Center for Transportation Infrastructure and Safety

NUTC NEWS

at Missouri University of Science and Technology

National University Transportation Center

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A Message from the Director — John J. Myers

Season's Greetings from CTIS! As usual, with the semester well under way and the Holiday season fast approaching, CTIS is bustling with educational, research and technology transfer activities. We invite you to the First Annual MOVITE/University Showcase in just a few weeks at Missouri S&T. Learn more about it on page 3.

On page 2, read about the next phase of development at Missouri University of Science and Technology's E³ Commons. A series of upgrades and new development to the Hydrogen Transportation Test Bed will provide further opportunities for students and faculty to research alternative fuels, leading the way to a hydrogen economy.

In this issue, we are pleased to feature one of Missouri University of Science and Technology's newest faculty members at the Department of Civil, Architectural and Environmental Engineering: Dr. Lesley Sneed. Learn more about Dr. Sneed's research and her NUTC activities on page 6.

IN THIS ISSUE...

Catch up with former UTC-student Dr. Mahmut Ekenel in this issue's "What Are They Doing Now?" section. Turn to page 5 to read about Dr. Ekenel's work developing acceptance criteria for new construction materials, systems and methods at International Code Council Evaluation Service, Inc. in Los Angeles, California.

Our education focus includes a profile of graduate research assistant Ding Chu, on page 7, and news of a Missouri S&T student's award winning paper at an international conference on page 4.

From all of us at CTIS, we wish you Happy Holidays and happy reading!

Warm Regards,
John

Upcoming Events

1st Annual MOVITE/ University Showcase

Dec. 3, 2009
Rolla, Missouri

More info on pg. 3 or email rolufs@mst.edu

52nd Annual Asphalt Conference

Dec. 8-9, 2009
Rolla, Missouri

More info at http://asphalt.mst.edu/

5th International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics

May 24-29, 2010
San Diego, California

More info at http://conference.mst.edu/5geoeqconf2010/

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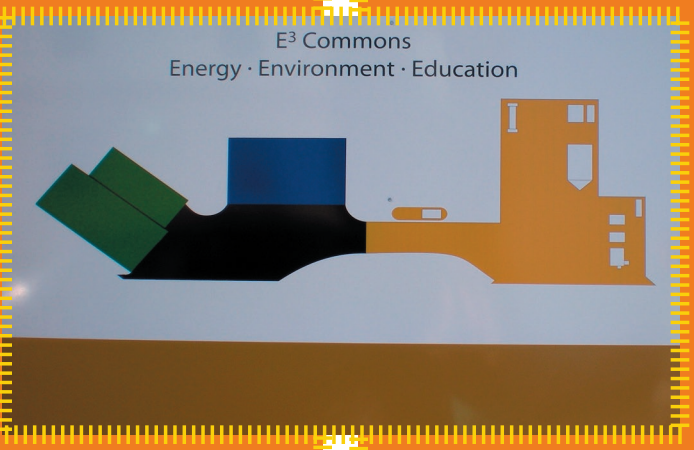
Missouri S&T Hydrogen Transportation Test Bed Equipment and Development: Phase II

With support from the Center for Transportation Infrastructure and Safety, development of a hydrogen transportation test bed at Missouri S&T, coined E³ Commons, is underway to develop, demonstrate and deploy hydrogen vehicles and supporting infrastructure, including hydrogen production from renewable energy sources. Phase 1 of this project was completed in 2008, consisting of the development of a Hydrogen Fueling Station, the EcoCAR Garage and a Renewable Energy Transit Depot.



Focusing on the overarching goals of collecting and evaluating the real-world performance and utility of hydrogen-powered vehicles and benchmarking issues related to the safety, operation and maintenance of hydrogen-powered vehicles with other alternative fuel-powered vehicles, CTIS will provide support in tackling Phase II of the project, which will upgrade equipment and complete development at the E³ Commons.

EcoCAR Garage

The EcoCAR Garage is home to the Missouri S&T EcoCAR design team. The EcoCAR Competition challenges engineering students from universities across North America to re-engineer a light-duty vehicle, minimizing energy consumption, emissions and greenhouse gases while maintaining the vehicle's utility, safety and performance. Phase II will upgrade the EcoCAR Garage with a hydrogen gas leak detection system using catalytic beads with alarms/monitors/security cams and with an automatic fire sprinkler system.

