SPC: Limited Only By The Imagination

Software developers need to keep up with the demands of new applications and industries.

BY KARIN GROENING, MARK FREDERICKS, AND MEL BONDEROFF

Can you go through a day without SPC? Probably not. SPC has spread to so many industries that throughout the course of a day you'll use several SPC-enhanced products.

Do you drive a car? SPC is used to make fuel tanks, bumpers, fenders, consoles, brakes, and other automotive parts. Do you eat? Cream cheese, shortening, frozen dough, chocolates, cookies, and poultry are just a sampling of the foods that have SPC as part of their production process. SPC is also used in printing food wrappers, making pop cans, cartons, and plastic bottles. It's used to make greeting cards, tape, carpet, and medicine, and to improve services such as banking. When you use these or any other products and services, you use something that has been made better with SPC.

This widespread use reflects a move toward continuous improvement that cuts across all industries. More often companies realize that staying competitive means constant product improvement. They also realize the best way to do this is to control and improve the production process with SPC methods.

Food processing and packaging food industries are areas where SPC use is growing rapidly. Food packaging companies, for example, use SPC to track ink temperature; roller tension; and the thickness of cans, boxes, and bags.

Controlling product weight

Food processing companies use SPC to adjust the final product weight. While an overage of a tenth-of-an-ounce is small for a one-pound package, consistent tenth-of-an-ounce overages add up to big losses for the producer. Using SPC, companies can monitor product weight and adjust filling stations to eliminate over- or underfilled packages.

Variables encountered during actual food processing are also a concern. A candy company uses SPC to help control the fill levels in its chocolates. Another company uses it to balance ingredients in its bread dough. A bakery uses SPC to control the weight of the chocolate and nuts it puts in its cookie dough. By keeping ingredients uniform, these manufacturers ensure their products are always the same size while material costs are controlled.

SPC as used in food industry is not limited to weights and packaging. Some food processing companies use SPC to monitor the quality of the final product. For example, a cheese producer uses SPC to monitor the moisture content, protein, and butterfat in its cream cheese.

Diversity within the food industry leads to new SPC applications. One such SPC application is in the chicken deboning operation of a major chicken processing company.

A chicken deboning process uses mechanical deboners and hand trimming to remove bones. Mechanical deboners remove most of the bones, and trimmers cut out any that remain. As the chicken is deboned, random samples are drawn from each worker's line. Data on the number of defects that remain are collected throughout the shift and plotted on attribute charts. These charts provide the trimmers with daily statistical feedback. Both managers and line workers find that the daily feedback leads to production improvements and helps to pinpoint problems so training can be process specific.

Environmental controls with SPC

The push to clean up and protect the environment is aided by SPC. SPC is used in recycling, waste water and sewage treatment, and power production. Alberta Power, Canada, for example, uses SPC at its Sheerness generating station to monitor the quality of raw coal. The company burns low-sulfur coal to minimize air pollution.

Coal shipments are checked to determine moisture, ash, and sulfur content. The coal's heating value is also analyzed.

Alberta Power inputs the results from daily coal analyses into SPC TimeSaver and uses the data to determine trends about supplier mining companies. Through the use of the system's control charts, the company identifies coal lots that have high sulfur or moisture content or other out-of-control conditions. It uses this information to look for trends in coal and informs mining companies of problems.

Coal analysis is not Alberta Power's only application of SPC. The utility also uses it to track the tonnage of daily coal deliveries. As the use of statistical methods spreads to other industries and applications, it also is shifting from off-line office-based SQC to on-line production-based SPC. This shift is the result of the drive for continuous improvement.

One result of this shift is greater worker involvement in the quality process. This in itself leads to better quality. Employers are finding that workers want to do a good job, but when they aren't given feedback, it's the same as telling them "we'll take whatever you do." When given the proper tools to do a good job, workers often exceed expectations. And because of their first-hand knowledge of the process and practices on the floor, they often are able to spot and correct problems quickly.

Changing technology

To have a successful SPC program, data must be analyzed and acted on. Feedback from corrective actions enable more refinements and the cycle begins again. During this process, data must be shared by the shop floor, engineering, quality control, and management. The faster data are circulated about changes in the process, the sooner they can be acted on. Computers play a big role in SPC because they enable information sharing and store large amounts of data.

Computers, more worker involvement, the shift to production, and new applications add up to changes in SPC technology.

Computer technology changes all the time. New operating systems, features, and hardware are making an impact. SPC

SPC As A Tool For R&D

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SPC is most common on the shop floor, but it also has applications in research and development. Point Blank, for example, uses SPC to test the design of its bullet-proof vests as well as a tool for continuous improvement.

Bullet-proof vests consist of layers of ballistic material stacked on top of each other. The number of layers used varies for different bullet types. What stops a 0.22 caliber bullet may not stop one that's 0.357 Magnum. In testing, Point Blank's researchers fire at vests to learn how many layers will stop a particular bullet traveling at a particular speed. Data gathered from these tests goes into X-bar and R charts, which help the tester determine the likelihood of a bullet passing through a vest.

