PEER REVIEWED

The application of continuous improvement principles and methods to safety

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ABSTRACT

The field of safety should aggressively adopt continuous improvement principles and methodology. Their broad application in manufacturing processes has resulted in gains in process knowledge leading to many remarkable quality and productivity improvements. Similar opportunities exist in safety.

Application:

Use of the Total Quality Management principles in the field of safety can help make the workplace safer.

TO MAXIMIZE BENEFITS IN THE workplace, Total Quality Management must include safety issues. There have been many popular but erroneous beliefs regarding quality. These opinions created sizable obstacles to the acceptance of the ideas of quality gurus. Similar barriers persist today when these concepts meet the long standing and very similar opinions concerning safety. A comparison of these paradigms illustrates many parallels between quality and safety improvement.

CHANGING PERCEPTIONS—CAUSES OF QUALITY AND SAFETY DEFECTS

A significant change concerning the causes of quality defects was perception of employees by management. There was a generalization: "If the employees would only pay more attention and be more careful, then these defects would not happen." The replacement for the generalization was the following: "Our process cannot prevent these defects—what can we do to improve the process?"

The theory of causes is central to viewing safety defects or accidents. "Employee carelessness" has been a category for 90% of accidents. This was a comforting, but illusory, reaction for plant managers, superintendents and supervisors. Management was not responsible. Employees bore the brunt of the responsibility. While the other 10% of accidents were due to physical conditions, today we recognize that 90% are not due to carelessness. Although 90% of accidents are a result of specific actions of people, they may or may not include carelessness, negligence, or indifference. Thorough upstream analyses of accidents often reveal something far different. The systems in which employees are working and the underlying consequences of these systems have the primary influence on their actions—not a foolhardy disregard for personal safety.

Processes create many outputs. The most desirable is a quality product. Undesirable outputs include off-quality product, waste, re-work and accidents. If we have accepted the idea that people do not equal output, then employees are rarely to blame for the output of the processes in which they work. The same should hold true not only for quality but also for safety outputs. This concept has even more validity for safety defects or accidents. This is because an employee has an even greater and more immediate self-interest in not being injured than in not producing a defective product. A quality defect produced today may or may not come back to the company directly. It is even less likely to influence the individual employee. Even if it did, it would be much later. When there is a safety defect, such as an injury or accident, the consequence is immediate. It is also painful and costly at best and potentially debilitating or fatal at worst.

CHANGING DEFINITIONS OF QUALITY AND SAFETY

Another significant change in the way of thinking about quality is its definition. It originally was not having complaints—especially ones requiring compensation. While a liberal replacement policy was in effect, it was permissible to ship all production and let the customer return anything out of specification—customer quality control.

Current definitions of quality have progressed significantly. They include not only giving the customer the product he wants that is totally fit for use every time, but also anticipating what products and features will be of value in the future.

The parallels with the meaning of safety are apparent. In the past, the definition of safety was the absence of defects, or "not having accidents", or "not having an Occupational Safety and Health Administration (OSHA) citation." We were satisfied with standing at the bottom of the cliff and counting the bodies of those who fell to the bottom. "Failure management" with its reactive efforts was the norm when the piles of defects at the bottom periodically rose too high. Now we are climbing to the top of the cliff where we can measure how far people are from the edge. Proactive efforts maintain a margin of safety between people and the cliff's edge.

The definition of an accident

commonly accepted for years was "an unplanned event or act that produced injury or loss." A better definition is "an unplanned result of an event or act that produces injury or loss." The distinction is important. Events or acts leading to most accidents have frequently been practiced before. They therefore are not unplanned. What was unplanned was the resulting injury.

Working "safe" meant not violating any safety rules. Many accident reports note that no safety rules were broken. Working safe today includes replacing at-risk behaviors with safe behaviors, whether required by a rule or regulation.

CHANGING REMEDIES FOR QUALITY AND SAFETY IMPROVEMENT

Remedies for improving quality have undergone similar transformation. Conventional wisdom once not only accepted but also promoted the practice of relying on inspection to achieve quality. Production underwent inspection and sorting to rework or scrap the bad. There has been total discredit of this approach. Building quality into the product through a focus on the process has replaced attempts to inspect quality into the product.

For years, many organizations relied on inspection for the reduction of accidents with equally inadequate results. The broadest effort has been a national one coordinated by OSHA.

Analyzing the basic causes of accidents reveals a serious shortcoming. We find that the actions of people cause approximately 90% of all accidents. These observable acts are behaviors by definition in the terminology of behavioral science. The other 10% of accidents are due to conditions.

The principal focus of safety inspections is on conditions. The most significant causes of accidents or behaviors are thereby being ignored. The effectiveness of safety inspections on accident reduction undergoes further dilution when we consider the nature of the inspection standards.

OSHA standards are the most common. As OSHA states, they represent only the minimum performance requirements. A focus on minimum standards does not provide very high or challenging goals. Past progress in quality would not have been possible had the focus been on minimum specifications instead of maximum reduction of variation. The absence of improvement in accident rates since the codification of the OSHA standards should come as no surprise. Only accidents resulting in fatalities from the most obvious hazards have experienced reduction since 1970.

