The University of Sarajevo–Helping to Rebuild a Nation

Through perseverance, a University regains its former greatness

- InduSoft Web Studio is enabling the University of Sarajevo to teach engineering students how to develop real-world software applications that simulate real-life conditions.
- Students were able to improve testing accuracy to better than 1% after developing test applications using InduSoft tools—a vast improvement over the previous use of manual methods.
- With the InduSoft advantage, the tower certification facility has regained its status as an accrediting agency. This development is enabling Energoinvest to realize significant savings by testing towers locally.

The University of Sarajevo

Background

Institutions of higher learning. They are the backbone of modern civilization and regional cultures. The University of Sarajevo is grounded in that tradition, and has been since its inception. Originally established as a higher school of Souphey philosophy in 1531, by the end of the 19th century it was the largest institution of learning in Bosnia-Herzegovina.

The modern history of Sarajevo University began with the establishment of its first secular institutions of higher education prior to World War II. The Faculty of Agriculture and Forestry was established in 1940, the Medical Faculty was first established in 1944, and in 1946 the Faculty of Law and the Teacher Training College began operations.

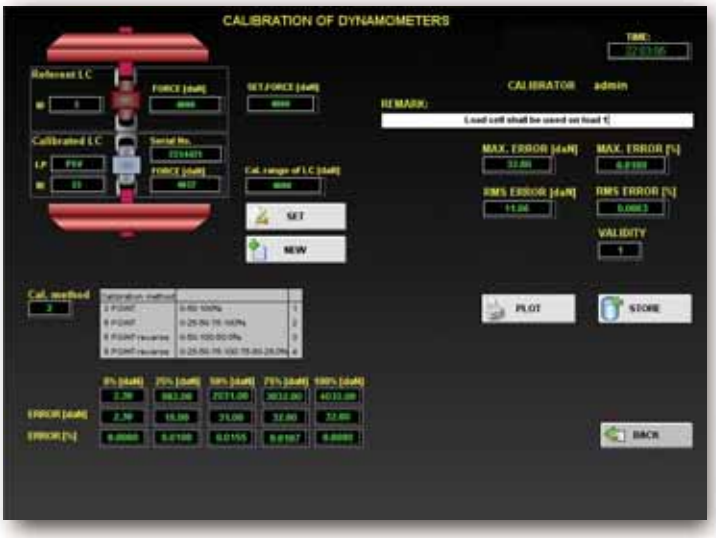
Today, the 23-faculty University is assisting the post-war Bosnia-

Continued from front page...

Herzegovina renewal. If such institutions are the backbone of civilization, infrastructure is the foundation—and the University of Sarajevo is helping to build that foundation.

Three years of war left not only the University facilities in near-ruin; it nearly destroyed the infrastructure of the entire country. Buildings, roads, and electrical transmission lines and towers were decimated—but the University is doing its part to help Bosnia-Herzegovina rebuild and recover its prewar position in the industrial world. And in the process, it's educating engineering students in modern design and testing techniques, using software to simulate real world conditions.

Specifically, the University of Sarajevo is assisting the tower certification station with the process of testing prototypes of high voltage electrical transmission line towers. This effort is one element in the manufacturing and design practice of Energoinvest, one of the five largest power transmission line companies in the world prior to the war.



The Challenge

As Bosnia-Herzegovina endeavors to rebuild its infrastructure, access to power is one of the government's highest priorities. Restoring power across the country, however, can be an arduous process. It takes time and effort to ensure that service is reliable, and this challenge is compounded by the fact that Sarajevo Energoinvest has set a very aggressive testing schedule. The company is currently on a path to regain its prewar market position, attempting to type test 40 towers per year—a daunting task at best. Further complicating the challenge is the reality of localized weather conditions.

One of the biggest threats to any electrical power delivery system is inclement weather.