Hydrogen Fueling Station

Phase II will upgrade the Missouri S&T Hydrogen Fueling Station from a temporary facility to a permanent facility by purchasing the currently leased GTI mobile hydrogen fueling unit. When finished, the Hydrogen Fueling Station will consist of several leading technologies including an on-site steam methane reformer and an electrolyzer for generation of high purity hydrogen; steel and carbon composite storage tanks for high pressure storage of hydrogen gas; a 350 bar hydrogen dispenser for both internal combustion engine and fuel cell vehicles; and a stationary polymer electrolyte membrane (PEM) fuel cell.

Story continues on page 8....

FIRST ANNUAL MOVITE/UNIVERSITY SHOWCASE

MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

THE MISSION OF THE UNIVERSITY SHOWCASE IS TWOFOLD:

1. SHOWCASE NOTEWORTHY TRANSPORTATION RESEARCH, INNOVATIVE SOLUTIONS, FACULTY AND STUDENTS AT MISSOURI'S UNIVERSITIES

2. PROVIDE AN OPPORTUNITY TO DEVELOP AND FOSTER RELATIONSHIPS BETWEEN TRANSPORTATION PRACTITIONERS AND ACADEMIA

DECEMBER 3, 2009

9:30 – 10:00 am
REGISTRATION
MTI/NUTC @ Missouri S&T

10:00 – 10:30 am
WELCOME
Dr. Jack Carney, Chancellor, Missouri S&T
Mr. Shawn Leight. President, MOVITE
Mr. Kevin Keith, Chief Engineer, MoDOT

10:30 – 11:00 am
MODOT RESEARCH NEEDS
Ms. Mara Campbell, Organizational Results Director, MoDOT

11:00 – 11:45 am
MODOT/UNIVERSITY RESEARCH PRESENTATIONS
Moderator: Ms. Angela Rolufs, MTI Director, Missouri S&T

11:45 am – 12:45 pm
LUNCH
MOVITE – Networking Opportunity & Poster Session

1:00 – 1:45 pm
S&T NUTC FELLOWSHIP STUDENT RESEARCH PRESENTATIONS
Moderator: Dr. John Myers, NUTC Director, Missouri S&T

1:45 – 2:00 pm
BREAK

2:00 – 2:45 pm
S&T/INDUSTRY PARTNERSHIP RESEARCH PRESENTATIONS
Moderator: Mr. Tom Ryan, HDR

2:45 – 3:00 pm
WRAP-UP AND DISTRIBUTE PDHS
Mr. Brian Chandler, State Director, MOVITE

3:00 – 5:00 pm
CAMPUS TOURS:
HYDROGEN FUELING STATION,
STRUCTURES LAB,
OTHERS TBD
Coordinators: Angela Rolufs, Dr. John Myers, Dr. John Sheffield

Due to generous sponsorship from the Center for Transportation Infrastructure and Safety, Missouri University of Science and Technology and Missouri Valley Section, there is no cost to attend this event. To register, email abigayle@mst.edu. For more information, email rolufs@mst.edu.

S&T Graduate Student's Paper Wins Award at International Conference on Hydrogen Systems

S&T grad students and a young faculty member presented six papers at the World Congress of Young Scientists on Hydrogen Energy Systems held October 7-9, 2009 in Torino, Italy.

Mathew Thomas' research paper was selected for the $1,000 Euro Cash Award for the best paper in Hydrogen Systems Applications. In addition, Thomas received a $250 Euro Grant from the event's organizers. Thomas's paper, "Design Layout of Hydrogen Research and Development Garage," will be published in a special issue of the International Journal of Hydrogen Energy.

Thomas is a member of Missouri S&T's EcoCAR team which is developing a hydrogen fuel cell plug-in hybrid electric vehicle (FC PHEV). The team is one of 17 university groups from the United States and Canada participating in a three-year competition to design a more eco-friendly vehicle. EcoCAR: The NeXt Challenge tests students' abilities to re-engineer a Saturn VUE. The ultimate goal is to improve fuel economy and reduce greenhouse gas emissions while retaining a vehicle's performance and commercial appeal.

