➤BY LAROUX K. GILLESPIE

Targeting Six Sigma

It takes leadership to motivate employees who must hit the Six Sigma improvement target.

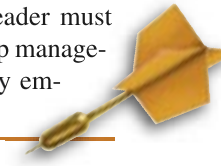
Many companies have turned to Six Sigma—a data-driven improvement process and methodology—to virtually eliminate defects in various processes, from services to manufacturing. The goal of companies using Six Sigma is reaching 6σ repeatability (3.4 defects per million opportunities). While this is a laudable goal, many companies have failed to achieve it despite elaborate—and quite expensive—implementation plans. Some of the key reasons Six Sigma projects fail are poor project management, lack of an effective plan to communicate results and an inability to tap into the expert knowledge needed to truly change faulty processes.

Six Sigma has many attributes that make it an effective quality improvement process. It uses a range of individual tools, both elementary and complex, to improve processes. These tools include project charters, control charts, document control, pareto charts and process mapping. Six Sigma does not, however, provide all the elements that a company should have in its self-help bag.

It Takes a Leader

Some companies begin a Six Sigma project with a flourish, only to fail in implementing it. Making Six Sigma work requires a strong leader and a cross-functional team that can continuously and effectively demonstrate the positive impact of Six Sigma on the company.

The Six Sigma team leader must provide inspiration, a clear understanding of Six Sigma's impact on the company and a plan for making it standard throughout the plant. The leader must also have the unflinching support of top management and express it in ways that every employee can understand and accept. It takes communication—including examples of Six Sigma's impact and why every employee is vital to the process—as well as a clearly demarcated plan to keep Six Sigma implementation on track.



Many companies have failed to reap the benefits of Six Sigma despite elaborate—and quite expensive—implementation plans.

It is important not to get lost in the Six Sigma process; keep in mind that it is, at heart, a problem-solving process. Simpler problem-solving processes can be as effective as Six Sigma in

certain situations. Consider the case of a small automotive supplier with an outstanding management team that produced parts to millionths of an inch tolerance around the clock. While most people might not think of the automotive industry as requiring tolerances that close, some parts do.

Every employee was a part of a team, with the common goal of making these parts more accurately and at lower cost. The general manager was the leader; he was the teacher, the monitor, the encourager and the person who clearly knew how to bring people together. The entire staff understood the cost structure, where costs had to be removed from the process and how each person could contribute.

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They did not call this process "lean manufacturing" or Six Sigma. They simply had a clear vision of what they needed to do each day, good daily communication of how they were doing, processes in place to alert the team to problems, and high levels of personal performance coordinated by a master of motivation and management.

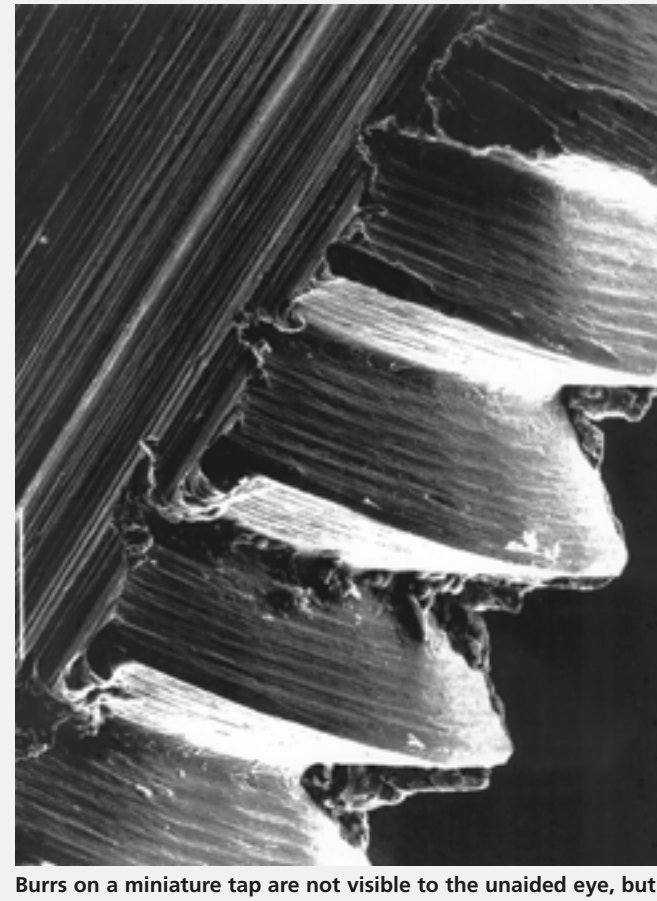
Another nearby plant instituted lean manufacturing. A consultant came in, provided layout changes and described how the process worked. Management provided a copy of "The Toyota Way" to each employee and said, "Read this. This is how we are going to work in the future." First-line management was not encouraged to buy into the process; there was no discussion and no visible commitment from first-line supervisors.

