

## **Productivity "Poka-Yokes"**

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THEY'RE MORE COMMON THAN YOU MAY THINK!

Our recent discussion of productivity has focused mostly on how to gather the data and study the work. These are the first two steps of an improvement process that may, at times, seem like this:



This article focuses on the third step —the miracle that leads to a lasting solution —which is often referred to as a "poka-yoke."

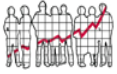
A poka-yoke is a specially designed feature of a process or a product that either prevents common mistakes or catches them before they cause trouble. "Poka-yoke" comes from the Japanese, meaning "inadvertent error" and "avoidance" and was popularized by the engineer Shigeo Shingo in his crusade to improve quality by eliminating human errors. Whether our goal is to improve productivity, quality, safety, customer satisfaction, or return on assets, "human error" or failure to follow the process is a usually one of the causes. Since our workforce is made up of people and nobody is perfect, how do we get to a lasting solution? We design a poka-yoke.

We see and use poka-yokes every day. For example, years ago, a dead car battery due to forgetfulness was a common problem. Since then, a poka-yoke was designed to sound a warning bell if the lights are left on. A "warning" poka-yoke is a big help, but not fool proof. I know from parental experience that four teenagers can exit a car without one of them pausing to wonder why the alarm is ringing. A more powerful poka-yoke is built into newer cars and turns the lights on and off automatically. You must make a special effort to leave the lights on in these cars.

A poka-yoke is the answer to *Murphy's Law*, which states, "If it can go wrong, it will." Make a poka-yoke so that it can't go wrong—or will be spotted immediately if it does!

Poka-yokes are everywhere. You see a wire gate swing out of the front of a school bus to guide children to cross far enough in front of the bus. You are asked to double-enter a new password to guard against typos. Wires are color-coded. Required fields have asterisks. Highways have rumble strips. All of these are features of a product or process that were specially designed to reduce the likelihood of a particular human error.

The best poka-yokes are quick, inexpensive and easy to implement changes to the materials, tools, environment, or process. For example, color-coding, redesigning forms, and other changes to the materials you use may reduce human errors. One company reduced accidents by replacing the white work gloves with neon gloves (alternating between two neon colors each month) so that people were more aware of the hand position. One financial services company greatly reduced the number of transactions they had to reject due to customer error by analyzing the data, identifying which mistakes were easiest to make, and then redesigning the form to make required fields hard to overlook.



Jigs, automatic stops, and other changes to production tools can make it much easier to execute the work to specification. One improvement team reduced downtime spent trying to find the right tool by replacing their generic toolboxes with portable pegboard-like kits with outlines for each tool. Excel, a widely accessible spreadsheet tool, is full of poka-yoke capabilities such as the data validation tools, vlookup formulas, conditional formatting, and many others. A billing department used Excel-based poka-yokes to reduce their processing time for a type of charge from over 40 hours per week to less than 45 minutes. Another financial processing group used Excel-based poka-yokes to reduce the time required to process, inspect and reconcile transactions from 2 full-time-equivalents per week to less than one. Because the changes required no programming, they were quick and easy to implement.

Changes to the environment, such as rearranging desks to facilitate required communication, setting up standard layout workspaces or establishing interruption-free work periods can reduce some types of errors. One improvement team reduced the chance of shortages and eliminated the time warehouse people spent looking for the right box size by arranging the box supplies in a standard location that was easily monitored by the purchasing agent.

The lean system of 5-S makes extensive use of the observation that the environment can have a great impact on the likelihood of human error and inefficiency.

Changes to the process can be made to catch critical errors at the time they are made. We are all familiar with the standard poka-yoke to prevent typos in a password: double entry. To prevent the risk of an undiluted medication being delivered to a patient, a hospital changed the process so the medicine was diluted in the pharmacy rather than in the patient's room. Many hospitals have implemented a pre-surgical process poka-yoke that involves marking the point of incision—in some cases having the patient sign off on the spot.

### *Finding the Right Poka-Yoke*

But how do you find the right poka-yoke for your problem?

Poka-yokes must be devised to prevent a particular type of error, which is why it is so important to thoroughly study the problem, the process, and the root causes. Once you have all the facts and data about what is going wrong most often, in what way, and why, you can set your collective creative minds to designing a poka-yoke that most effectively and efficiently prevents the most frequent human errors or omissions.

Yet a simple and powerful poka-yoke is almost never the first solution a team comes up with. The best ideas take creativity, collaboration, and the time to press on past the weaker solutions that come to mind first. Most often, the first idea is one of the following: (a) ask people to be more careful, (b) ask management to send an email telling people to be more careful, or (c) schedule a training session in which people are instructed to, yes, be more careful! These solutions often help for a little while, but the improvement is fleeting.

Armed with a thorough understanding of the process and how things go wrong, you must keep brainstorming ideas until you can find a way to inexpensively make it much easier to do the work right or at least automatically alert a person when he or she has just made the mistake. Although your poka-yoke must be designed to fit your particular situation, poka-yokes lend themselves to borrowing across situations and even industries.

Here are some categories or types—organized in increasing degrees of effective prevention:



- Job aides are a little less fleeting than exhorting people to be more careful, because these are present at the work site when the work is being done. Examples include: cheat sheets, check lists, laminated guides, photographic work instructions. We've all seen and used these. They make it easier to do things right because they aid our memory, if we consult them. Their weakness is that we can forget to consult them —especially when we are rushed, tired, or distracted.
- Situational visual guides are better. When you design a form, design it to draw attention to the key items. If a particular type of transaction or operation requires an extra step that could easily be forgotten, consider using color coding or conditional formatting to highlight the important information. These can be effective and are often very quick and inexpensive to implement.
- Situational audio alerts can be even better —such as alarm bells when you are about to make a mistake. If you were trying to reduce pick and pack errors, you might want to set up a bell that will ring whenever the package weight does not equal the expected weight for the order. This may be a little harder to implement, but in certain environments the audio signal may be much more effective than a visual cue.
- Automatic guides can reduce mistakes by leading you through the necessary fields or screens of a data transaction, the safest path through the warehouse, or the correct movement under a jigsaw. Automatic guides can often be designed fairly inexpensively, although may require some programming.
- Automatic controls are the most effective. These are design features that do not allow a certain mistake. For example, a gas cap may be tethered to the car to control against its loss. An automatic shutoff switch will prevent the work from continuing under the wrong conditions. A form requiring a valid entry is used to prevent missing or invalid entries. These generally involve more time and investment to implement, but if the mistakes have serious consequences automatic controls are the best option.

You cannot poka-yoke everything all at once, so you may want to use the **Failure Mode & Effects Analysis** (FMEA) to help prioritize. FMEA helps you calculate and rank the risk factors associated with all the things that can go wrong —weighing 3 things: how likely is the error, how likely is it to be spotted in time, how bad is the impact if it happens and is not spotted. You can find a FMEA tool and tutorial in our **Charting Solutions Plus**. Develop your list of things that could go wrong and poka-yoke the highest risk factors first.

To gain a lasting solution to the problem, combine the team's knowledge of the problem and the process with the time and creativity to design a simple and effective poka-yoke that will keep the problem from coming back. Facts, data, and analysis are the foundation for process improvement, but you need creative and collaborative thinking to finish the job. In our next issue we will talk about ways of inspiring creativity in a problem solving environment.

If you are interested in discussing poka-yokes further, or if you have any questions, please give us a call. We welcome your comments, questions, suggestions, or additional observations. Write to [mj.king@conwaymgt.com](mailto:mj.king@conwaymgt.com).