



## Poka-Yoke

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Have you ever undertaken a task, only to find you did not quite '*get it right first time*'. More importantly, did you learn from your mistake, and did you ensure the mistake would never be repeated? If you designed a technique, method or some physical device that guaranteed no further mistakes could possibly occur in the future, the chances are that you had implemented *poka-yoke*.

Poka-yoke is quite simply "a technique for avoiding simple human error" (1). The technique is attributed to Shigeo Shingo who was instrumental in using the technique to achieve zero defects.

A simple example of poka-yoke in action can be seen in the pits of a formula one grand prix. Watch the guy with the 'lolly-pop' stick in front of the car. The words on the sign read 'brakes on'. When the team have replaced the tyres, topped up the tank, and made all necessary adjustments he simply turns the sign around letting the driver know that he can speed off to join the race. This example of poka-yoke ensures the driver does not leave the pit until all operations have been successfully carried out.



<http://www.f1jordan.com/>

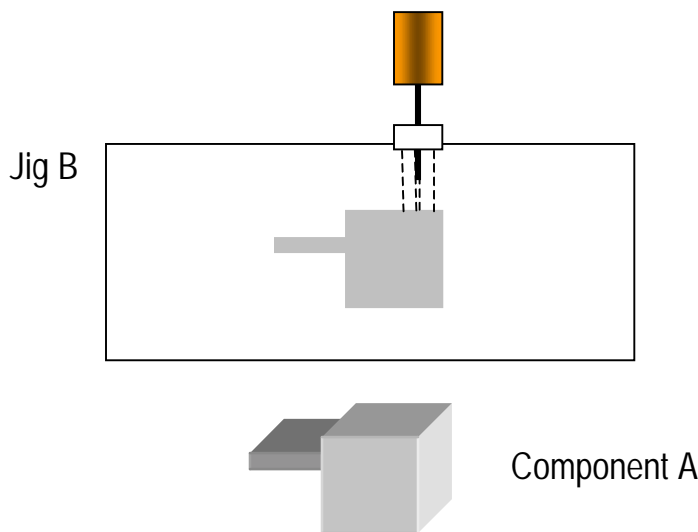


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Poka-yoke is derived from two Japanese words - 'to avoid' (yokeru) and 'inadvertent errors' (poka). Shigeo Shingo coined the phrase poka-yoke (pronounced POH-kah YOH-kay), which generally translated means 'mistake proofing' or 'fail-safing' (1). The technique is widely used in Japanese organisations as a means of preventing / detecting errors.

The following example demonstrates poka-yoke. To avoid drilling a hole in the wrong position, a jig has been designed to locate component 'A' in the correct orientation. In other words there is only one way (mistake-proofing), component 'A' can locate in jig B. This simple device enables a hole to be drilled in the correct position each and every time. Poka-yoke prevents mistakes occurring, so there is no need to 'control' or 'inspect'.



The poka-yoke technique of mistake proofing can be applied to both manufacturing and service industries. The mechanisms devised to either prevent mistakes occurring or detect mistakes, are designed to have a 100% success rate. Poka-yoke mechanisms applied throughout the workplace guarantee that defects will not reach the final customer. Shigeo Shingo states in his book Zero Quality Control: Source Inspection and the poka-yoke system. ... "Mistakes will always be made (we're only human after all), but if poka-yoke's are implemented, then mistakes can be prevented from becoming defects (mistakes that reach the customer)."



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Examples of common mistake proofing (poka-yoke) mechanisms include:

- o Overflow device in sinks preventing water from flooding the bathroom should the tap be left on by mistake.
- o Computer 3.5-inch diskette that can only be loaded one way.
- o Switch mechanism on a hedge trimmer that can only be operated when the operator's hand is safely positioned in the 'safety guard'.
- o Electrically operated car window that stops when it detects an obstruction such as a hand.
- o Filing cabinet that will only allow one drawer to be opened at a time, thus preventing a top heavy cabinet tipping over.
- o Electric iron that automatically switches off when it is left face down and unattended.

Further examples of mistake proofing can be found at the following site  
<http://www.campbell.berry.edu/faculty/jgrout/everyday.html>

### **EXERCISE**

Identify a common mistake that occurs in your workplace. Design a poka-yoke mechanism that will prevent that mistake occurring (or at least detect the mistake).

Include photographs or sketches to show the 'before' and 'after' situation.



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Defects = Zero is what Shigeo Shingo advocated when he devised the technique of poka-yoke. Because there is variability throughout the supply chain, whether that is natural process variability or human error (mistakes) it stands to reason that defects are bound to occur unless management take action to provide the means of eliminating their occurrence. There are various approaches that numerous Gurus have taken. Juran advocated that 90% of all defects were management controllable, the other 10%, employee controllable -providing the employee had been provided with a standard, a means of measuring and a means of making adjustments to the process should the standard have not been met. This approach as good as it is, still accepts that defects will occur at some point.

The zero defect concept was first coined in the 1960's mainly as motivational programs (2). Shingo took this ideal target literally, and demonstrated how through company wide involvement, zero defects could be achieved through the design of simple mechanisms.

