THE UNIVERSITY OF TOLEDO 1872

UT-UTC UPDATE

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The Newsletter of The University of Toledo University Transportation Center

Director's Message –

Director Martinko, far left, and PI Douglas Nims, with hand on a stay, discussing possible solutions during the site visit of the project meeting for the Veterans' Glass City Skyway bridge icing project.

Featured in this issue is an update on a research project that can have a significant impact on the state of the art in anti/de-icing of bridge structures. Our University Transportation Center is leading a team of researchers from the University of Cincinnati, the Army Cold Regions Research and Engineering Laboratory, and other University of Toledo faculty and students.

Our research team has been collecting data from instrumentation placed on the bridge to proactively forecast for ODOT a likely icing event on the Toledo Ohio signature bridge, the Veterans' Glass City Skyway. This web based "Dashboard" is monitored by ODOT operations and enables them to better safeguard the traveling public by allowing them to make timely and informed decisions regarding lane closures and detours. Eventually the research will lead to proposing anti/de-icing solutions. I encourage you to read this interesting article and go to our web site to see recent videos and articles from the local media - http://www.utoledo.edu/research/ITi/ITInews.html

The Veterans' Glass City Skyway bridge in Toledo, Ohio

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ODOT Project Tackles VGCS Bridge Icing Problem

The Veterans' Glass City Skyway (VGCS) is a cable stayed bridge carrying I-280 over the Maumee River in Toledo, Ohio. It was dedicated the summer of 2007. But that winter the bridge revealed an unnerving quality. Under some weather conditions, ice would form on the stay sheath conforming to the cylindrical shape and as the stays warmed, curved sheets of ice would fall up to 250 feet to the roadway. Because of their shape, some of the sheets could be blown across several lanes of the bridge deck. This posed a potential hazard to motorists and lanes had to be closed.

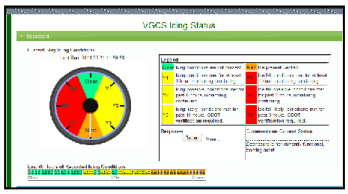
Ice on the stay cables of the VGCS bridge.

The stay sheaths of the VGCS are unique: they are made of stainless steel, have a brushed finish, lack the usual helical spiral and have a large diameter. No existing ice prevention or removal technology appeared to be a solution.

Dr. Douglas Nims of The University of Toledo Department of Civil Engineering was willing to tackle the problem when the Ohio Department of Transportation decided to look for an answer. The ODOT project "Ice Prevention or Removal on the Veterans' Glass City Skyway Cables" through the UT-UTC was awarded with Dr. Nims as the PI. The original goal was to broadly define and cost several viable long term solutions to the ice falling from the cables.

This was a unique problem that needed a quick response. (Four times in the three winters the VGCS had been in service, ice had formed on the stays.) Plus a specialized knowledge of icing under these conditions was required. So first a team was assembled including experts on icing from the U.S. Army Cold Regions Research and Engineering Laboratory and the NASA Glenn Icing Branch, the ODOT project managers from the bridge construction, the engineers who designed and implemented the existing structural strain measurement system on the bridge, and experts in green technology. In June they held a team meeting to discuss various approaches to the problem.

The information required to move to the second phase of the project included information about the conditions on the bridge before, during and after the icing event. This winter fully accommodated their needs. On February 24th the bridge had to be closed due to the massive ice build up. With the additional forecasting tools that ODOT had added to its monitoring systems, including precipitation sensors, and visits by Dr. Nims and team members to the site during the event, valuable knowledge was gained in the weather conditions when ice is forming, when a fall is possible, and when and how the ice actually falls.



Icing Dashboard concept

The observations in addition to the data collected will help the team create an ice fall dashboard that will alert ODOT operations personnel when icing conditions and when ice fall conditions are likely. Although this will not prevent the ice from forming on the bridge, it will assist in protecting the traveling public from a potentially hazardous event as well as avoid disrupting traffic with lane closures when there is no likelihood of an icing incident.

As the team refines the ice fall dashboard by delving into the information that was available from the sensors and their background study of the weather conditions of past icing incidents, they are resolving the fundamental uncertainties in the conditions surrounding an icing event. They will now move on to an in-depth assessment of available technologies and the cost associated with an effective affordable solution to preventing the icing of the VGCS bridge.

