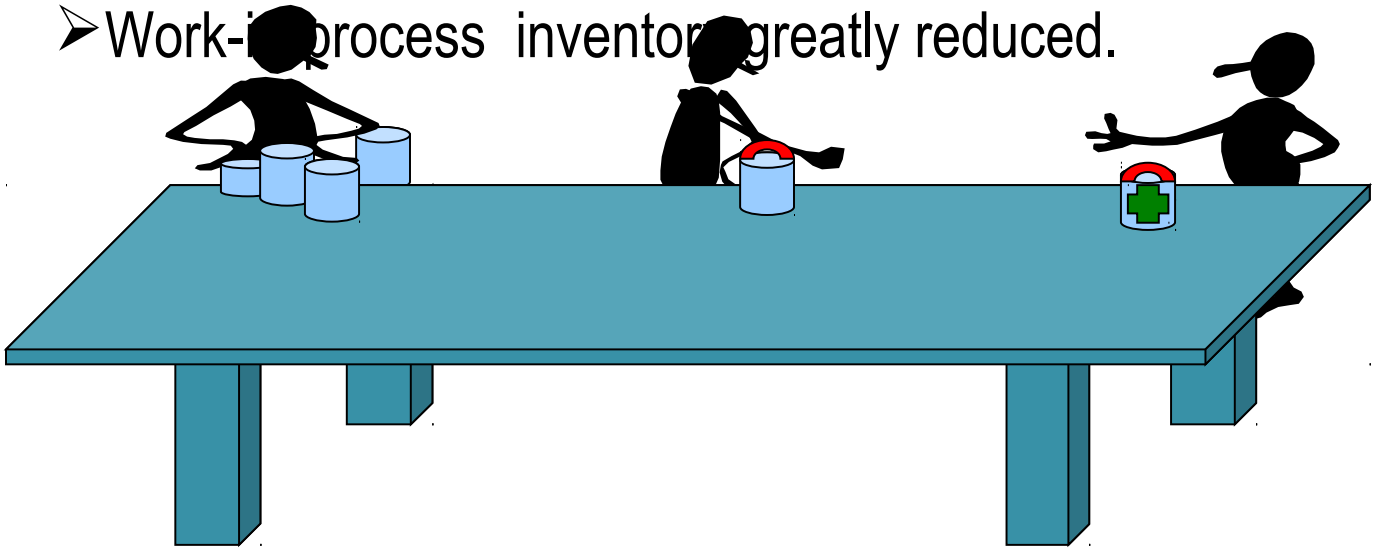
Jidoka refers to building quality into the production processes. Mechanical Jidoka is: ***Autonomation***

Autonomation – means giving machines the human capability to detect a defect when it is created and stop immediately. As a result only one defective product is made and the source of the problem can be investigated.

JIT – Continuous Flow

- Product flows continuously through the manufacturing processes

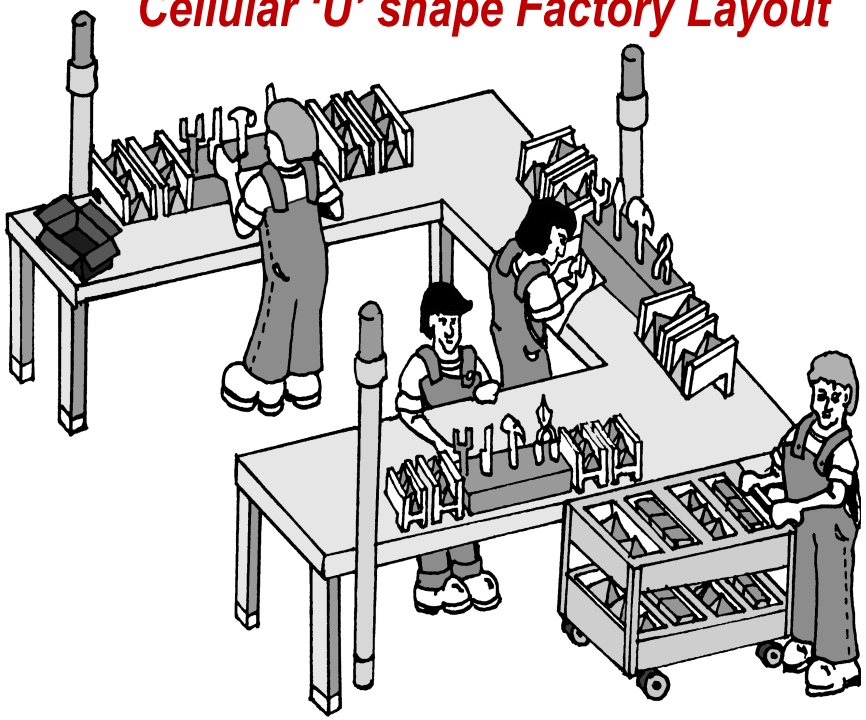
  ideally *one-piece at a time*.
- Work-in-process inventory greatly reduced.



- Lead-time greatly reduced.
- Defect detection is immediate.
- Flow of work is ***simple and visual***.
- Imbalance in operator work load easy to identify.

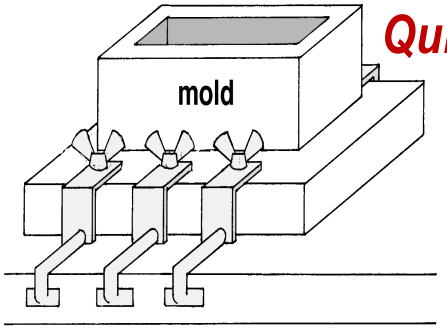
Enablers for Continuous Flow

Cellular 'U' shape Factory Layout

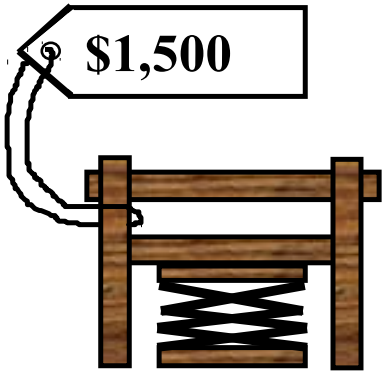


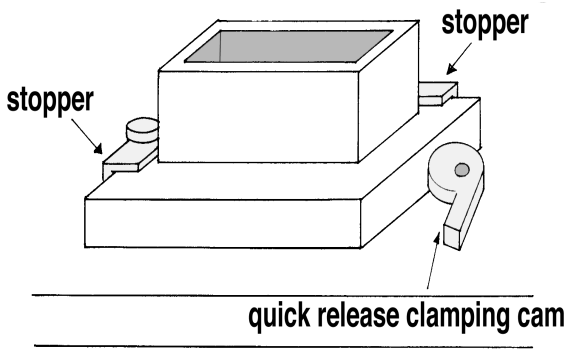
Multi-skilled Operators

Quick Changeover 'SMED'