According to Professor, Dr. Adnan Salihbegovic, ViceDean for Science & Research Faculty of EE, University of Sarajevo, Bosnia, "High voltage wires are heavy to begin with, and in the winter, it's not uncommon for ice and snow to accumulate on them, making them even heavier. High winds also pose a potential threat to power lines. If the line connections on the support tower and the tower itself, aren't strong enough, the connection will fail and the line will usually break. Worse, the tower might collapse, causing hazards to nearby traffic and wildlife, and inducing power outages. Such catastrophic failures—though rare—are disastrous, leaving entire areas without light or heat."

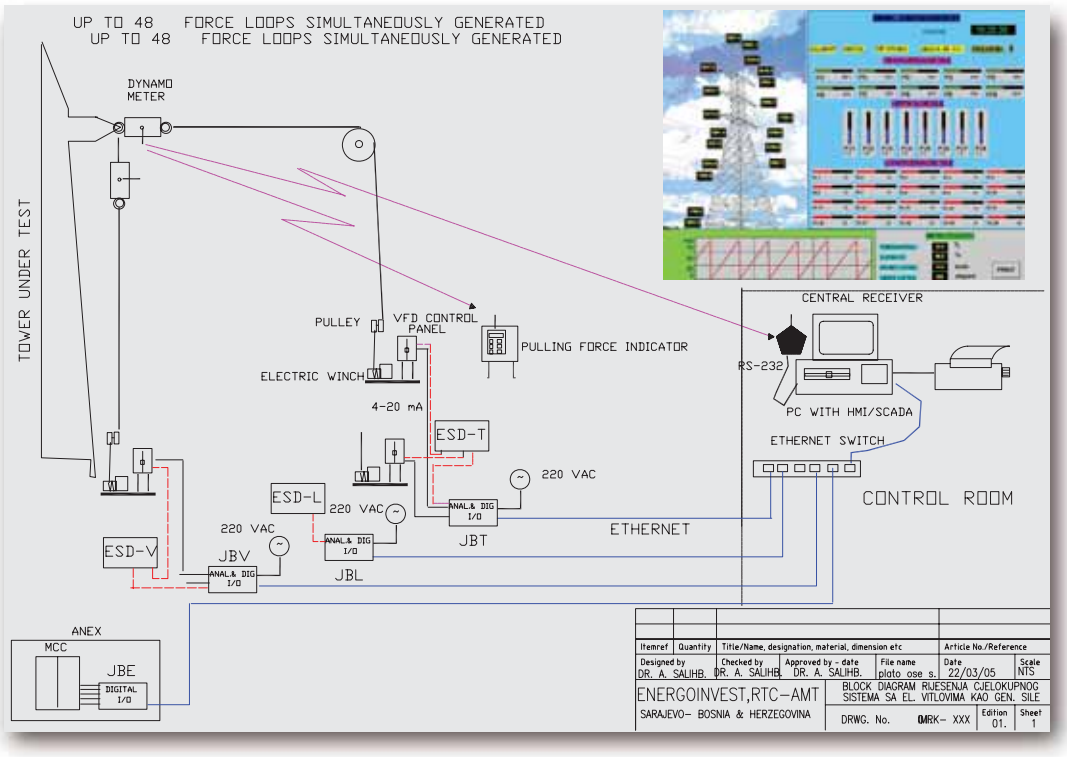
To diminish this possibility, towers are rigorously tested for structural integrity. The testing

InduSoft Web Studio enables extremely accurate calibration, ensuring both safety and superior customer service.

is performed at the tower certification station in Sarajevo. Steel ropes are used to simulate the loading effects to transmission towers. Dynamometers are connected to the tower and a system of pulling lines subject the tower to tension forces. Readings are then taken and recorded to ensure that the tower, which is designed for a specific deployment location, won't fail when subjected to hostile, real-world conditions in the field.

