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QualPro Employs Statistics For Process Improvement

IN A CASE OF "everything old is new again," a consulting firm is using mathematical tools developed in the 1940s to spearhead a revolution in quality control. QualPro, based in Knoxville, Tenn., is using multivariable testing (MVT) to help chemical manufacturers improve their processes.

In defiance of conventional academic wisdom, which dictates that variables be changed one at a time when determining their effect on a function, MVT tests all variables at once to identify changes that have the most impact and find the strongest synergies between them.

"MVT is a very versatile technique," says Art Hammer, principal of QualPro. "There are few, if any, goals to which it can't be applied."

He adds that QualPro is generally hired with one of three missions: to use MVT to solve a particular problem, to help a client get better results from its resources, or to integrate MVT within a client's operations.

Mr. Hammer notes that one of MVT's greatest strengths is that the technique is simple enough to be understood without a technical background. "We're often asked to train the plant staff to use MVT for themselves," he says. "It's like teaching a man how to fish instead of giving him a fish."

QualPro's improvement strategy begins with a brainstorming session with plant managers and staff to suggest ways to improve the manufacturing process. However, Mr. Hammer says, these suggestions are often off the mark. Of the process improvement ideas plant employees suggest, QualPro finds that only 25 percent help. About 53 percent have a negligible effect, and 22 percent are actually harmful.

Finding the combination of changes that would yield the greatest benefit would require the testing of every possible combination, according to conventional wisdom. For example, if considering 10 suggestions to improve a process, 1,024 tests would have to be run to find the optimum combination. Mr. Hammer observes that this "is impractical and pretty much impossible. Anyone would get tired of it and quit long before they

ran anywhere near that many tests."

MVT is built around the precept that for each instance a single factor is tested, each of the other factors is tested only half the time, yielding the greatest volume of information from the fewest tests. In a field of 10 possible changes, MVT would call for only 12 tests instead of 1,024.

Although MVT overlooks some combinations of variables, it is nearly as thorough as brute force testing while only a fraction as time-consuming. In addition, MVT uncovers beneficial interactions between the factors, which would be overlooked if each variable were tested alone. QualPro finds that one-third of the factors it tests have an impact only in combination with other factors.

MVT has been shown to work on the plant floor as well as on paper. As one of QualPro's success stories, Mr. Hammer cites E.I. du Pont de Nemours & Co.'s agricultural chemical plant in LaPorte, Tex., where the consultancy was asked to improve the quality of an herbicide produced there.

The product, which was 25 years old and on the downturn of its lifecycle, was achieving a first-pass yield of only 15 percent. After a brainstorming session that produced 30 suggestions, QualPro ran a round of trials using seven of those factors.

Following two months of testing, the product's first-pass yield rose to 90 percent. Four months later, once the testing of all 30 factors was complete, the yield reached 100 percent, producing a bottom-line improvement of more than \$25 million. QualPro continues to work with DuPont to improve the plant's capacity using its existing capital.

QualPro also produced powerful results for LaRoche Industries, which was facing a shutdown of its Orem, Utah, site as a nitrate waste holding pond there approached capacity. Through MVT, QualPro uncovered a way to recycle filtered nitrates back into the manufacturing process, reducing outfall by 40 percent and recovering \$250,000 worth of nitrates from the holding pond. ♦