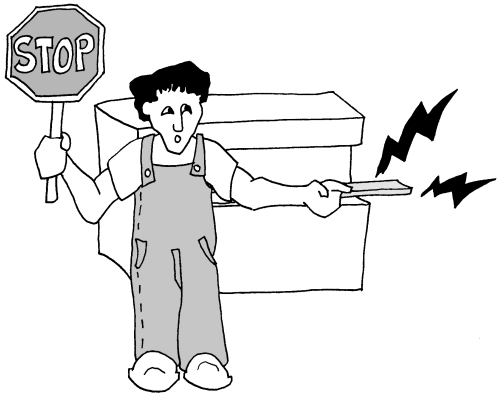
Right-sized, flexible Equipment



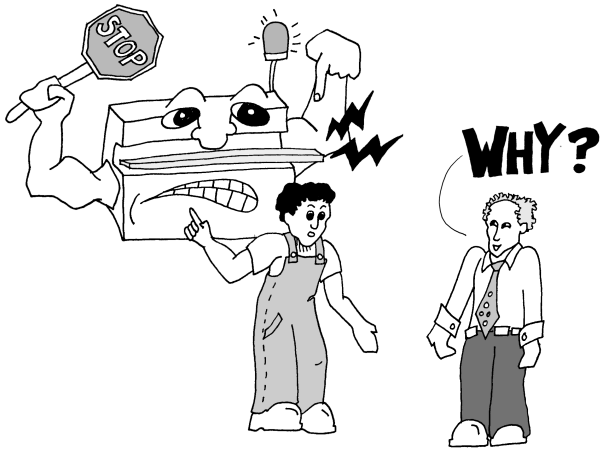


Jidoka – Build Quality into Processes

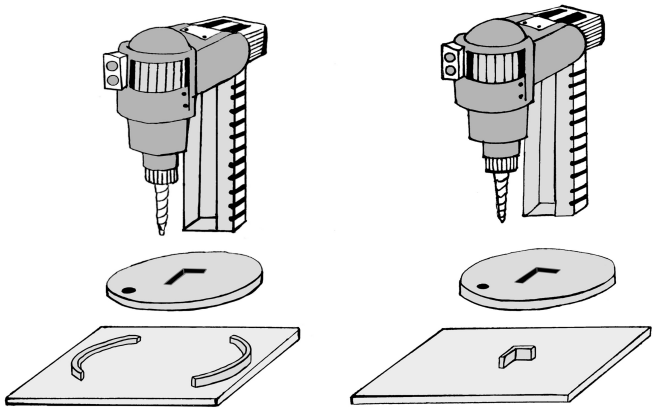
"Stop the Line" Authority



Jidoka - Autonomation

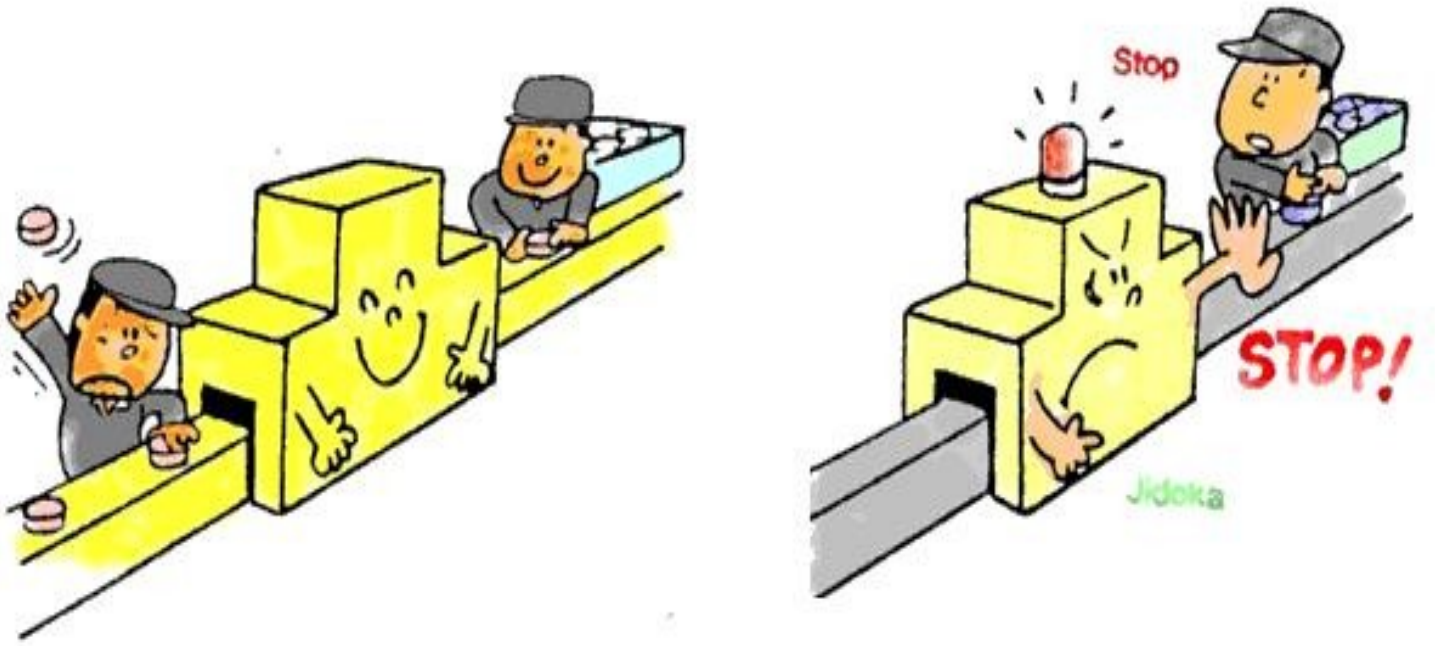


Poke Yoke – Mistake Proofing



Jidoka – Autonomation

Jidoka frees the operator from watching the machine, now one operator can monitor many machines (reducing cost). By giving machines the ability to perform simple repetitive tasks, then human can focus on problem-solving and improvement.



Jidoka – Transferring Human Intelligence

Jidoka

The principle of stopping work immediately, when a problem occurs. (central to Lean)

"automation with a human element,"

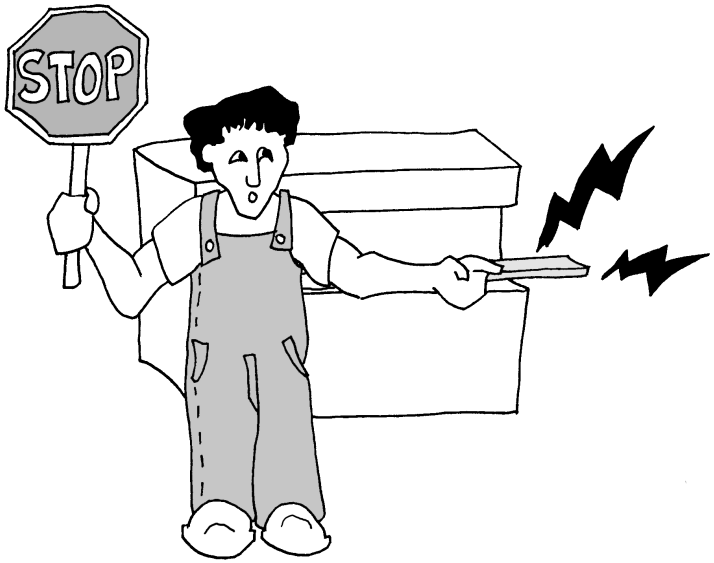
Defects, *rework*, and *scrap* add cost and represent waste that must be eliminated.

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

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

Jidoka – Stop Line Authority

"Stop the Line" Authority



In a lean factory every operator is an ***Inspector***, responsible for the quality of their own work. Operators are trained in evaluating quality and are given the ***authority*** to stop the production line.

Operators must never accept or ***pass on*** a known defect.

The ratio of Inspectors to Operators in a lean factory is very low. The title ***Inspector*** is reserved for highly-trained specialists using specialized equipment.

Jidoka – Poka-Yoke

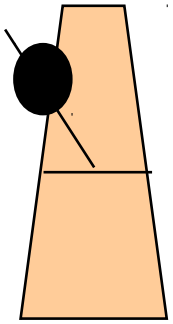
Poka-Yoke

translated from Japanese means ***mistake-proofing***
Modify the production system so that abnormalities cannot occur, as opposed to detecting abnormalities which have already occurred.

Mistake Proofing ***eliminates*** the possibility for a defect from occurring. If mistakes aren't made in the first place, then we don't have to spend extra time and money ***fixing*** them.

Takt-time the pulse of the LPS

Takt Time is the pace of production in a continuous flow factory.

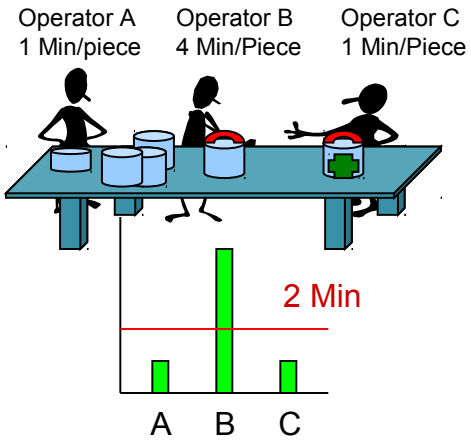


✓Takt Time = Daily working time divided by Daily Production Requirement

✓When operator work load is balanced to takt-time a piece will complete at a rate equal to takt-time.