The challenge faced by the tower testing station was that it could not meet the requirements posed by the IEC Standard 60652 published in 2002 and therefore continued to operate in accordance with the previous standard. Prior to the new standard, tension measurements were provided by mechanical dynamometers, which were connected as part of a series of chained equipment including, hand winches for mechanical force generation, shackles, pulleys, and sheaves. The dynamometers were located near the ground where they were physically accessible.

This configuration was necessary because it was impossible to take the readings from dynamometers if they were tied next to the connection point for the pulling rope due to tower height.



Testing forces are accurately displayed, easily read, and recorded in real time.

The new standard for tower certification requires that the tension force readings are taken with load cells located at points where the pulling rope is connected to the tower under test. Doing so produces an accuracy of better then 1%, all the while dynamically and continuously recording measurements in real-time—an essential improvement over the previous ±2% accuracy. Furthermore, all tension force readings for transmission line towers must be acquired and recorded in the presence of Inspectors.

In the past readings were acquired and checked manually by individual readings of old mechanical dynamometers. Meeting the new standard required fast and accurate PC based HMI/SCADA system. The University of Sarajevo turned to InduSoft.

The Solution

InduSoft responded with a comprehensive application proposal based on its real time Web-based HMI/SCADA system. The proposed solution employed a central radio receiver connected over an RS-232-C serial port to a PC running IWS HMI/SCADA software, while gathering data at high speed from wireless load cells.

With the new solution, developed by University students and faculty, the tower under test is erected at the tower certification station after attaching the wireless load cells to the tower

connection points. Forces that simulate various real-life loads are then applied to the connections. Testing Engineers and developers from the university run a series of tests specified by IEC Standard 60652 as inspectors supervise the operation. Varying amounts of tension are induced that approximate assumed or known field conditions.

The wireless load cells continuously transmit force readings to a central radio receiver and a PC running HMI/SCADA software developed on an InduSoft platform. The data is then presented to inspectors and test engineers in real time. The application presents a series of screens with monitored alarm values, and the results are immediately recorded for archiving and test documentation.

The accuracy of the test is greatly improved and simultaneous visualization and recording of up to 50 measuring channels is enabled.

The Energoinvest testing station can now meet the new IEC 60652 standard of measuring all forces at the points where they are acting on the tower and with the required accuracy. The company also has the added bonus of being able to continuously acquire and log the measurements for reporting and certification approval.

The 1%-plus tolerance improvement may not seem like much, but that improvement along with the continuous and simultaneous test visualization and recording has made a huge difference for both Energoinvest and BosniaHerzegovina. These factors have enabled the certification tower facility to regain its status as a certifying agency. The Energoinvest facility is now in a position to test and certify the towers in accordance with new standards while accelerating its production rate and bringing badly needed power to the country. And that's also a significant step in regaining its prewar market position in high voltage power transmission lines.

The certification station also now has a dynamic record of all tests that is free of human error—a common problem with manually recorded readings and observations. "It's a perfect example of how the human machine interface is supposed to work." says Dr. Salihbegovic. "Humans and machines working together, each contributing their individual strength to the solution."

And in this case, the solution is rebuilding a formerly war-torn country, and helping its industry to comeback to its prewar position in the world manufacturing and engineering community.

Web-Ready InduSoft® Realize Your Potential

UNITED STATES
Sales, Marketing, Engineering, and Support
3445 Executive Center Drive, Suite 212
Austin, Texas 78731
Phone: 877-INDUSOFT (877-463-8763) or (512) 349-0334
Fax: (512) 349-0375
Email: info@indusoft.com

BRAZIL
Sales, Marketing and Engineering
Av. Engenheiro Luís Carlos Berrini, 962 - 8° andar
São Paulo, SP - Brazil - 04571-906
Phone: (+55) 11 5505-0093
Fax: (+55) 11 5505-1672
Email: info@indusoft.com

GERMANY
Sales and Support
Bruchsalerstrasse 18
D-68753 Waghaeusel, Deutschland
Phone: (+49) 7254-952841
Fax: (+49) 7254-952843
Email: info@indusoft.com