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Materials Testing Needs***

ADMET retrofit is the answer for Alfred University

A few years ago, Alfred University, located in Alfred, New York, received two Instron universal test frames. The donation was fortuitous because the University had been researching testing machines and had determined that a new one would cost around \$50,000 – well beyond its budget. Unfortunately, the donated machines were 1960s vintage and, although the frames themselves were in excellent shape, the analog controllers and gauges were inaccurate and not reflective of what students would find in the real world. Assistant Professor, J. Steven Mayes, set out to refurbish one of the machines – a 20,000 lb Instron TTD. He started his research with the manufacturer but ultimately found ADMET with its MTESTWindows testing system. ADMET retrofitted and calibrated the machine for about one-half of the price quoted by the manufacturer. The ADMET-updated Instron unit has been in service for over two years with excellent results.

Alfred University, the second oldest coeducational institution in the United States and the oldest in New York, combines undergraduate programs for its 2,000 students with masters and doctoral programs.

One of the major initiatives in its Mechanical Engineering Program within the Alfred School of Engineering is the Capstone course. This is a major research project that seniors must complete over their last two semesters which encompasses everything that they've learned. Capstone generally includes design and analysis, and requires correlations of experimental and analytical findings.

Many of the Capstone projects, as well as graduate and doctoral work, require tensile or compression testing. Unlike in industrial settings, the testing is low volume and requires a high number of custom setups and fixtures. Students are assisted by skilled University technicians who operate a machine shop which translates student drawings into sample parts and fixtures for the tensile and other tests.

In 2001, Alfred received two Instron universal testing machines, a TTC 10,000 lb and a TTD 20,000 machine, to complement its MTS testing frame. Commented J. Steven Mayes, Assistant Professor, "We always wanted a machine of this type that was simple to operate and low-cost to maintain, and we knew that we were looking at \$50,000 if we were to buy a new one."

However, the machines were mechanically controlled with instrumentation from the 1960s. They were also worn and not accurate enough for the research that was being conducted by the students and faculty.

Said Mayes, "We tried the machine, but there was too much slop and it was so painful to use that we would turn to alternatives if we could."

Mayes started looking into refurbishing the machines. "Naturally, the first call we made was to the manufacturer but they quoted us a price of \$30,000. Being a small school with a small program – that's a lot of money and we couldn't afford it."

SOLUTION OVERVIEW

Industry: Mechanical Engineering - Research
ADMET Product: MTESTWindows retrofit of Instron TTD 20,000 lb universal test frame

Application: Tensile/compression testing
Customer: Alfred University

Discovers ADMET

Mayes hit the Internet and soon found ADMET. "Being engineers and numbers-based, we went through a fairly rigorous search and ADMET was clearly number one. It wasn't much of a decision once we found them," he said.

ADMET quoted a price of \$16,700 to do a complete retrofit of Alfred's Instron TTD 20,000 lb machine. The price was so good that Mayes was skeptical. He asked specifically what would be done and was told that ADMET would install its MTESTWindows testing system and replace all of the mechanical controls, gears and levers with electronic controls. The motor would be rebuilt. Essentially, the only component that would not be replaced or updated would be the frame itself, which never wears out.

"We could hardly believe what we were hearing. The ADMET price was in our range," said Mayes. "This would give us a like-new Instron machine that is easy to operate, plugs into a 110 volt outlet, has no fluids or pumps, and requires virtually zero maintenance. So, we decided to retrofit a machine to see how it would go."

In order to expedite the process, Alfred stripped the machine and sent the motor to ADMET for rebuilding. As soon as that was completed, an ADMET technician came onsite, reinstalled the motor and added all of the new components. Within two days the retrofitted Instron machine was fully operational and calibrated to NIST – traceable standards.

The ADMET-controlled machine is so simple that students have no trouble operating it. "I asked a graduate student to develop a simple manual for the machine. He came up with what I call Test Windows for Dummies," said Mayes. "I use it all the time. The students find that it has everything they need to set up and operate their tests."

Students program and save their tests on MTESTWindows in the event that they are not able to complete their series of tests in a single setup. MTESTWindows controls the crosshead position and reports position, stress, strain, load and displacement.

More sophisticated tests

The retrofitted machine has enabled students to take on more ambitious testing projects. For instance, a Capstone project tested Formula One car frames for a Society of Automotive Engineers (SAE) Collegiate Design Series competition. The student devised a process, as well as fixtures to test frame welds, the most likely area of failure and the point which basically controls the strength of the car.

The student first simulated the tests and developed realistic 3-D renderings of the frame using SolidWorks. Next, he ran physical tests. He was able to develop statistically significant weld strength numbers.

For another car related program, a Capstone project examined the load carrying capabilities of a magnesium alloy engine mount. The student received a large finite analysis from a team at another university, performed analytical simulations to determine where to put the strain gauges and then conducted physical tests. By verifying the simulations with physical tests, the two teams were able to develop a high level of confidence in the simulation results.

Mayes sees potential for other test frame retrofits. "I've got another testing machine with an environmental chamber for high temperatures. I would really like to retrofit that machine. It's just a matter of coming up with another \$16-17,000 to do it," he said.

For More Information

For more information about ADMET products or services, please call us at 800-667-3220 in the U.S. or Canada, email sales@admet.com or visit our Web site at <http://www.admet.com>.

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