Another remedy that enjoyed broad support before the application of continuous improvement philosophy was reliance on specifications. A lack of understanding of variation accompanied this reliance. If an item met specification, it was acceptable. We assigned little value or emphasis to reducing the range of the specification. The parallel here with past safety improvement efforts is a similar preoccupation with specifications. We use disproportionate amounts of resources specifying the dimensions of the handrails, guards, tools, and stairs we use. More attention is due to the way we use them—behaviors.

There is a resemblance between past notions about quality and safety in the use of incentives and slogans. At the heart of an incentive plan that rewards workers for better quality or safety is the supposition by management that it is the worker who, if only motivated enough, could control such defects. This contradicts the acknowledgment that it is the process—not careless workers—that controls the rate of defects. Simultaneously contradicted is the concept of management being the responsible party for the process and its outputs.

Safety incentives can send a message that can be misinterpreted as manipulative, if not offensive, when we offer trinkets in return for avoidance of lost time accidents. If the incentive is high enough, we can drive accident reporting underground. Peer pressure or an individual's desire to obtain the reward can discourage reporting all but the most apparent injuries.

We now recognize that posters with slogans and exhortations to produce fewer quality defects have targeted the wrong people. Slogans, like incentives, arose from management's notion that operators putting their best effort forward would prevent most deficiencies. The frustration and resentment thus generated did nothing to improve quality. Improvement in safety is no more likely when management uses safety slogans. They are advertising to employees that they are as unaware of the barriers to pride of safe workmanship as they were to quality workmanship years ago.

CHANGING IMPORTANCE OF QUALITY AND SAFETY

Many American companies had placed a high priority on the quality of their goods and services long before the emergence of Japan as a major competitor. Japan's success hinged on elevating quality beyond a priority to a core value. While this distinction between the two countries' level of importance remained, Japan's dominance continued. When we view quality only in terms of a priority, its importance appears variable and temporary. It is subject to lowering and raising depending on other company needs such as cost control, sales volume, productivity, waste, or quarterly dividend.

When these or any number of other process outcomes present a

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more urgent or short-term problem, priorities undergo reordering with concomitant suffering of quality. If quality is a value, a long-term perspective is possible. When the concern for quality strengthens all process activities, improvement in process outcomes follows. Japan demonstrated this powerfully and repeatedly.

If safety is only a priority, its importance varies inversely with the day-to-day concerns of production or other outcomes. When top management places safety beside quality as a core value of the enterprise, it too can lead to process enhancement with superior outcomes.

CHANGING EMPLOYEE INVOLVEMENT

Traditional methods of command and control management using "the one best way" communicated the wrong message to employees. "Bring your body into the plant, but leave your brain in the parking lot." Central to continuous improvement methods and key to the Japanese success story were their abilities to bring all employees' knowledge, experience and creative abilities to bear on the process.

Many quality accomplishments attribute the greatest credit to this crucial element. To achieve similar success in safety, it is equally essential to educate and involve a significant majority of employees. As with quality, this is no small challenge.

A SYSTEM FOR SAFETY IMPROVEMENT

The changes noted above that have impacted quality improvement are formidable. Progress in quality has not come easily nor will it be easy to transform our safety effort. As Deming said, "The timid and the faint-hearted, and people that expect quick results, are doomed to disappointment."

Deming's System for Profound Knowledge provides an excellent place to begin:

- Appreciation for a system;
- Some knowledge about variation;
- Some theory of knowledge;
- Some knowledge of psychology.

The last item has an additional and particular application to safety improvement. The field of behavioral science provides the necessary knowledge about the fundamentals of man's actions. When we strongly link these principles to those of continuous improvement, we provide the very effective system for statistically significant reductions in accidents used today. This system addresses the following:

- Defining safety appropriately;
- Recognizing safety as a core value;
- Understanding root causes of accidents;
- Defining behavior operationally;
- Using upstream measurement;
- Achieving broad based employee ownership with observation and feedback;
- Measuring and problem solving.

Accident frequency is a universally recognized safety outcome that preoccupies both line and staff functions. It therefore affords an opportune place to begin the move upstream to address the root causes. Considering that the vast majority of accidents are the result of behaviors or "observable acts," why these actions are chosen and how to alter such choices beneficially become central questions. We must answer them accurately to reduce accident frequency.

An understanding of the principles that most strongly influence behavior is necessary. The antecedents and the consequences of a given behavior have different impacts that we must grasp. We must also learn the nature of consequences, their relative power and how to apply them.

One can develop operational terms to define work behaviors. Employees also design and take ownership of a system in which they observe each other's work behaviors, providing timely feedback and reinforcement. It is possible to organize the data generated into useful, upstream measurements for problem solving and preemptive accident prevention.

CONCLUSION

The continuous improvement principles and methods are as applicable, effective and beneficial for safety as they are to quality. The lessons learned grappling with quality issues can help to avoid reinventing the wheel for safety improvement. In some respects, application of the principles to safety meets with broader acceptance among employees than when quality is the objective. Although the prevalent techniques applied to safety issues today are reminiscent of quality procedures of one or two decades ago, there are notable exceptions. The science, tools, and methods employed by behavioral safety practitioners warrant investigation, learning and adaptation. **TJ**

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