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From Defining to Preventing Errors

Preventing error is key to shipping good parts every time.

The past couple of months we have discussed ways to define errors that are outside the realm of normal shop conversation. We tend to know what an error is after it happens but having a deeper understanding of types of errors will help us design processes that prevent errors. Preventing error is key for long term sustainability and improvement.

Four techniques to have in your toolbox for preventing error are Process Thinking, SPC, Poka-Yoke (mistake proofing), and Redundant Systems. When preventing errors, we need to look for leading indicators to catch errors before they happen. Depending on trailing indicators is like performing an autopsy. The non-conforming condition has occurred, and a damage assessment is being performed. To minimize cost and maximize improvements performing tests while the process is still happening to prove its fitness and prevent failure. The goal is to never reach a non-conforming condition.

Process Thinking

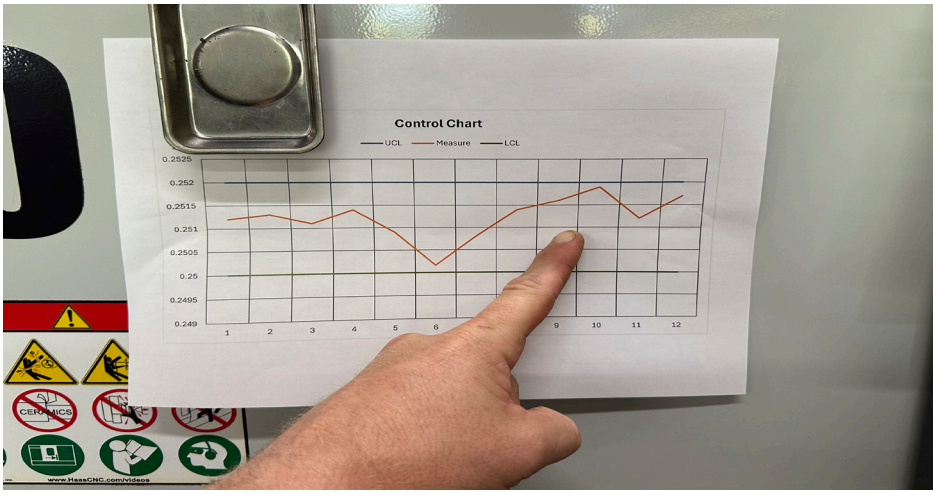
The best way to prevent error is to have a process. What is a process? A process is a series of steps that are performed to reach a particular end state. Processes are everywhere. We often recognize them in our own life. We have a process for starting the coffee maker in the morning. It is a series of identical steps that have little variation. If there is no process, then there is nothing to control. Once we build a process it must be consistent. In order to move to higher level error prevention and detection a consistent process is imperative. One way to improve consistency is to document a process. In manufacturing where multiple people will complete a process it must be documented. Documented processes make sure everyone is on literally the same page doing the steps the same way every time. Providing consistency across multiple people, shifts and days creates a stable process that can be tracked.

SPC

Once we have a stable process, we can utilize tools like statistical process control or SPC to track variation within the process. SPC makes variation visible to everyone. When variation is visible, problems can be detected and corrected before non-conforming parts are made. Utilizing a control chart, an operator can easily see dimensional drift moving toward the upper control limit for instance. When dimensional drift appears on multiple dimensions it might be determined that a form tool is wearing. Tracking the statistically relevant change creates opportunities for continuous improvement. In the Plan Do Check Act (PDCA) cycle, SPC is in the check phase. The process has been created and is running so checks are performed to verify process stability. Once change has been detected, the process can be adjusted to minimize occurrence of the change.

Poka-Yoke

Poka-yokes are systems that prevent mistakes from occurring. Mistakes and non-conforming conditions are synonymous. For poka-yokes to be effective they need to



be automated. Building training and operator lead work stoppages are not true poka-yokes because the human element is a potential point of failure. Performing SPC will help identify areas of the process where poka-yokes can be implemented. In the example provided with the form tool failing, SPC will define the number of pieces a tool can get before failure. A macro counter or machine counter can be used to force stop the machine and have the operator change the tool. Most FANUC controllers can use #3006 to send a custom message to change a specific tool. (Look at your manual since it seems like everyone does this differently.) Other examples of poka-yokes are a whisker switch to stop a machine if a tap breaks. Or a laser mic to check parts as they come off a machine to make automated offsets. Even better would be a laser mic feeding into a SPC system making offsets that display a custom message to change an insert only at the point of real failure to maximize the use of every insert.

Redundant Systems

For mission-critical applications, building redundancy in the process will help prevent errors. Redundancy is a fancy way to say double-check our process. In our shops we should never have the person that sets up a job do the first piece sign off. Depending on the shop there would be at least one other sign off on a new job. Close tolerance dimensions are often checked with multiple gages. No single point of failure can create an error. The key is building redundancy as early in the process as possible to stop errors before they happen. Sound familiar? Many types of redundancy are also poka-yokes. Redundant systems are essential to detect errors of omission and commission. Double-checks reduce the chances that errors make it through the final stages of a system. Building redundancy stops non-conforming products from making it to our customers.

The key factor is to reduce variation in our processes which directly correlates to reducing errors. Poka-yokes and redundant systems will help reduce both Type I and Type II errors. Redundant systems are our best way to check for errors of commission and omission. Understanding what error is provides the foundation for eliminating it. Start with a process. Make it consistent. Build in improvement with SPC then attack the low hanging fruit of problems that quickly arise with statistics. Then build in poka-yokes and redundant systems that will make processes sustainable. Continuously improve the process forever. A process is never perfect but should be on the journey to perfection.

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