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Monday, 01 March 2004 13:11

Eastman Kodak turns to college for certificate program.

Eastman Kodak Co., Rochester, NY, knows that being competitive in a global marketplace requires a lean, cost-efficient operation. So finding innovative ways to maximize productivity is a priority. That is why it has one of the most aggressive asset management programs of its kind.

A key element in this strategy centers on the work performed by Kodak's maintenance technicians. To better prepare these employees to succeed in a proactive maintenance environment, Kodak turned to the Rochester Institute of Technology (RIT). The result is a one-of-a-kind academic certificate program in reliability-based maintenance that is rewarding Kodak with a healthier bottom line.

A different approach

" The objective was to give shop floor maintenance workers the skills and knowledge to initiate reliability improvements," said Kodak engineer Mark Christianson. In addition, management wanted a quick cycle time for students to complete the program—less than 1 year—and a measurable return for the investment.

A traditional degree did not fit these criteria. However, RIT was able to accommodate Kodak by taking a flexible approach to the challenge. The school designed a seven-course certificate in reliability-based maintenance that technicians could complete in 10 months.

To measure the return on investment, a unique twist was added: students were assigned live projects that ran throughout the course of their studies. This format let maintenance workers apply the new skills they were learning while allowing managers to track the cost savings (or potential cost savings) generated by each project.

Students accept the challenge

Kodak recruited nearly two dozen maintenance mechanics and technologists. Classes were held on site in the late afternoons so workers could participate between shift changes. During the course of the 10-month program, students were immersed in reliability tools, quality statistics, and investigative techniques.

“ It was difficult at times but worth it. Seven courses in 10 months is definitely challenging,” said maintenance technician Tim Wheatley. “The instructors collaborated to make our in-class assignments fit the projects we were working on, and the tools we learned are making a big difference in how we approach a problem on the shop floor. We also learned the value of getting good data. Without it you can’t put the reliability tools into practice.”

“ I’m proud of this group,” said Norm Jagodzinski, RIT’s lead instructor in the program. “Some students hadn’t opened a textbook in 20 years and they were learning statistics.” He is a reliability expert who has worked for Bell Aerospace and counseled both the Ford and Carter administrations about the subject.

“ It wasn’t easy for them, but I’m confident in their abilities to identify where reliability-based maintenance can work and then apply the tools to minimize equipment downtime and save Kodak money,” Jagodzinski added.

The proving ground

Proof of the program’s success was seen when the student teams presented their final project findings to management. Included in their reports were the reliability tools they used, results from the data they collected, recommended actions to take, and the cost savings associated with the solutions. One team presented a simple yet elegant remedy that is an example of how the program is improving Kodak’s operations.

The problem statement for the project charged a group of three Kodak maintenance technicians to find a solution for motorized overhead shutter doors that were failing. Some of the doors accumulate many thousands of cycles per year and the mean time between failures was declining.

When a door fails, it can leak white light into factory space, spoiling photographic film. In addition, the doors are expensive to fix and maintain, and downtime for repairs cuts into scheduled production time.

Using the reliability tools they learned in class, the team conducted an analysis of the failure modes contributing to the door problems. Using root cause analysis, they narrowed the problems down to specific failures that kept recurring.

The team then determined that the cause of the failures could be solved by adding weight to the bottom of the doors. This solution would prevent the doors from sticking open and also eliminate the need for expensive weekly lubrication service performed by an outside contractor.

Since the team's solution was implemented in September 2002, over $30,000 in maintenance costs have been eliminated. In addition, not one failure has been reported in the doors that were refitted. In the next step, they hope to leverage these findings and apply their strategy throughout the manufacturing site.

Next steps

Similar successes were reported by other teams, and Kodak expects additional savings to pile up as the newly trained maintenance technicians look to apply their skills on other projects.

As a result of its success at Kodak, RIT has recently made the program available online, and students sponsored by other companies and individuals on their own are starting to take the classes. **MT**

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COURSES IN RELIABILITY-BASED MAINTENANCE CERTIFICATE PROGRAM

The reliability-based maintenance certificate completed by Kodak maintenance technicians consists of the following seven courses, which are now available on line:

Reliability I: An introduction to the concepts embodied in maintenance strategies—mainly reactive maintenance, preventive maintenance, predictive maintenance, and proactive maintenance—and in reliability-based maintenance. Reliability concepts and tools are introduced that will form the foundation of a reliability-based maintenance program.

Reliability II: An examination of the underlying probability distributions and statistical tests that are used in reliability-based/centered maintenance. Included are the exponential distribution, curve fitting techniques, the normal distribution, the lognormal distribution, extreme value statistics, the Weibull distribution, and reliability analyses of repairable systems. Graphical techniques are emphasized along with data analysis using software.

Statistics for total quality: An introduction to statistics and probability emphasizing the analysis and interpretation of variation in quality control. Topics include descriptive statistics (statistical tables and graphs, measures of central tendency, and dispersion), a brief overview of probability theory, probability distributions, sampling distributions, confidence interval estimates, and one- and two-sample hypotheses tests of means and proportions.

Problem investigation isolation and analysis: An introduction to problem solving methodologies and tools used in reliability-based maintenance. Topics include root cause analysis, fault tree analysis, FMEA, FRACAS, mechanical system failure processes, diagnostic systems/devices, RCM, and multi-variant analysis.

Reliability III: An in-depth focus on the theoretical and practical applications of reliability, availability, and maintainability. Topics include parts selection and control, reliability analysis, reliability test and evaluation, equipment production and usage, spare parts forecasting, reliability/maintainability trade-offs, and improvement techniques.

Reliability IV: A continuation of Reliability III dealing with the theoretical and practical applications of reliability, availability, and maintainability. Reliability software is used extensively by the instructor to illustrate analytical procedures and by students to complete assignments and a term project.

Report writing: Students learn the principles of organizing information into clear, concise reports, including techniques for oral reports, formal reports, and informal letter and memo

reports. Also includes proposals, project status, and progress reports.

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