It isn't enough for the ballistic material to stop bullets; the vest has to be assembled correctly as well. This can be a complex process, as some vests require over 200 operations. Audit data collected at Point Blank over the last seven months has been very effective in improving the assembly process.

To audit the assembly process, Point Blank uses Pareto analysis and trend charts. Pareto charts (Figure 1) allow Point Blank to determine what problems need to be worked on. Trend charts (Figure 2) show the long-term results of working on the problem. SPC tools, such as X-bar and R charts and Pareto analysis, have played a key role in the continuous Quality Improvement Program at Point Blank.

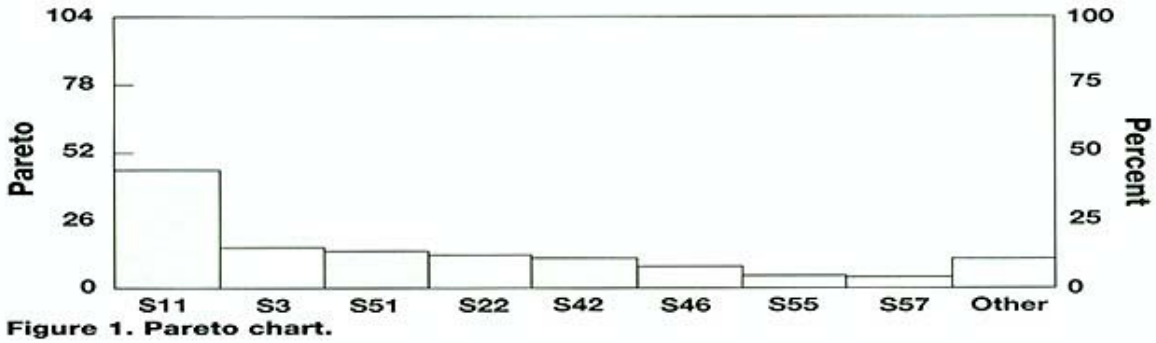

Figure 1. Pareto chart.

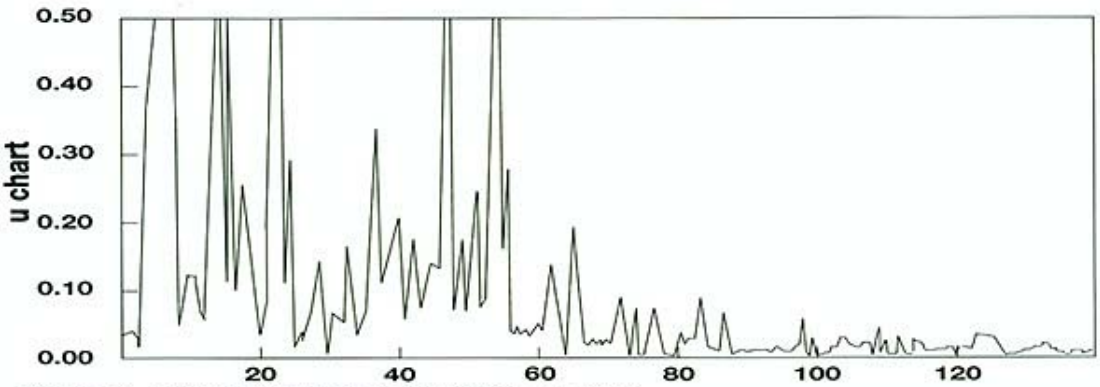

Figure 2. Trend analysis (samples 1 to 137).

technology is expanding to keep up with these changes. SPC software systems have been developed for new platforms such as Windows and OS/2.

Changing computer technology has also led to better interfaces between software programs. Users can access SPC data through spreadsheet programs such as Excel and Lotus 1-2-3 and copy control charts and data directly into word processing programs.

As industries increase their use of SPC, new measurement systems and hardware will emerge. SPC technology will adapt to these and other hardware changes providing users with more direct input options. Already, interfaces for multichannel coprocessors allow high-speed direct data input from 100 different devices into 100 different data files. Some SPC programs can accept data from almost any measurement device on the market. These systems will be adapted to new devices as they are developed.

New applications and users' requests also lead to changes in technology. Some systems, for example, now include three charts for plotting machine and cross direction of rolled goods and others have added short run SPC.

Since continuous improvement is at the heart of SPC, it follows that SPC technology would adopt this philosophy. Software developers need to keep up with the demands of new applications and industries.

When will all the changes end? They won't. As long as there are new products and new applications, there will be improvements to SPC technology. As Mark Fredericks of Alberta Power says, "the only limitation to SPC is your imagination." □

KARIN GROENING is a technical writer at Zontec, Inc., Cincinnati, OH. MEL BONDEROFF is QA Manager at Point Blank, Amityville, NY. MARK FREDERICKS C.E.T. is the Mine Contracts Administrator at Alberta Power's Sheerness generating station.