Cycle Time = 6 Minutes

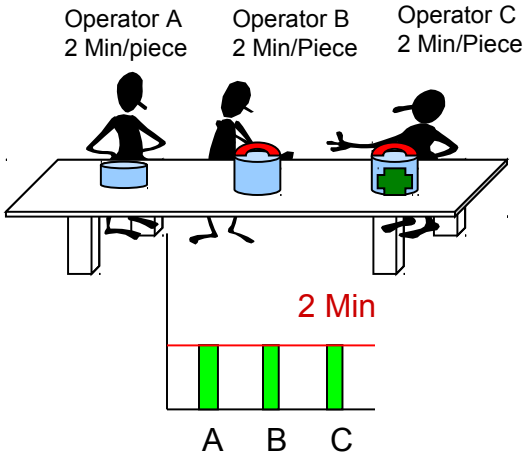
1. Unbalanced Line



T/T = 2 Minutes

WIP = Variable

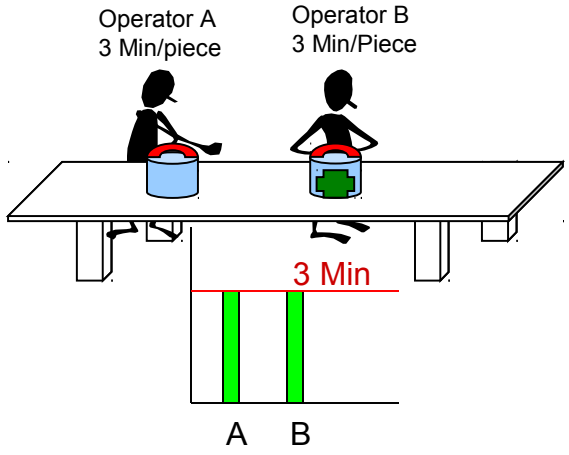
2. Balanced to Takt-Time



T/T = 2 Minutes

SWIP = 3 Pieces

3. Change to Takt-Time

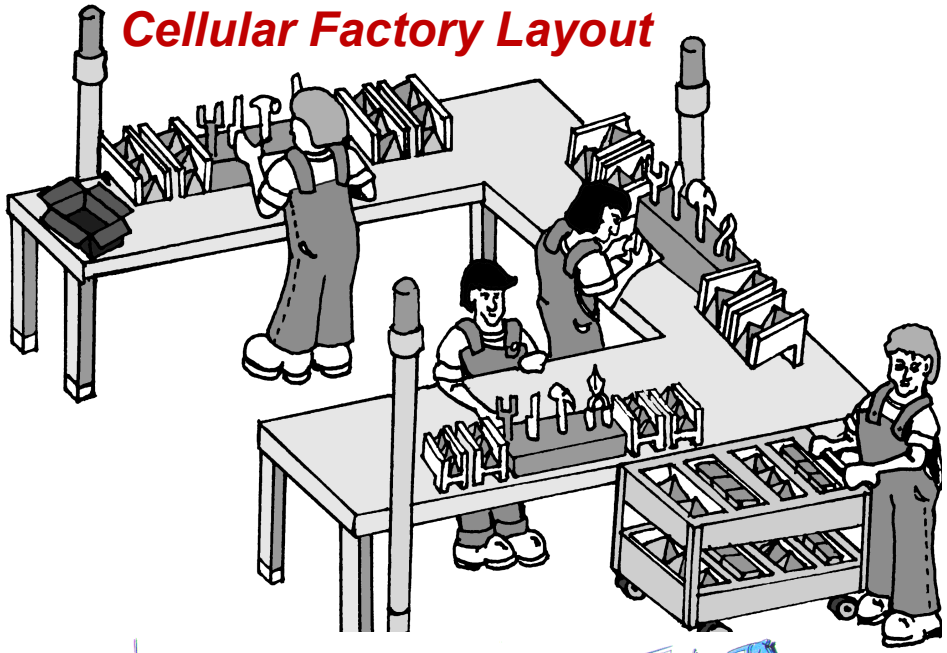


T/T = 3 Minutes

SWIP = 2 Pieces

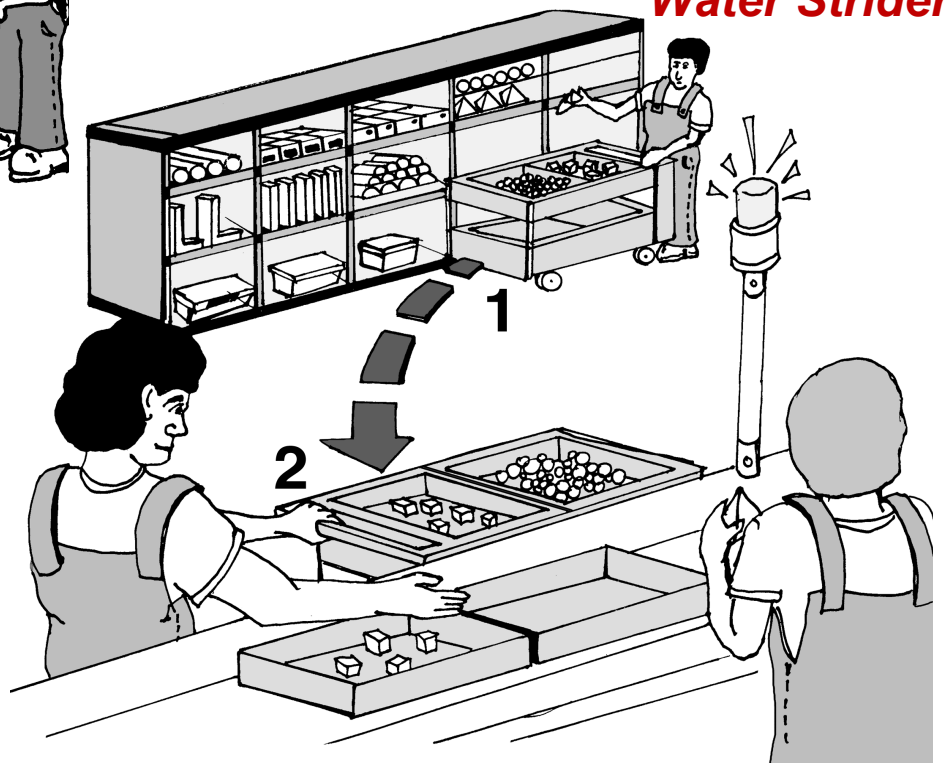
Enablers for Takt-time Production

Cellular Factory Layout



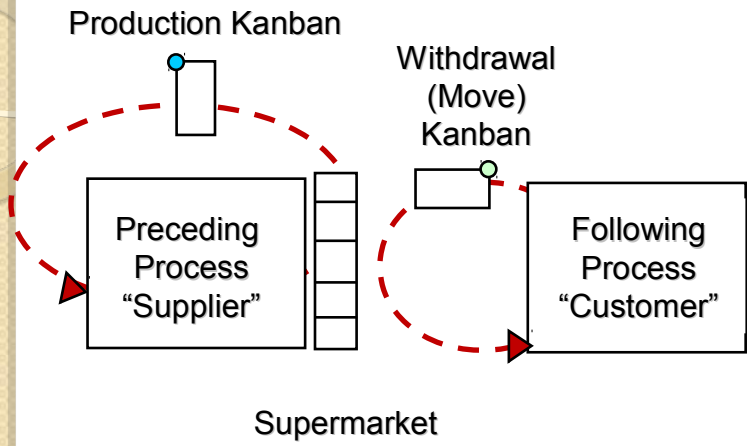
Multi-skilled Operators

Water Strider



5 S's

Pull Production and Kanban



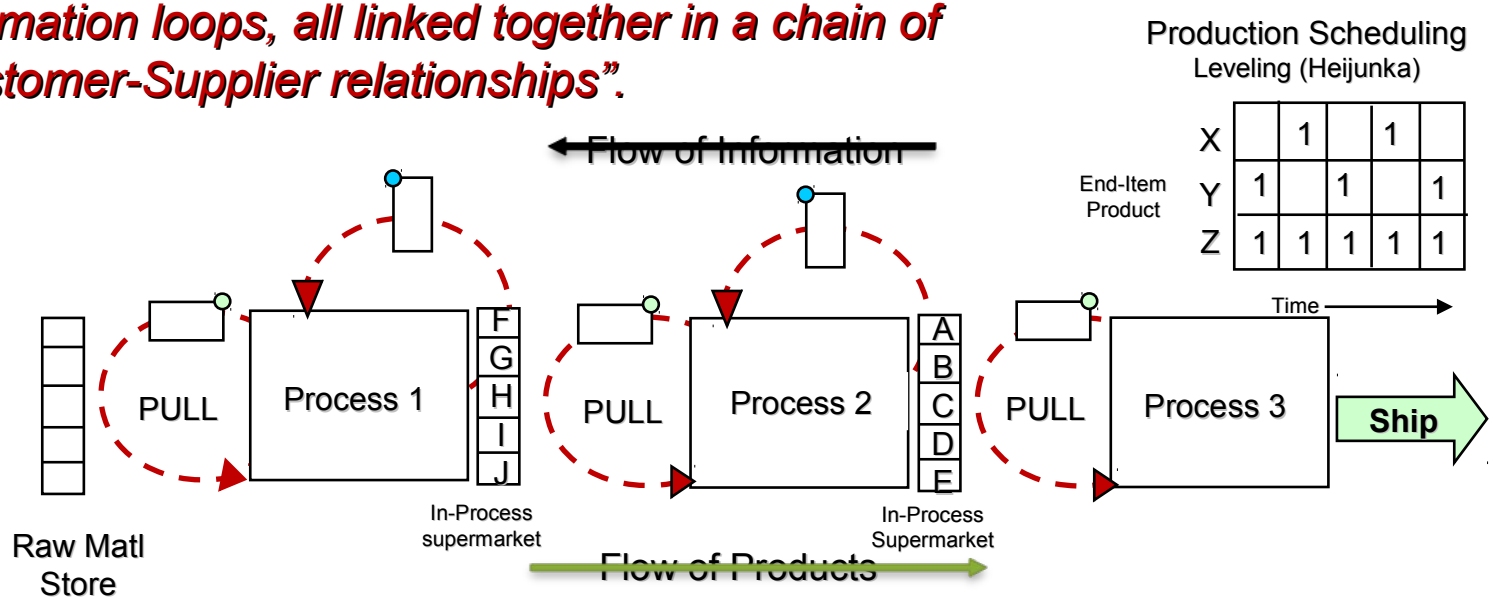
- Following processes go to preceding processes and withdraw what they need and when they need it.
- Preceding processes replaces only what was taken.
- A 'Customer-Supplier" relationship is created.
- All activities are linked directly to real customer demand .
- Makes only what the customer wants.

- **Kanban** is the signal in a pull system and controls inventory.

- **Benefits of Pull Production:**

Avoids Overproduction, greatly simplified scheduling, highly predictable lead times, problems made visible.

A Pull system is composed of a series of closed information loops, all linked together in a chain of "Customer-Supplier relationships".



