

Six Sigma and Poka-Yoke

Eliminating remaining opportunities for mistakes

by Praveen Gupta



In layman's language, Six Sigma means great and fast improvement, which leads to virtual perfection. Another indicator of a successful application of the Six Sigma methodology is the degree of breakthrough. Sometimes, when customers demand zero defects at any cost, suppliers are forced to add an inspection stage to their system regardless of its process capability. Achieving zero defects for the Six Sigma's sake leads to more waste and breeds undesirable approach toward Six Sigma. In theory, companies can achieve Six Sigma, but reality is sometimes different. It may be difficult to achieve Six Sigma level performance through process improvement using statistical techniques alone.

Companies must consider using *poka-yoke* or failure-free methods to eliminate remaining opportunities for mistakes.

Remembering Bill Smith's Six Steps to Six Sigma, it's possible to see the potential of *poka-yoke*. Smith's six steps to Six Sigma are listed below:

- Define products or services.
- Identify customers and their critical requirements.
- Determine company's needs and their sources.
- Establish a work process and mistake-proof it
- Measure process capability and make adjustments if it's less than desired levels of $C_p = 2$ and $C_{pk} = 1.5$.
- Improve the process capability and achieve $C_p = 2$ and $C_{pk} = 1.5$.

Many people think *poka-yoke* sounds like Ying and Yang. *Poka-yoke* means making it more difficult to make mistakes. When opportunities for mistakes are present and companies are unable to improve their processes through DMAIC, they must think of eliminating that possibility for mistakes. The six steps to Six Sigma listed above encourage companies mistake-proof each process in the defining phase. Because applying *poka-yoke* may involve decisions about the process design, it's better to apply *poka-yoke* earlier rather than later in the product life cycle.

Poka-yoke, is about reducing process variability by minimizing possible ways of doing things. If a part is to be assembled on a base and it can only be assembled in one way, the assembler won't make a mistake. A good example is a floppy disk, which only works, if it's inserted in a specified way. Another example is an order entry system that won't process the customer order unless the required information is entered in a pre-specified way.

Depending upon the stage of occurrence of a mistake, companies can *poka-yoke* processes at the verification, control or design level to implement failure-free solution—or to prevent mistakes. At the verification level, the inspection should be before an item or service is delivered to the customer. *Poka-yoke* at the control level may include automatic adjustment or compensation to some undesired variation at the process level and eliminating the opportunity for error at the design level. The cost of implementing *poka-yoke* at the verification level, control level and design level decreases on the order of 100, 10 and one respectively.

Poka-yoke is most effective in case of human errors. Human errors aren't prone to the application of SPC for prevention. Human errors are prevented by raising awareness to the chance for mistakes. There's a simple rule of thumb: one error is human, two errors are a warning, and three errors require the quick application of *poka-yoke*. The person making mistakes or the design engineer must understand what sequence of events caused the repeated human error.

A failure-free methodology or a technological solution should be implemented. Typical human errors include the following:

- Lack of training
- Forgetfulness
- Misunderstanding
- Inattentiveness
- Inexperience
- Sloppiness
- Flexibility
- Inconsistency

The *poka-yoke* methodology includes the following steps:

- Remove potential for excuses.
- Reduce the opportunity to make mistakes.
- Eliminate the root cause of mistakes.
- Leverage teamwork and knowledge.
- Make the process insensitive to human mistakes.
- Eliminate nonvalue-added activities.
- Encourage creativity for "*poka-yoke'ing*."

Poka-yoke means making it difficult to make mistakes without focusing on the mistake itself. Integrating *poka-yoke* with Six Sigma makes Six Sigma a stronger methodology that generates a more dramatic improvement.

About the author

Praveen Gupta is a Six Sigma consultant and trainer at [Quality Technology Co.](#) He's an ASQ Fellow and has been associated with Six Sigma since 1986 at Motorola. Gupta has taught Six Sigma at Motorola University for more than 10 years. He has authored [Six Sigma Business Scorecard](#) (McGraw-Hill Professional, 2003), [The Six Sigma Performance Handbook](#) (McGraw-Hill Professional, 2004), [The Six Sigma Black Belt Handbook](#) (McGraw-Hill Professional, 2004) and [Six Sigma in Transactions and Service](#) (McGraw-Hill Professional, 2004).

**Copyright © 2005 QCI International. All rights reserved.
Quality Digest can be reached by phone at (530) 893-4095.
[Contact us via Contact Form](#)**