Student of the Year 2010
Mike Titus

Mike Titus, who is currently pursuing his master's degree in Civil Engineering from the University of Toledo, was named the UT-UTC Student of the Year 2010. He attended the Council of University Transportation Centers annual banquet in Washington, D.C. in January where he received his award.

Along with fees and expenses for attending the Transportation Research Board conference, he received a check for $1,000.

Mike Titus, Student of the Year 2010, with guest Jenna Slattery holding his certificate after the CUTC awards Banquet in Washington, D.C.

Mike's primary transportation area of experience/study is on a project involving the magnetic inspection of embedded prestressing strands in box girder bridges with advanced corrosion.

In the nomination for the award written by Dr. Douglas Nims of the Department of Civil Engineering and Principal Investigator on the bridge projects wrote: "Mr. Titus played a key role in the planning and execution of the first field test of a magnetic prestressing strand inspection system on a adjacent prestressed box girder bridge. Because 10% of the square footage of bridges in Ohio are of this type, reliable inspection is very important.

"Mike is bright, inquisitive and has a good grasp of the behavior of the bridge and the characteristics of the test system. These characteristics plus hard work enabled Mike to make key contributions to the success of this inspection. He carried out lab experiments to design the system and ready the system for field deployment, was important in designing the field test fixtures, and helped establish the test procedures. He, also, lead the dissection of the bridge to validate the magnetic inspection results.

"Mike has demonstrated leadership and commitment by serving on the Civil Engineering Student Advisory Board, mentoring middle school students participating in the 2010 West Point Bridge Design Competition and by excelling at helping students for which he received the Civil Engineering Outstanding Teaching Assistant Award."

TTA Alternate Energy Teams – Automated Electrolyzer and Fuel Cell Vehicle Projects

The Toledo Technology Academy, a Toledo Public magnet high school focusing on manufacturing technologies, has two projects this academic year supported by the UT-UTC: the development of an automated hydrogen refueling station, which is a senior engineering project, and building a fuel cell go-kart, a project of the alternate energy team.

The refueling station automates the electrolysis of water to produce hydrogen and fill metal hydride cylinders with the hydrogen. The goal is to produce an automated system that can be left unattended for long periods of time. The cylinders are then used in the hydrogen fuel cell battery hybrid go-kart.

The back of the hydrogen fuel cell battery hybrid go-kart. The hydrogen cylinders filled from the automated fueling station are behind the fan units above the batteries.

The alternate energy team is one of the extra curricular activities at TTA. Students apply to participate, must have a 2.5 GPA and receive a varsity letter for participation.

Students apply to work on the teams and are chosen based on their knowledge and skills. Once the team is formed, a team leader is selected by the group. In addition to the technical work, the team has a business manager who handles the ordering of materials and supplies and makes sure the work is on track.

While participating in these projects, the students will learn the energy content of different fuels, the inefficiencies of energy conversion, the obstacles to alternate energies, the difficulties in developing alternate energy infrastructures, and problem solving strategies. Energy conversion and efficiency is an integral part of the manufacturing engineering technology curriculum at TTA.

Ian Mc Callister, left, Erin Orzechowski, team business manager, and Dustan Murray, right, TTA seniors in the hydrogen fuel cell battery hybrid go-kart powered by hydrogen from the automated fuel cell station.

The students will compete April 14-16 in Marion, Ohio at the National Robotics Challenge with the automated electrolysis fueling station. The event is funded by the Society of Manufacturing Engineers Education Foundation. It is a STEM-based competition which introduces and prepares young people for careers in advanced manufacturing. Last year a TTA team won second place for their automated biodiesel processor, a project also funded by the UT-UTC. Good luck to the students again this year.

Director Judges Automotive Services in DECA District III Competition

On January 28, 2011, Director Martinko served as a judge in the automotive services marketing series of the DECA District III competition held at The University of Toledo for the high school division.

The mission of DECA is to prepare emerging leaders and entrepreneurs for careers in marketing, finance, hospitality and management. Students compete in two major parts: a written exam and role playing events. For the automotive services marketing role playing segment, the students were given the scenario of a failing automotive parts store and were asked questions related to saving the store by the judges.

Director Martinko was invited to participate by Kurt Seibenick, the DECA Advisor and Supply Chain Management Instructor at Woodward High School in Toledo.

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