Build Quality into Processes

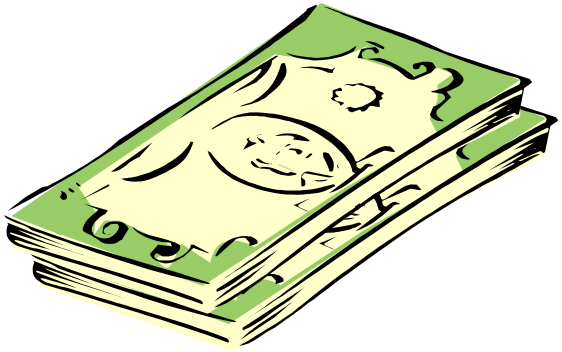
"Traditional Inspection"

Traditionally manufacturing relied on Inspection to detect defects before reaching the customer.

This approach may result in high quality for the customer, it does nothing to eliminate the source of the defect and the associated costs reduction.

In a **Lean factory** equipment is designed to detect abnormalities and stop automatically whenever defects occur. Operators are trained to stop the production line whenever they note anything suspicious. These practices prevent defective items from continuing and preventing waste of producing a series of defective items.

Build Quality into Processes

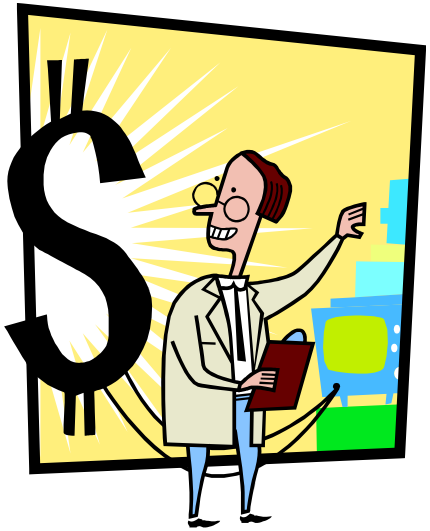


Costs of Defects

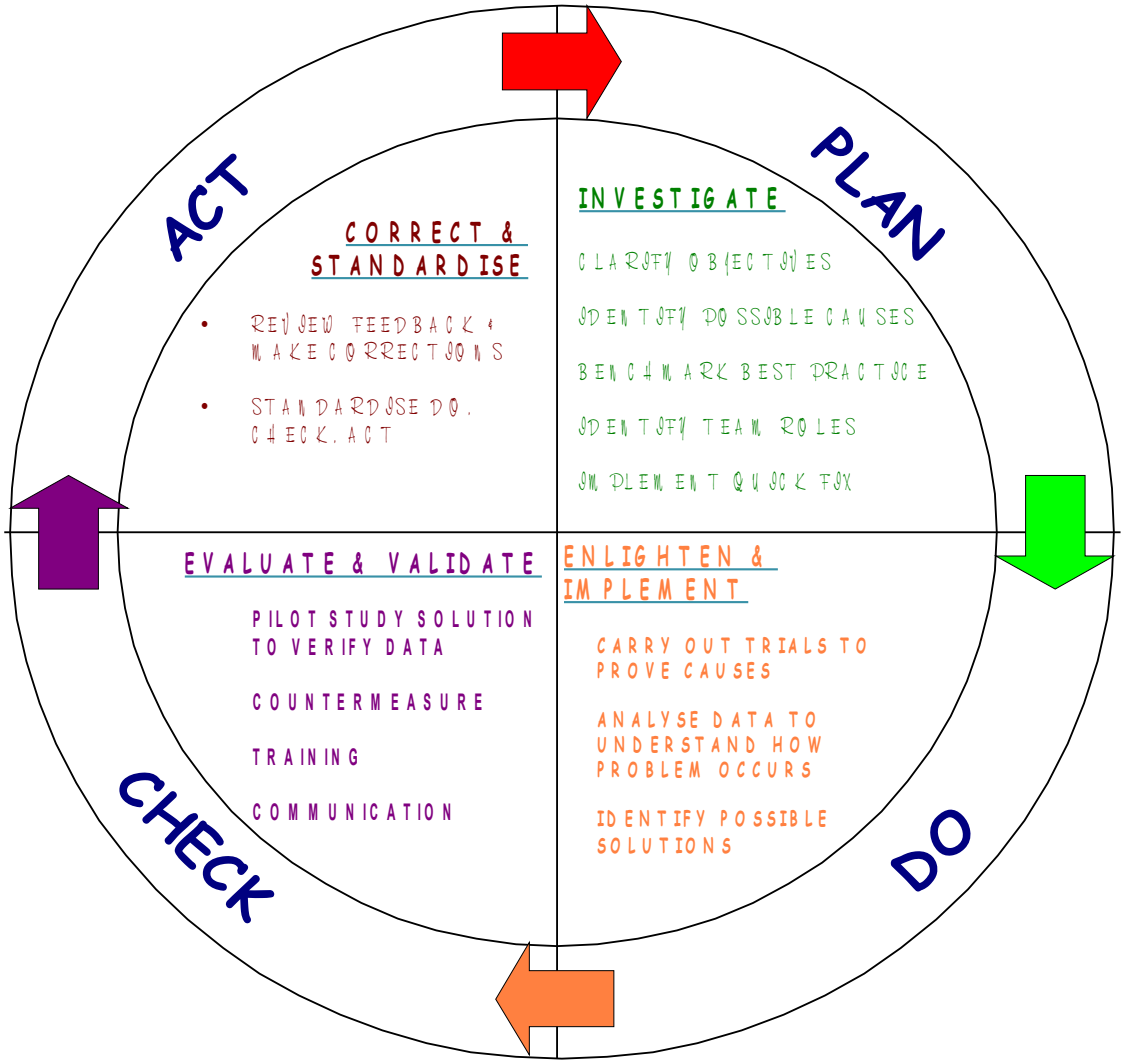
Does it cost more to make processes better? NO

Making processes better leads to reduced

- **Defect**
- **Rework**
- **Scrap**
- **Wastes**



PDCA, a Team Approach to Problem Solving



PDCA Problem Solving Guide

Elimination of Waste- CAP Do

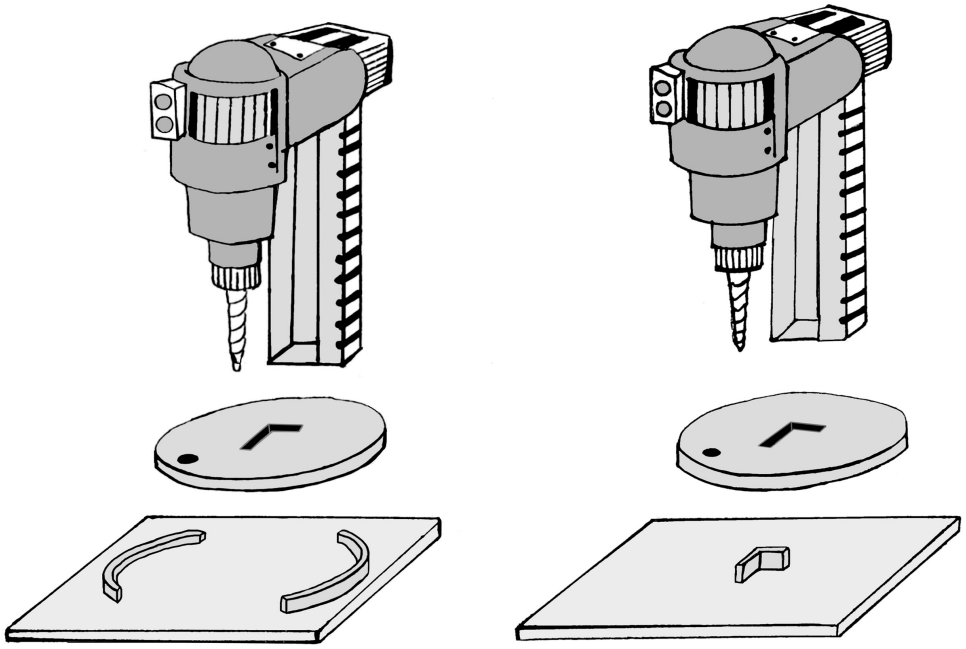
CHECK
What is the Waste

ACT
Find root causes

Plan
Poka-Yoke
KAIZEN
Continuous Improvement

Do
Implement Poka-Yoke & measure results

Build Quality into Processes



Example: A cast part must have a hole drilled in it in order to be used in assembly. The original jig required that the operator carefully orient the part on the drill press table in order to ensure a proper fit during the assembly process.

Taking advantage of the “L” shaped slot on the part, a piece of angle iron has been attached to the drill press table which matches the slot in the part, allowing the part to be loaded *only* with the correct orientation.

POKA-YOKE Approach

POKA-YOKE APPROACH

- Proactive Approach :

- A fully implemented ZERO DEFECT QUALITY system requires Poka-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.