Defining 'burr free'

Producing quality products and eliminating defects begins with defining "quality." For example, many small machine shops lack a detailed, written definition of "burr free" when they quote projects. Interestingly, there is no generally accepted definition of burr-free.

Many companies say their parts are burr-free, but what they generally mean is that the naked eye will not find any burrs on most parts. If that is the definition, it needs to be written down as part of the contractual agreement or plant standard. Few designers define what they expect on edges, so when bidders send in their written standard shop practices as part of the contract, they have made their definition part of the contract. This minimizes potential conflicts with the customer.

After a bid has been received, some major companies have come back to the manufacturer and insisted that the parts must be burr-free when examined under magnification. Although the drawings did not say that, the lack of any burr-related definition allowed the companies to claim the industry standard included magnification. There is no industry standard, but using magnification is common in some areas. To further illustrate the potential problems a company can have, one Japanese company inspects for unacceptable burrs and edges at 400x magnification.



Burrs on a miniature tap are not visible to the unaided eye, but they are clearly there in this highly magnified view.

Just several sentences in a company's written standard practice provides critical information on company practices for potential customers. Some companies use language such as: "Plant standard practice for burrs is to remove all visible burrs. No projections visible to the naked eye are permitted beyond the normal plane of adjacent surfaces. Small projections may still exist at an edge, but are so small that they are not detected by normal unaided vision. Any remaining material shall not cause dimensions to fall out of drawing specifications. Edges shall not be sharp to the extent that they could cut hands, wiring cables or mating parts."

Other wording works, but this at least provides awareness within the plant and to customers of typical practice. Of course, everyone in the shop needs to understand and practice this.

—L. Gillespie

Both of these companies are profitable. However, the small automotive supplier is poised for future growth and the other plant is facing a long, hard, frustrating road.

Expert Advice

Many companies are frantically trying to improve to keep up with their competitors, and some are turning to Six Sigma. The Six Sigma process and its tools provide data to make decisions and provide solutions for many applications. What the process does not do, however, is replace expert knowledge.

In-house manufacturing experts typically know nearly everything about the products a company produces and its manufacturing processes. They know the best way to do something, why things happen as they do and what the results will be. Every machine shop used to have at least one expert and large companies had several.

Today, many manufacturers believe they cannot afford experts and have outsourced much of their process knowledge, expecting their suppliers to provide it as a cost of doing business. Companies with a single product line may still rely on a few experts, but multiproduct plants typically rely on cutting tool engineers, for example, from tool suppliers. Often, plant engineers know the general trade, but tool suppliers provide the detailed knowledge of how systems work.

Companies that have outsourced expert knowledge may be able to use Six Sigma to develop short-term fixes to quality problems, but they still will not have a deep understanding of the manufacturing process. Causes and effects are mathematically tied together in Six Sigma, but the mechanism behind the cause-and-effect relationship is not understood. Employees' attitudes can be summarized this way: "I know how to make it better with Six Sigma data, but I don't know why it happened. Let's move on to the next problem."

While companies may not be able to afford experts, expertise is still available in the form of published data. However, getting people to use that information can be difficult. For example, in one large multiproduct facility, several hundred engineers rarely use the company library, which has thousands of company reports on various processes. Engineers, managers and those who support them lack the knowledge their experts once had; they also lack the insight and don't put forward the effort needed to use what the company has already documented.

