Classroom projects translate into immediate workplace gains

In the final semester of his UW-Madison master’s degree, Bob Aloisi didn’t just earn a letter grade in his quality engineering class: He saved his company $50,000. It wasn’t the typical classroom outcome, but then this classroom wasn’t typical. As a student in “Quality Engineering and Quality Management,” Aloisi accomplished a major class project in quality improvement—at his own workplace.

The project is the capstone experience in the College of Engineering’s award-winning distance education program, the Master of Engineering in Professional Practice (MEPP). Designed for mid-career engineers who live and work all over the country, MEPP’s Internet-based curriculum strives to provide knowledge students can apply immediately at their companies. And in Quality Engineering & Quality Management, or QEQM, students take this philosophy to its logical conclusion by leading a team of co-workers in tackling a workplace problem.

“The assignment gives students a chance to show their companies what they’ve learned in MEPP—that they can take on a major project and bring it to fruition quickly,” says Harry Steudel, chair of the College of Engineering Industrial and Systems Engineering department and the course’s creator and instructor. “And in many cases, these projects have major economic and other benefits.”

A suitable problem for Aloisi’s QEQM project emerged when sales of disinfectant wipes surged at his employer, Rockline Industries in Sheboygan, Wisconsin. To meet demand, Rockline had switched the product to a new production line. But with little time to properly execute the change, waste soared and productivity was “abysmal,” says Aloisi.

Aloisi, a Rockline product development manager, had begun attacking the problem in previous MEPP courses. Still, waste hovered near 20 percent and productivity was half of required levels. After assembling a team of mechanics, equipment operators and a process improvement specialist, Aloisi led the group in the methods taught in QEQM. In less than three months, the team cut waste on the production line by two-thirds, doubled productivity and saved the company $50,000. And because the results have been sustained, Rockline expects annual savings in the six-figure range, Aloisi reports.

“This project’s results were exceptional and well-recognized by the company,” he says. “They are also applicable to other, similar processes, so the benefits continue to accrue.”

Results like this are just what Steudel had in mind when he crafted the QEQM course in the late 1990s. The Emerson Electric Professor in Total Quality is an expert in continuous quality improvement—a systematic, multi-step approach to making a process or product better. He has also consulted with industry on quality issues since 1974. “So, I had a pretty good sense for what practicing engineers would need in this area,” he says.

What engineers learn in Steudel’s course is the “Kaizen” management philosophy. A Japanese word meaning “improvement,” Kaizen emphasizes small, incremental and continuous changes as a path to competitiveness. Centered on people and ideas rather than on technology, Kaizen also requires open communication, a willingness to make and admit mistakes and participation at all levels, from top managers to workers.

“Our project was a very good example of the Kaizen approach,” says Aloisi. “It wasn’t one specific thing, a home run type of thing, that we changed to make our improvements.” Instead, his team met its targets through many small steps, including adjustments to equipment settings and better training for machine operators.

(Continued on reverse)
**TAKE-HOME LESSONS**

Tim Smith, a division engineer in continuous improvement at John Deer in Waterloo, Iowa, was already familiar with Kaizen when he took QEQM last spring. Still, the systematic techniques taught by Steudel helped him crack a particularly thorny problem. Breakdowns of a certain drive train assembly on Deere tractors had spiked during a three-month period, producing an unusual number of expensive warranty claims. It routinely fell to Smith’s group to ferret out the causes. In this case, he says, “The challenge was trying to determine exactly what had failed first. It was really difficult because all the internal components were broken into many pieces.”

Using information from QEQM and its own engineering expertise, Smith’s team at Deere methodically sifted through all the potential failure modes. After settling on four root causes, the group devised a strategy and budget for fixing each.

“The course lent organization and credibility to our project, so that when we presented the corrective actions and the needed expenditures, they were very well received,” says Smith. In the six months since, the failure rate has dropped by 75 percent, he adds. Smith is now applying the same tools to warranty issues in hydraulics.

To maintain this impressive track record of relevance, QEQM, too, must continuously improve. At semester’s end, students rigorously evaluate the course (as they do all MEPP courses). And Steudel has proven exceptionally open to their suggestions, says MEPP’s director Wayne Pferdehirt. “The great thing about having Harry teach this course is that he really ‘walks the talk’ of quality improvement,” Pferdehirt says.

Some students, for example, recently asked for additional help, not with the nuts and bolts of continuous improvement, but with resistance to it from their co-workers. In response, Steudel will present in spring of 2006 three weeks of new material on change: why it causes fear, how to lead it successfully and tools for facilitating it.

To make room for the new content, he will lecture less on ISO 9000 quality systems, now much more common and familiar to students than when he first began teaching QEQM in 2000. “The world is changing,” Steudel says. “But then so is my course.”

One strength of the course likely won’t change: Students from diverse backgrounds can shape the experience to fit their needs, as Bruce Wallin found in spring of 2002. An Associate Fellow in dynamics at Hamilton Sundstrand (HS) in Rockford, Illinois, Wallin admits he felt somewhat out of place among his MEPP cohorts—mostly project and manufacturing engineers. “I’m almost a pure analyst. I do calculus every day,” he jokes. Still, when Wallin got the QEQM assignment, he knew precisely where to take it.

Wallin studies how parts designed at HS—mostly gear boxes and pumps for aircraft engines—vibrate during actual airplane flight. When HS structural engineers fashion new parts for clients on paper, it’s critical they consider these field test data, says Wallin. Otherwise, structural engineers tend to err on the side of caution, making parts larger and heavier than is likely needed for survival during flight.

“We want to minimize that conservatism,” says Wallin. “Weight is king. We have to lift aircraft off the ground 10 times a day, so a pound of weight is worth tens of thousands of dollars.”

To make the vibration data more accessible, Wallin and his team constructed a database for his QEQM project. Now, a structural engineer designing a new fuel pump can quickly look up earlier pumps, see how they vibrated during test flights, and compare their specifications to those of the new one on paper.

Not only is the design process more efficient, but, says Wallin, “I truly believe we’ve also improved optimization with this tool.” And with scads of supporting data at their fingertips, engineers can more easily justify certain design parameters to customers.

“We’ve seen a substantial increase in the number of winning design proposals over our competitors,” says Wallin.

Just another typical outcome from this not-so-typical course.

by Madeline Fisher, University Communications

Pictured below (from left to right): Bob Aloisi (Rockline Industries), Bruce Wallin (Hamilton Sundstrand) and Tim Smith (John Deere)