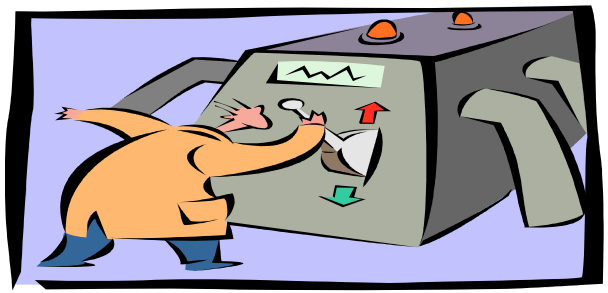
- Reactive Approach :

- 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 next process.

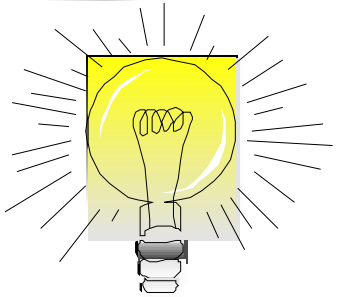
POKA-YOKE Approach

Three Ways of Preventing Mistakes

When an error is predicted or detected there are three ways of preventing mistakes:



1.Shutdown the process

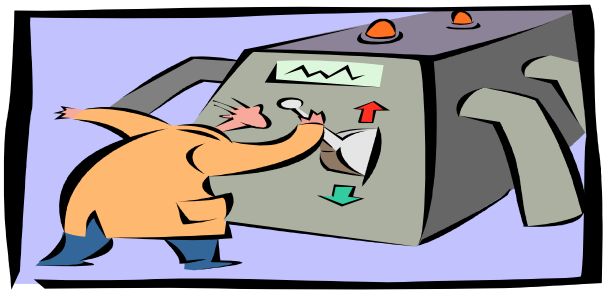


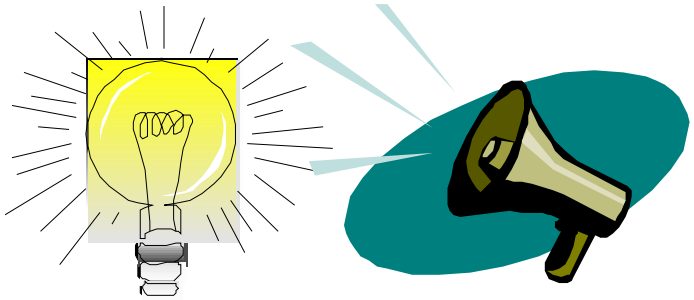
2. Control to prevent an error going ahead or mistake occurring

3. Warning is sent to indicate an error may occur

POKA-YOKE Approach

TYPES of Poka-Yoke in Prevention





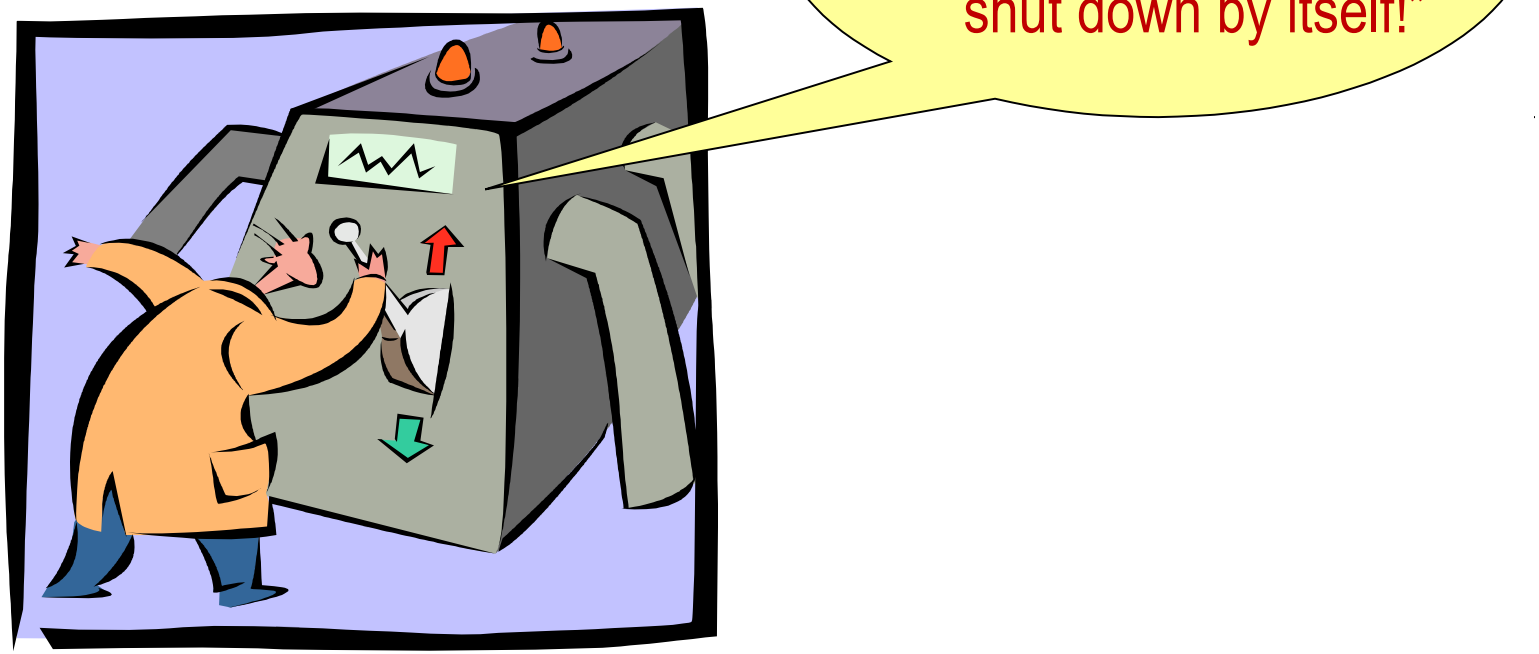
Control - eliminates the possibility of a mistake to occur (automatic machine shutdown)

Warning - signals that a mistake can occur (blinking light, alarm, etc.)

Control System

Takes human element out of the equation; does not depend on an operator or assembler.

- Has a high capability of achieving zero defects.
- Machine stops when an irregularity is detected.



Example of ‘Control’ Poka-Yoke in Prevention

A simple Poka-Yoke ‘control’ is demonstrated when a driver of the car equipped with a Auto 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 an automobile.

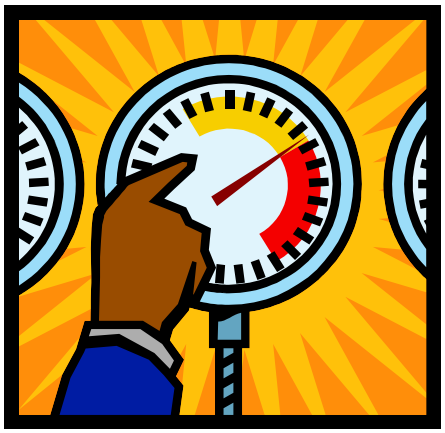
The interlock serves to *prevent* unintended movement of the car.

Example of 'Warning' Poka-Yoke in Prevention

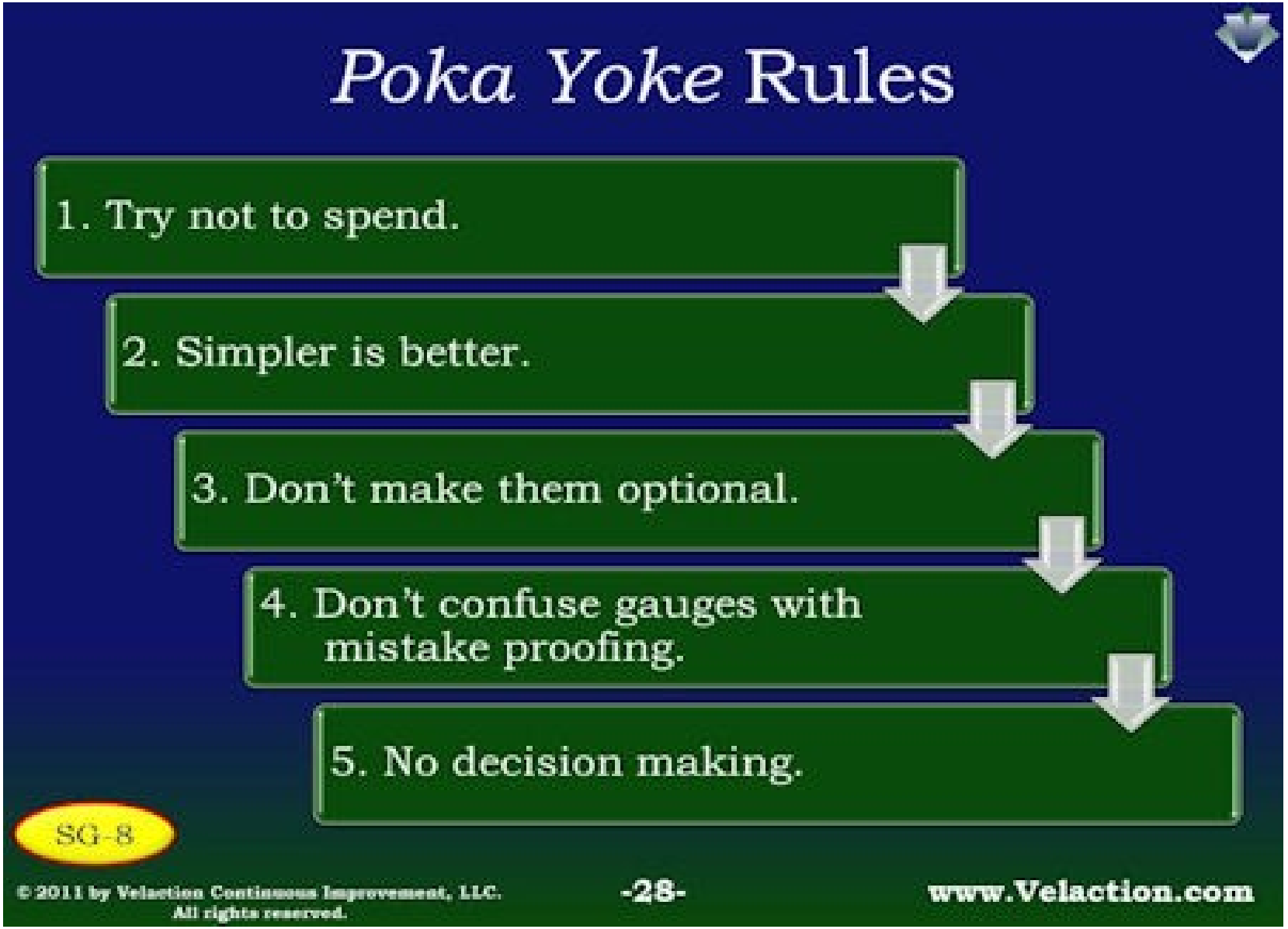
Sometimes an automatic shut off system is not an option. A warning or alarm system can be used to get an operators attention.