The main problem with the target *defects = zero* is the attitude adopted by management that "defects are inevitable". Because some managers believe defects are inevitable, they invest in repair stations, inspection, quality assurance systems, and a host of 'quality control' techniques. Management should be focused on preventative measures – investigating methods that result in the design of mechanisms that prevent or detect mistakes. This type of effort, focused on mistake-proofing rather than 'controlling' is a far better investment and leads to customer's receiving defect-free / error-free products and services.

Quality cannot be controlled. For starters, at what level does the organisation satisfy itself that 'quality is in control' – 0.5% of turnover, 2%, 5%? This is a defensive quality strategy. Controlling quality sucks up organisation resources through non-value adding activities, the results at best being the production (however limited) of defective products or poor service. Controlling quality does not work. What must be adopted is a program for eliminating defects at source. If the potential for producing defects is removed – because it is not possible to make mistakes – then *defects = zero* becomes a reality and the need to 'control quality' is eliminated.



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Norman Bodek in the forward to Poka-Yoke (1) states.. "the totality of company-wide poka-yoke devices have resulted in the Japanese miracle..... I saw many sensors lined up to inspect 100 percent of the work. Every single operation was checked before it moved on. These checks normally detected errors before a defect could occur. And many of these devices were thought-up and installed by the workers themselves."

"It had dawned on me that the occurrence of a defect was the result of some condition or action, and that it would be possible to eliminate defects entirely by pursuing the cause"

Shigeo Shingo (1)

Shigeo Shingo (1) states " there are three major inspection techniques in the field of quality control" He states these are:

1. "Judgement inspection – Separates defective products from good ones after processing. It prevents defects from being delivered to customers, but does not decrease a company's defect rate."
2. "Information inspection – Investigates the causes of defects and feeds back this information to appropriate processes so that action can be taken to reduce the defect rate."
3. Source inspection – A defect is a result, or an effect, usually caused by a simple mistake. Through 100 percent inspection at the source, the mistake can be corrected before it becomes a defect."

Shingo (1) is no lover of statistical process control. "Statistics is really no more than quantified guesswork." He adds ... "Because there is always some discrepancy with reality, a certain level of defects is tolerated."



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Shingo (1) identifies three components (weighted by their level of importance) that lead to the elimination of defects:

1. "Source inspection (60 percent) – Checks for factors that cause errors, not the resulting defect."
2. "100 percent inspection (30 percent) – Uses inexpensive poke-yoke (mistake-proofing) devices to inspect automatically for errors or defective operating conditions."
3. "Immediate action (10 percent) – Operations are stopped instantly when a mistake is made and not resumed until it is corrected."

Shingo (1) clarifies the weighting of the three components by stating .... "As you can see, source inspection is the most important function, with 100 percent inspection, using poke-yoke, as a tool for achieving it. Poka-yoke is a technique for avoiding single human error at work. The responsibility for a successful 'Zero Defects' campaign ultimately rests on management. The leaders of the company must themselves have a vision of the quality the company can produce, and create a company culture and environment that motivates employees throughout the company to make that vision their own."

"Inadvertent mistakes increase work"

"Organise production to inspect 100 percent of the products"

"Aid the operator with 'fail-safing' devices to eliminate defects occurring or detecting defects from a previous operation"

Hiroyuki Hirano (1)



## Poka-Yoke

### Defect prevention continuum (Svikis,2003)



100% inspection through the adoption of poka-yoke – prevents defects / mistakes occurring or detects defects / mistakes from previous operations.

Where 'fail-safing' devices are not yet possible, the criteria for employee control should be adopted. Employee control advocates that quality responsibilities and 'quality control' are executed at source.

Employee control:

1. Knowledge of "supposed to do" – the required standard.
2. Knowledge of "is doing" – measuring against that standard.
3. Means for regulation – should the standard not be met, the ability to correct/adjust.

**Employee Control - 'controls at source', is limited but at least enables 'root-cause' at source problem solving to take place.**

Inspection operations further down the process 'catch a limited amount' of defects / mistakes, therefore there are no guarantee's the customer will receive a product or service to specified requirements.

The means to resolve a customer complaint is also limited. Identifying the root cause becomes more difficult the further down the process this type of 'quality control' is applied.

**Patrol inspection; end-of-line inspection; inspection by the internal / external customer, leads to 'Zeroplus Defects'. In other words, there will always be defects, errors and mistakes – the degree of which depends upon the scope of 'quality control'.**

**Poka-Yoke leads to Defects = Zero.**



## Poka-Yoke

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### References

- (1) Nikkan Kogyo Shimbun, Ltd / Factory Magazine – Edited by (1988) Poka-Yoke. Portland. Productivity Press
- (2) Juran, J.M. (1979) Quality Control Handbook. Mcgraw Hill
- (3) Jordan team <http://www.f1jordan.com/>

### Useful links

[http://www.pepsan.com/poka-yoke\\_tutorial.pdf](http://www.pepsan.com/poka-yoke_tutorial.pdf)

<http://www.mistakeproofing.com>