For many engineers, surfing the Internet has taken the place of consulting published literature. While the Internet provides useful information for some issues, it is not useful in many other cases. Some Internet users believe online information is superior to the printed word, but that is simply not the case for many processes. Major scientific and engineering books and journals are still important and are available through technical libraries and private information services such as Compendex, published by Engineering Information, New York; Inspec, Institute of Electronic Engineers, London; and the National

Problem solved?

The Six Sigma process does not include the Kepner-Tregoe (KT) problem-analysis method, which is an effective tool for finding out what has changed in an existing process (see Figure 1). Companies implementing Six Sigma may want to supplement the process with KT training, which should help provide Six Sigma team members with the problem-solving abilities they need to ferret out difficult-to-find sources of quality problems.

The format and logic of KT problem solving allows the data to be laid out on a single sheet of paper so that changes are clearly evident. The KT problem analysis structure shows why a problem happened. It asks some simple questions and can provide the solutions in minutes when the right participants are brought together. It does not require consultants and only one person is needed to guide the process. The KT process is explained in "The New Rational Manager," which can be found in online bookstores.

In developing the KT process, Kepner-Tregoe Inc., Princeton, N.J., articulated a core set of analytical problem-solving and decision-making processes that continue to be recognized as universally valid. Kepner-Tregoe offers more than problem-analysis tools, but this one method is particularly effective and can be used by anyone, with or without a technical background. KT problem analysis is as useful to a one-person shop as it is to major corporations. It begins with the first element of any problem solving tool—a clear statement of the problem. *—L. Gillespie*

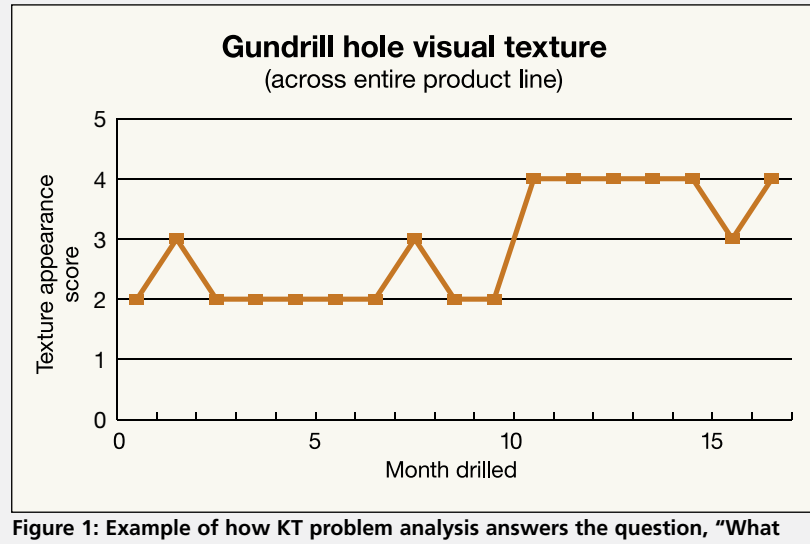


Figure 1: Example of how KT problem analysis answers the question, "What changed to cause this?"

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Companies must also have a plan to publish and communicate the information that Six Sigma provides. They must ask themselves the following questions: Where is Six Sigma data stored? In what format is it stored? Do engineers and managers really use it? Who is responsible for publicizing its availability?

Making Six Sigma work requires more than just hiring a consultant and following the process. It takes a commitment by management to make the process work, a leader to drive the process and expert knowledge to inform the process. Management may also want to consider supplementing the Six Sigma process with other problem-solving tools (see sidebar, page 59). By making sure their quality "tool bag" is full, companies can greatly improve their prospects for a successful Six Sigma implementation. △

About the Author

LaRoux K. Gillespie is a retired manufacturing engineer and quality control manager with a 40-year history of precision deburring and edge finishing. He is the author of 10 books on deburring and almost 200 technical reports and articles on precision machining.