Right is an example of an alarm system using dials. Color coding is also an effective non automatic option.

Lights and sounds are also used as warning to bring attention to the problem.



POKA YOKE- RULES in Lean Production



Poka-Yoke Mistake Proofing

Day 2 Poka - Yoke

All about Poka-Yoke (Continuous Improvement)

Usage & Examples of Poka-Yoke

KISS guide to Poka-Yoke, 7 Steps

Workshop – Application of Poka-Yoke in Production Line

Debrief & Summary

All About "Poka-Yoke"
(Continuous Improvement)

Poka-Yoke was developed by Shigeo Shingo from Toyota Motors as a tool to achieve Zero Defects.

- The process of Zero Defects is also known as "Mistake Proofing" or "Fail-Safe".

- By taking over repetitive tasks or actions that depend on vigilance or memory, Poka-Yoke can free workers' time and mind to pursue more value added activities.

Why mistake-proofing is important

- **Lean practice does not allow extra inventory to compensate for scrap.**
- **Lean ideology focuses on speed ... & ... speed cannot exist when defects and rework prevail.**
- **Cost pressures don't tolerate continued mistakes: scrap, rework, lateness.**

And most importantly:

Our customers rightfully expect defect free products and …Traditional 100% inspection won't provide 100% defect-free products.

Mistake-proofing 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.

Fact: People Make Mistakes.
A good Poka-Yoke device makes it impossible to make a mistake.

Some Background on Inspection

Traditionally, quality is *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.
- **is not 100% effective.**

All of the above tolerate some level of defects. How do we achieve 0 defects?

"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 upside ..

- *100% coverage is likely.*
- *instant learning and correction are possible.*
- *potentially less resistance when self-discovered.*

On the downside ..

- *sometimes compromises are made & proper 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.*

"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 upside ..

- *often catches errors overlooked by self-checking process.*
- *can build a sense of cooperation between process participants.*

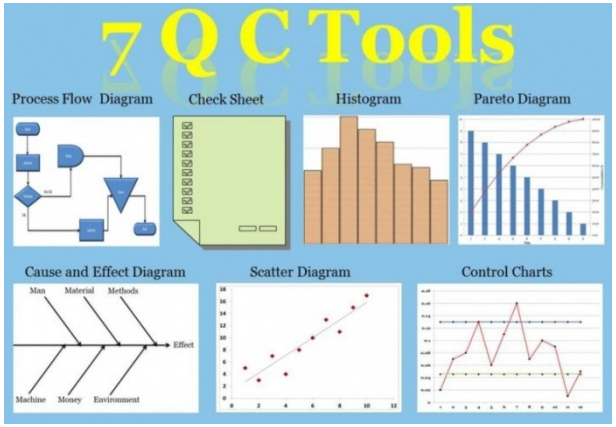
On the downside ..

- *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.*

Self-check and successive-check was required because the process allowed errors to occur.

"Special Cause" Variation

Special cause (*assignable cause*) variation should be attacked first. (*A single factor, with little interaction, acting on process causing a large perturbation …*)



Tools which are effective in resolving 'special causes' have minimal impact on 'common causes'.

- SPC, 7 basic tools (*focus to stabilize process*)

Different tools and methods are required to effectively identify and improve common cause issues.

- PFMEA (*focus to optimize process*)

Eliminate the common cause variation through repeated application of Poka-Yoke.

Make No Mistake

Attributes of Zero Defect quality system

- Source Inspection - Checks conditions at the source
- 100% Inspection - Simple Poka-Yoke devices in place to check every time the process occurs

- Immediate Action

- Operations stop and corrective action is taken when a defect occurs. Teams brainstorm and implement new devices wherever there is an opportunity for error

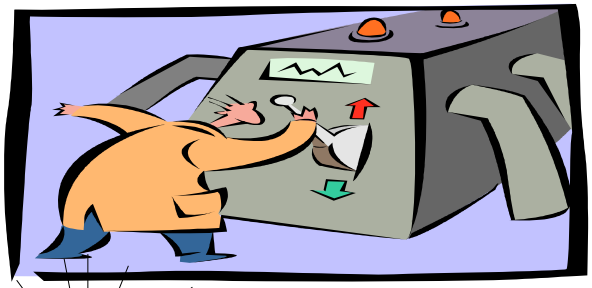
Quality can only be assured when there is always immediate feedback at the source of the defect.

Basic Function of Poka-Yoke

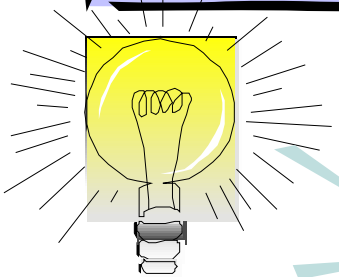
A defect exists in one of two states:

1. it is about to occur
2. it has already occurred

Three basic poka-yoke functions to use against defects:



1. Shut down a machine or operation



2. Control a process or operation

3. Warn that a defect has occurred

Recognizing that a defect is about to occur is called PREDICTION.
Recognizing that a defect has happened is called DETECTION.

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.

No more excuses! Build a culture that finds a way to do it right the first time and does not tolerate errors!

Contrasting Cultures

NEGATIVE APPROACH

Mistakes are Inevitable

- people make mistakes
- place blame
- detect at final inspection
- sampling inspection
- errors are inevitable
- no time, no money
- no support

POSITIVE APPROACH

Mistakes Can Be Eliminated

- 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

What is the culture in your workplace?
What is your approach?

Top10 Errors that Cause Defects

Error: *When any condition necessary for successful processing is wrong or absent.*

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

What is the culture in your workplace? What is your approach?

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

What is the culture in your workplace?
What is your approach?

Mistake Proofing Device Example

A critical condition detector is a device that detects two type of conditions:

1) the presence or absence of a specific, visible pre-set quantity such as the correct number of parts, correct weight, height, volume or depth

2) fluctuations in a non-visible condition such as pressure, temperature, current and non-visible fluids (air).

Mistake Proofing Device Example

How it works:
A critical manufacturing condition (pressure, current, temperature, time, etc.) is measured -

and work cannot proceed if the value is not within a pre-determined range as indicated on the detector.

Critical Condition Device Example

Fluid Element Detectors:

Detect changes in air streams occasioned by the placement or removal of objects (useful in detecting broken drill bits).

Pressure Change Detectors:

Detect interruptions in flow through pressure gauges or pressure-sensitive switches.

Temperature Change Detectors:

Detect temperature change and variation through thermometers, thermostats, thermistors, thermocouples, etc.

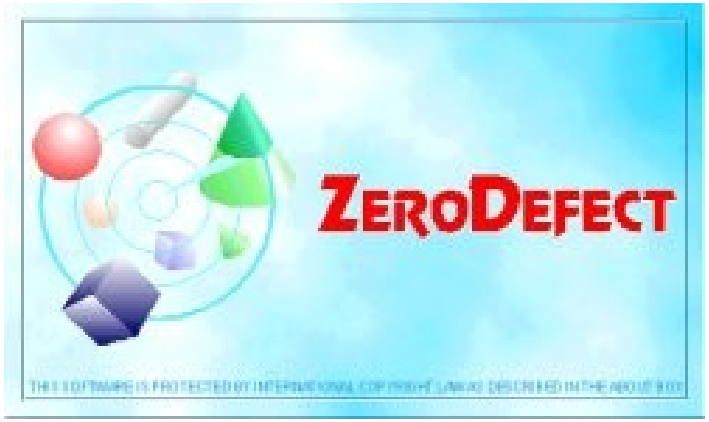
Current Fluctuation Detectors:

Detect via meter relays occurrence of electric currents or secondary currents (important applications in spot welding).

