

The Role of Poka-Yoke in Human Performance Improvement (HPI)



EFCOG ISMQAWG - Hot Topics

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You Don't Know What You Don't Know...

"You just flash that thing, it erases your memory, and you just make up a new one?"



Definitions

◆ Human Performance

- INPO: **A series of behaviors executed to accomplish specific results**; very simply, human performance is behavior and results ($HP=B+R$)

◆ HPI

- a disciplined approach to proactively prevent events triggered by human error

$$Re + Md \longrightarrow \emptyset E$$

[reducing error AND managing defenses leads to zero events]

◆ Poka-yoke – Japanese **manufacturing** tool (Shingo-Toyota)

- POKA - Inadvertent Errors
- YOKERU - Avoid

= Avoid Inadvertent Errors

a.k.a. **Mistake-Proofing**, Error-Proofing, Fool-proofing (baka-yoke)

Definitions

- ◆ **Event** – An **undesirable change** in the state of structures, systems, or components or human/organizational conditions (health, behavior, controls, and so forth) **triggered by human error** that exceed established significance criteria.
- ◆ **Defect** – **any deviation** from specifications; nonfulfillment of an intended requirement or reasonable expectation for use, including safety considerations often due to **human error**.

Some Guiding Principles

HPI

1. People are **fallible** and even the best make mistakes.
2. Error-likely situations are predictable, manageable, and **preventable!**
3. Events can be **avoided** by understanding the reasons mistakes occur and applying the lessons learned from past events.

Poka-yoke

1. Errors are **inevitable!**
2. Errors can be **eliminated!**
3. Defects are **preventable**
 - Zero Defects can be achieved!

“Substitution”

Substitute “Event”

(or Incident, or Accident, or Injury)

for

“Defect”

(BTW: Mistakes = Errors)

Goal of Poka-Yoke

ELIMINATE ERRORS BY:

1. designing the errors out
(Design Poka-yoke)

OR

2. controlling the process at the source to prevent the error or detect the error before it becomes an accident.
(Process Poka-yoke)

Two Types of Process Poka-Yoke “Devices”

Type I – Eliminate/prevent the error from occurring at the source. (Prevent Error)

Type II - Detect the error (feedback) in the process of it occurring, before it results in an accident. (Prevent Accident)

Process Poka-Yoke “Devices”

“MAKE IT EASY TO DO IT RIGHT!”

Use “Quick and Easy” Tools by thinking:

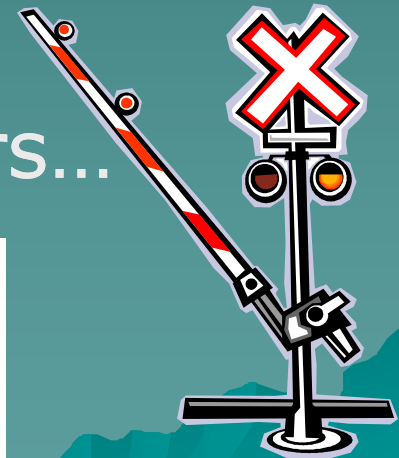
C - color, color-coding, checklists...

L - location, lockout...

O - orientation, organization...

P - position, placement, physical...

S - size, shape, sequencing, sensors...



Poka-Yoke and Hierarchy of Controls

(Controlling the health and safety risks in the workplace)

Most Effective



- 1. Elimination or Substitution – best in design/development stage... *Design Poka-yoke***
design the hazard or error-potential out of the process; substitute safe materials for hazardous ones, reduce energy; speed, voltage, sound level, etc... change process to eliminate distractions, perform tasks at ground level, automate material handling...
- 2. Engineering Controls – remove a hazard or place a barrier between... *Process Poka-yoke***
ventilation systems, machine guarding, sound enclosures, circuit breakers, platforms and guard railings, lift tables, conveyors, locks...
- 3. Administrative Controls – Warnings, Procedures, Training – includes alarms, signs, labels, beepers, computer warnings & training, procedure revisions, rotation of workers, safety equipment inspections**
- 4. Personal Protective Equipment - safety glasses, ear plugs, face shields, safety harnesses, back belts**

Least Effective

poka-yoke region

Defenses (Hierarchy of Controls)



The “Swiss Cheese Model”

PRACTICE

Background:

Work surfaces in a secured lab were found contaminated with lead and cadmium and needed to be “cleaned”.

Industrial Hygiene wanted to keep personnel out of the lab until the clean-up was complete.

Q: How did they do this?
How would you do this?

(HINT: Use the Hierarchy of Controls with a Poka-yoke device)

PRACTICE

Some Options:

1. Meet with the scientists and lab techs, informing them of the hazard then post a sign on the door instructing personnel to stay out of the lab. **TYPE:**
2. Place "Warning" tape across the door to lab; in addition to the sign. **TYPE:**
3. Change the lock on the door and post a sign instructing personnel who to contact if access is required. **TYPE:**

HPI and Poka-yoke

SUMMARY

1. Errors (mistakes) are inevitable - (people make mistakes)
2. Errors are Direct "Cause" of Accidents
3. Accidents are preventable (i.e. Zero Accidents)

Error (Mistake)

(Direct "Cause")



Defect

(Effect)

PREVENT THE ERROR...PREVENT THE ACCIDENT

FINAL THOUGHTS

Poka-yoke's role in HPI:

“The approach applies error-proofing ideas originally developed for safety reasons.”

- Shiego Shingo, developer of the Toyota Production system and inventor of the Poka-yoke device concept!

“...performance improvement is not limited to safety. Organizations that have adopted human performance improvement (HPI) methods and practices also report improved product quality, efficiency, and productivity.”

- DOE's HP Handbook – Nov. 2007

CONCLUSION

*The next time you want to be
"S-A-F-E-R", use a
"Questioning Attitude" to
"Stop, Think and Act" by utilizing
POKA-YOKE...then "Review" the results*

Poka-Yoke – The Tool of Choice