Prioritizing Prevention

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Enormous efforts and dollars are spent in production operations reacting to, containing, and solving problems. However, considerably more effort is needed in product design and manufacturing to prevent product failures, scrap, and other inefficiencies.

Warranty costs and product recalls persist and product liability suits are widespread. Over the past 30 years, plants and jobs have moved overseas, and the U.S. has lost over 30% of its manufacturing jobs (source: Bureau of Labor Statistics). Warranty costs of large U.S. manufacturers typically average 2% of revenue. So, for every $1 Billion in revenue, a company spends a *preventable* $20 Million in warranty expenses. Recall costs (just for consumer products and excluding automotive recalls) are more than $700 Billion annually (according to the Consumer Product Safety Commission).

We are all aware of the practice of prevention. For example, most parents faithfully have their children immunized against various diseases in order to prevent them from occurring. Many consumer products display warning labels to discourage unsafe usage.

However, considerably more effort is needed in product design and manufacturing to *prevent* product failures, scrap, and other inefficiencies. There are significant opportunities to evolve beyond the traditional efforts spent on problem prevention.

Traditional Approaches to Problem Prevention

Many methods and tools have been adopted in order to prevent issues. Some of the more common include:

Failure Mode & Effects Analysis (FMEA) – An analysis tool used to identify potential product or process failure modes, their effects, severity, "detectability", and probability of occurrence. The highest risk items are addressed by taking corrective actions to reduce the risk of occurrence. FMEA is typically completed by a cross-functional team based on their knowledge, experience, and beliefs.

Poka-Yoke (Mistake-Proofing) – Any mechanism in a manufacturing process or product that helps an equipment operator or user avoid mistakes. Its purpose is to eliminate product defects or mistakes by preventing human or process errors as they occur. An example is the inability to remove a car key from the ignition until the transmission is put into "park" – thereby avoiding an unsafe parking condition.

Inspection – There is a common misconception that as long as everything is produced within specification that no problems should occur. However, almost all product failures, recalls, and warranty items are not related to part characteristics failing to meet specifications. Manufacturers make substantial investments in inspection processes (people and machines) in an attempt to avoid potential problems.

What-If/Scenario Analysis – Brainstorming technique to consider possible scenarios and the probable outcomes. Solutions to prevent potential major issues are developed.

Progressive Methods for Problem Prevention

Many of the common approaches above rely on opinions, experience, and beliefs. These approaches should be supplemented with quantitative, data-driven techniques that are superior for predicting and preventing more complex issues that may arise. These methods include:

Design of Experiments (DOE) – An invaluable tool to efficiently develop process understanding regarding the relationship that many factors (and their interactions) have on key process outputs. DOE is often utilized as a problem-solving tool. However, its use to develop extensive process understanding so that problems may be *avoided* has been more limited. Effective and efficient use of DOE is the best approach to develop the required knowledge to effectively prevent problems.

Statistical Process Control (SPC) – The application of properly designed control charts on key process parameters will quickly detect process changes *before* they result in harmful consequences. To be extremely effective, appropriate choices must be made regarding the type of chart, sample size, and sampling scheme. Often, when SPC is deployed, common misconceptions and misapplications prevent maximum benefits from being realized (see "Misapplications of SPC…and the Consequences."

Reliability Testing & Prediction – While many product validation tests are typically specified and performed during the product development process, less emphasis is placed on test-to-failure reliability testing. Reliability is the probability that a device will function at some specified time in service and

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reliability testing allows quantitative predictions of product reliability. Where testing times are impractically long, accelerated life testing or degradation testing may be performed to develop reliability estimates.

Barriers to Problem Prevention Success

Several barriers prevent widespread and effective efforts in problem prevention. They are summarized below.

Performance Objectives & Reward Systems

Measurable performance objectives drive most behavior within companies. The issue with preventative efforts is that they are by nature difficult or impossible to measure. Problems that are avoided never occur so that their impact and cost is never seen. Companies must realize that proper investments in problem prevention are necessary and will pay off – although quantifying the return may be difficult.

Conversely, problem solvers are seen as heroes in many companies and gain substantial rewards. While efficient and effective problem solving is very important, efforts at problem prevention must be equally valued.

Lack of Dedication to Training with Subsequent Application

The progressive methods for problem prevention require some in-depth training and application experience. Unfortunately, training is typically viewed as a discretionary expense, especially in these trying economic times. Where training has been done (e.g. Six Sigma), it often sacrifices depth in the most useful quantitative methods, for breadth in a multitude of qualitative methods – which lack power to prevent complex issues from being prevented.

When training in progressive methods is conducted, it must be followed up with applications to build expertise and confidence. Training participants must be expected to adopt and apply the methods rigorously which will result in returns that far exceed the cost of the training.

Short-Term and Myopic Thinking

Short-Term thinking produces short term benefits at the expense of long term success. Clearly making decisions based on short term impacts are not consistent with preventative efforts that pay off years down the road. Certainly, our children face a more difficult future given many of the financial and policy decisions that have been made to provide short-term benefits without regard to the future impact especially given the predictable changes in the landscape.

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From Reaction to Prevention

Many companies are trapped in a cycle of reaction and fire-fighting which prevents any real focus on controlling, predicting, and preventing. It's ironic when participants in a training seminar dedicated to problem prevention are missing important chunks of the seminar to "fight another fire." A real commitment must be made to value problem prevention and deploy methods that are required to break out of the reactionary cycle.

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