POKA YOKE- Usage & Examples

Defect Management

Finding and fixing any defect in early stage of equipment development reduces time, rework and money.



Finding the defect in later stages always costs multiple times than early stages. It enhances the quality by adding reliability, portability, maintainability etc.

Hence it is advisable every company should go with *defect management* system and defect management team at every stage of the development to attain good quality in products adding Value delighting Customer always.

POKA YOKE- Usage & Examples

Control type Poka-Yoke is one that physically rejects defect whilst a Warning type Poka-Yoke is one that sounds an alarm when you accidentally make an error.

Control (prevention): The floppy disc is only able to be inserted in one orientation.

Shutdown / Warning (Prevention): Mowers have a safety bar on the that must be pulled back to start the engine. If you let go of the safety bar, the mower blade stops in 3 seconds or less.

POKA YOKE- Usage & Examples

These two Poka-yoke can further be classified into the following three types;

1. *Contact*

Poka Yoke

2. *Fixed Value*

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

3. *Motion Stop*

Contact type POKA – YOKE

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.

Contact type POKA – YOKE

A three pin plug would fit into this category as it can only be plugged into a socket in one orientation.

The SIM card in your Hand-phone can only be fitted one way around in your phone..

Fixed Value Poka Yoke

Fixed Value Poka-yoke is a method that uses physical and visual methods to highlight that all components are available in the right quantities and have been used, sometimes combined with contact style sensors to make them more positive.

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

Examples would be egg tray style containers that present the operator with exactly the right number of fixings or pre-dosed medication in a sachet rather than relying on the user to measure from a larger container.

Motion stop POKA-YOKE

These types of Poka-yoke devices ensure that the correct number of steps have been taken and possibly also the sequence of steps.

Example of this could be the use of a nut runner to tighten a specific number of bolts to a required torque;

if the correct torque is not reached or if the operator does not tighten all of the bolts the part will not be released to the next operation.

KISS Guide to Mistake-proofing, 7 steps

Note: This guide assumes a reactive effort (a problem already exists) Mistake-proofing should be also be used in a proactive mode. Defects can be prevented by mistake-proofing products and processes at the design stage.

Step 1 : Describe the defect (or potential defect).

Step 2 : Determine where the defect is discovered or where it is made.

Step 3 : Detail the sequence of events in the documented standard.

Step 4 : Observe the process and detail the steps that differ from the standard.

Step 5 : Identify contributing conditions (tools, training, etc).
Refer to step 4 observations; ask the 5 'whys' to determine root cause.

Step 6 : Identify the mistake-proof device necessary to prevent the defect.
Show the team the Poka-Yoke hints and examples of poka-yoke devices.

Step 7 : Add the device to the process - Now!

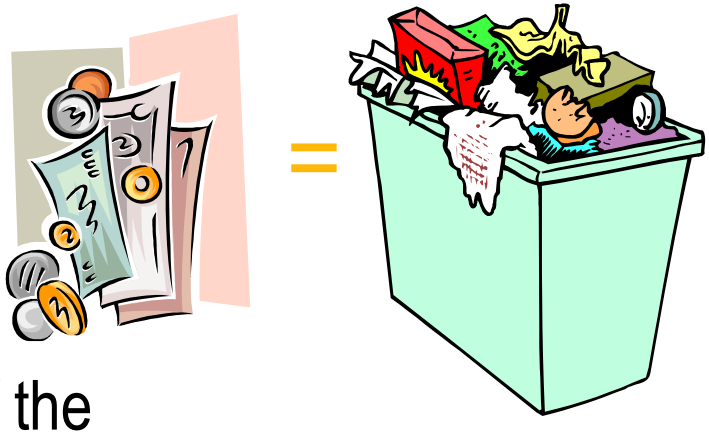
What Causes Defects?

Process Variation From :-

1. Poor procedures or standards.
2. Machines.
3. Non-conforming material.
4. Worn tooling.
5. *Human Mistakes.*

Except for Human Mistakes these conditions can be predicted and corrective action can be implemented to eliminate the cause of defects

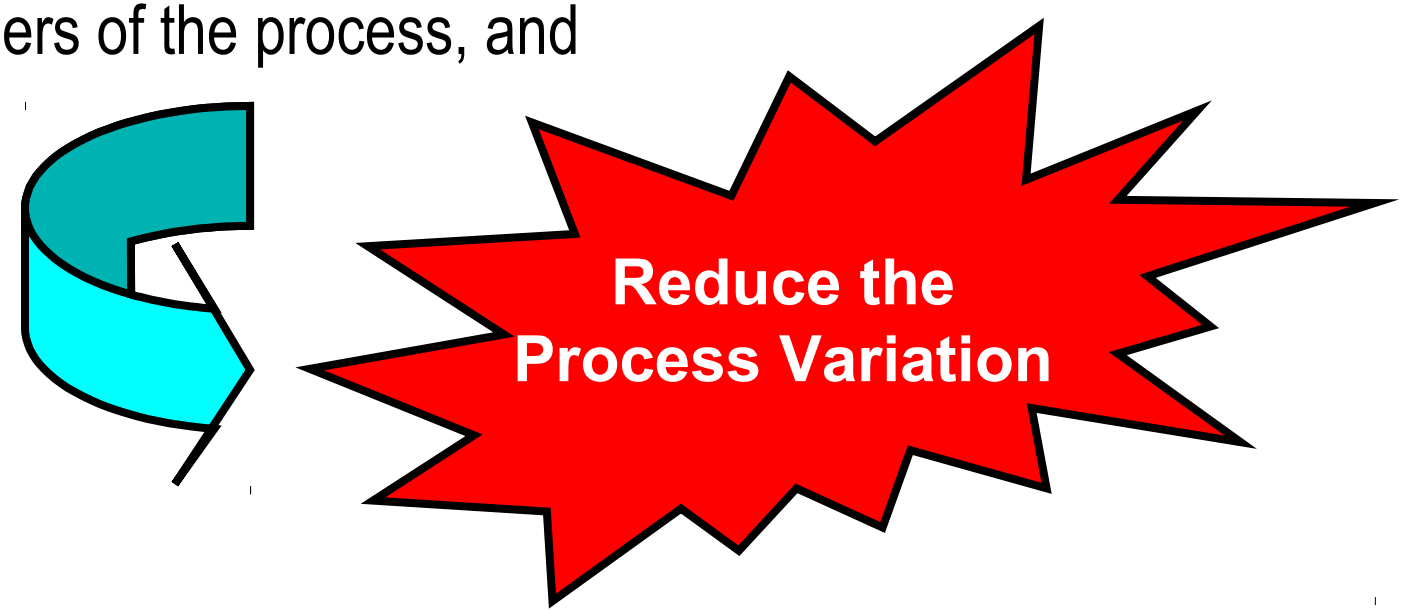
In order to reduce quality defects(waste) and cost (money), we must :-



Understand the process an its relationship to other business processes.

Identify the inputs and outputs of the process.

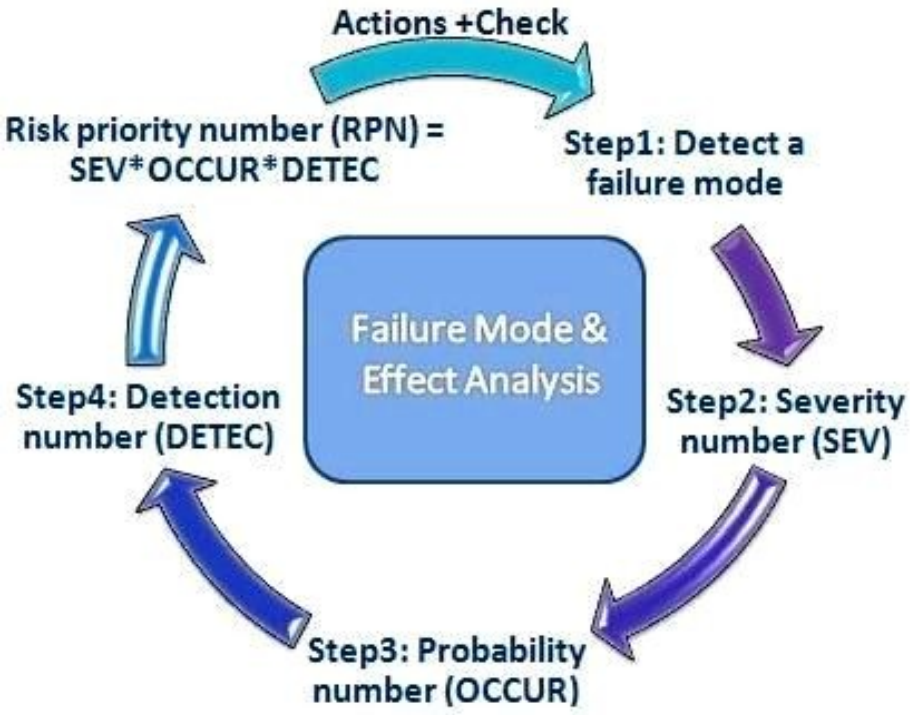
Know who are the suppliers to and customers of the process, and



Combining Lean And Variation Reduction

Start with an **FMEA**

This organized approach will identify potential problems that can be addressed with mistake proofing activity.



Process maps can also be beneficial. Understanding the inputs and outputs can help identify specific solutions.

Mistake proofing is an excellent opportunity to combine the tools of variation reduction and lean.

Poka-Yoke Hints

Think about how to verify items by their characteristics

- weight, dimension, shape

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

When brainstorming, review hints and examples to get people thinking.

Additional Hints for Defect Prevention

Don't make surplus products

- make only what the customer needs, when it is needed
- surplus inventory makes poor quality harder to find
- in a high inventory environment, the sense of urgency is not there

Eliminate, simplify, or combine production operations

- identify and eliminate waste; drive 5S
- follow standard operations & utilize visual aids

Once processed, use immediately

- adopt a flow process
- implement immediate feedback and action cycles

Involve everyone in defect prevention

- form action teams - team brainstorming

Make daily improvements and invent mistake-proofing devices

A Lean environment promotes defect prevention.

Engineering Examples

Approved parts database which only allows approved parts to be on the BOM - Control (preventative)

• Checklists (Info missing so drawing does not release)- Shutdown (detection)

• CAD systems that detect interface issues
Warning (detection)

And then there's the design itself.
(Alignment pins, keyed connectors, part shapes, part count reduction …)

Service and Administrative Examples

Approved parts database which only allows approved parts to be on the BOM - Control (preventative)

• Checklists for requirements gathering during sale process Shutdown (detection)

• Reduce complexity of forms ; unneeded fields.

• On line forms with required fields - Can't complete task without complete info in correct format

Supply Chain Example

MRP provides info related to supply vs. demand

Warning (detection)

- High priced PO's can not release without approval

Control (prevention)

- Approved vendor lists limit suppliers

Control (prevention)

- Cannot complete transaction with missing fields

Shutdown (prevention)

SEVEN RULES to POKA - YOKE

These are the seven rules to a successful Poka-yoke implementation, generally in most text you will see 8 guidelines to poka-yoke attainment; we combined two steps into one. These should be custom fitted to your organization and culture.

1.) **Quality Processes**

2.) **Utilize a Team Environment**

3.) **Elimination of Errors**

4.) **Eliminate the "Root Cause"of The Errors**

5.) **Do It Right The First Time**

6.) **Eliminate Non-Value Added Decisions**

7.) **Implement a Continuous Improvement approach (KAIZEN)**

SEVEN RULES to POKA - YOKE

1.) Quality Processes

Design "Robust" quality processes to achieve zero defects.

2.) Utilize a Team Environment

Leverage the teams knowledge, experience to enhance the improvement efforts.

3.) Elimination of Errors

Utilize a robust problem solving methodology to drive defects towards zero.

4.) Eliminate the "Root Cause" of The Errors

Use the 5 Why's and 2 H's approach

SEVEN RULES to POKA - YOKE

5.) Do It Right The First Time

-Utilizing resources to perform functions correctly the "first" time.

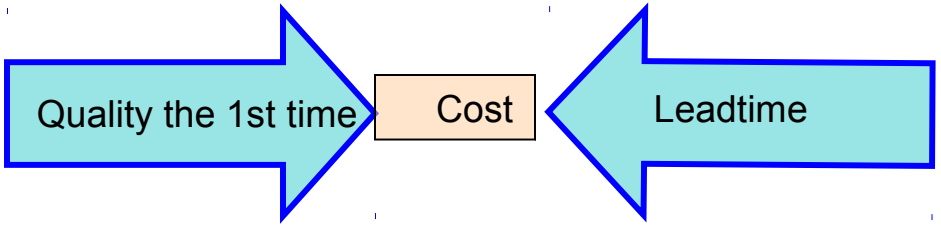
6.) Eliminate Non-Value Added Decisions

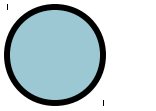
-Don't make excuses-just do it!

7.) Implement Continuous Improvement Approach

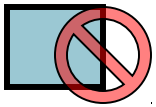
-KAIZEN, Do improvement actions immediately and focus on incremental improvements; efforts do not have to result in a 100% improvement immediately.

Poka-Yoke results in Quality of Processes

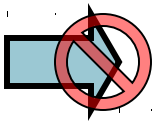




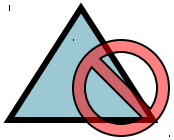
Transformation = <u>Quality production the 1st time</u>



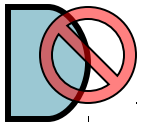
Inspection….eliminated ???



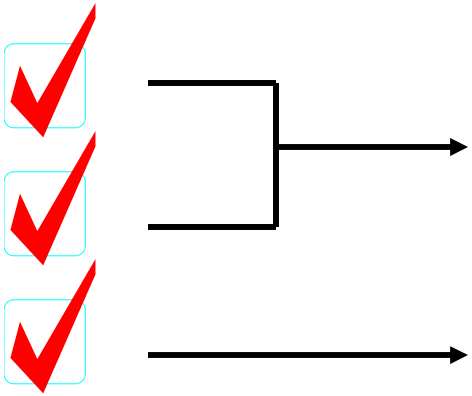
Transport



Storage



Delay/wait

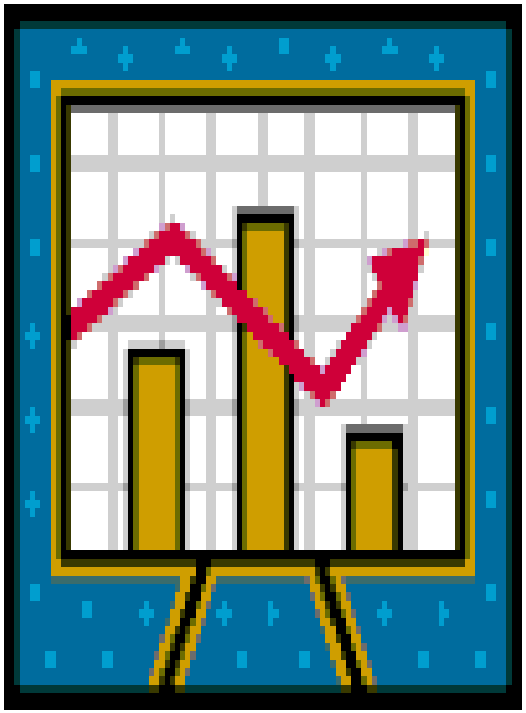


SWIP & U shape lines

One piece flow

Relationship between processes and quality defects.

Almost any business activity can be considered a process.



- Production processes involve the flow of material.
  Machining, assembly, and packaging are typical production processes.

- Business processes involve the flow of information.
  Financial planning, purchasing & order entry are typical business processes.

- All processes have the potential for defects. Hence, all processes offer a opportunity for the elimination of defects and the resultant quality improvement.

What Causes Defects?

Human Mistakes: *Simple errors-the most common cause of defects-occur unpredictably.*

The goal of Zero Defect Quality (ZDQ) is **ZERO!.**

Make certain that the required conditions are in place and *controlled* to make acceptable product 100% of the time.

Ten Types of Human Mistakes

- Forgetfulness
- Misunderstanding
- Wrong identification
- Lack of experience
- Willful (ignoring rules or procedure)
- Inadvertent or sloppiness
- Slowness
- Lack of standardization
- Surprise (unexpected machine operation, etc.)
- Intentional (sabotage)

POKA YOKE- Mistake Proofing

Don't wait for the perfect POKA-YOKE.

Just Do it and Do it now!

If your POKA-YOKE idea has better than 50% chance to succeed…Do it!

Do it now….improve later!

WORKSHOP

POKA YOKE at Production line

Form into a Team and identify the defect (or potential defect) to implement Mistake Proofing using Poka-Yoke approach.

1: Observe defect and ask “What, Where, When, Who & How” the defect happen.

2: Detail the sequence of events in the documented standard.

3: Observe the Actual process steps that differ from the standard.

4: Identify Root Cause (use Poka-Yoke approach tools, observations) ask the 5 ‘whys’ to determine root cause.

5: Identify the Poka-Yoke device necessary to prevent the defect.

6:Try storm with the team the various Poka-Yoke examples/devices and KAIZEN the device to the process – Now!

7:Use company’s Quality metrics to measure/monitor effectiveness of the Poka-Yoke KAIZEN and update SOP accordingly.

POKA-YOKE Summary

Poka-Yoke: ***A*** **Japanese mistakes avoid (*poka-yokeru*) *methodology* to eliminate product defects by *preventing*, *correcting*, or drawing *attention* to human errors as they occur.**

Applicable in Lean manufacturing assembly and now in all manufacturing to *eliminate defects and* develops equipment that *prevents or makes it impossible for human to make an error*.

POKA-YOKE Summary

Every inspection method has weaknesses.

- **Prevention** of defects is better than detection.
- Poka-yoke devices can be applied within **any** process.
- Focus on the **critical** functions and actions.
- Sources of defects can be challenged and **eliminated.**