During the three-year competition, General Motors is providing production vehicles, vehicle components, seed money, technical mentoring and organizational support. The Department of Energy and the Argonne National Laboratory are also providing support.

Thomas is studying engineering management and systems engineering at Missouri S&T. He is the first author of "Design Layout of Hydrogen Research and Development Garage." Other co-authors from Missouri S&T are Dr. Kevin Martin, Assistant Research Professor of Mechanical and Aerospace Engineering; Dr. Scott Grasman, Associate Professor of Engineering Management and Systems Engineering; Dr. John Sheffield, Professor of Mechanical and Aerospace Engineering; and Edward Anculle, a graduate student in Mechanical and Aerospace Engineering.

Joining Mathew Thomas on the European trip were S&T grad students Edward A. Anculle Arauco, Joseph A. Ishaku, Andrew L. Meintz, Clint Alex Cottrell and faculty members Drs. Kevin B. Martin and John W. Sheffield.

A version of this article, written by Lance Feyh, was first published by Missouri S&T Public Relations in September 2009.

Catching Up with Former UTC Student Mahmut Ekenel

As a Staff Engineer for International Code Council Evaluation Service, Inc. (ICC-ES), a nonprofit, public-benefit corporation in Los Angeles, California, Mahmut Ekenel, Ph.D., P.E., develops acceptance criteria for newly invented construction materials, systems and methods; evaluates test results submitted by accredited laboratories and issues evaluation reports to show building code compliance for building and construction industry professionals.

Dr. William Schonberg , Chair of the Department of Civil, Architectural and Environmental Engineering at Missouri S&T (left) presents the Civil Engineering Exemplary Young Alumni Award to Dr. Ekenel (right)

Ekenel earned a Ph.D. in Civil Engineering in 2004 from the University of Missouri – Rolla (now Missouri University of Science and Technology), where he was also a post-doctoral research fellow in 2005. He earned a M.S. in Civil Engineering in 2001 from Southern Illinois University, Carbondale and an undergraduate degree in Civil Engineering in 1996 from Seljuk University in Turkey.

As a graduate student working with the UTC, Ekenel worked on the optimization and durability of high strength and high performance concrete produced using materials locally available in the state of Missouri. Other UTC projects included work with environmental durability and nondestructive evaluation of FRP strengthened RC Structures. Based on these research projects, Ekenel published seven papers in nationally and internationally recognized technical journals and contributed to six conference proceedings

Ekenel cites the variety of projects, the tools and equipment available, the highly skilled people involved and the opportunity to learn by "taking responsibility and making big decisions" as key reasons for getting involved with UTC research. These opportunities directly apply to his work at ICC-ES, including recent projects developing acceptance criteria related to FRP strengthening, concrete produced using waste materials and masonry construction. Because of the testing procedures and research topics Ekenel was exposed to during his work with the UTC, he was able to develop the needed criteria with a high level of success.

Since 2002, Ekenel has been an active member of the American Concrete Institute (ACI) and the American Society of Civil Engineers (ASCE). While in school, he was a member of the student chapters of these organizations as well as the Chi-Epsilon Civil Engineering Honor Society. In April 2009, Ekenel received the Civil Engineering Exemplary Young Alumni Award from the Missouri S&T Academy of Civil Engineers.

Ekenel grew up in Turkey, near the Mediterranean Sea. He now lives in Los Angeles where he is very active in Turkish-American Associations and several beach volleyball groups. He is also "a big fan of the Lakers."

He encourages current students to stay observant of what's going on around them, saying: "Help your friends with their projects...even if they are not related to your research. Every...[piece of] new knowledge... can help you become a success..."

Lesley Sneed, Ph.D., P.E.

Assistant Professor of Civil, Architectural & Environmental Engineering

The Center for Transportation Infrastructure and Safety welcomes Dr. Lesley Sneed to Missouri University of Science and Technology. Dr. Sneed joined the Department of Civil, Architectural & Environmental Engineering as an Assistant Professor in August 2008 and became immediately involved in some new and exciting NUTC research projects, which could potentially address many of the nation's highway infrastructure needs.

Dr. Sneed's research focuses on the behavior of reinforced and prestressed concrete structural members and systems; innovative methods of repair and strengthening of structures subjected to seismic loading or other extreme hazards, including the use of fiber reinforced polymers; and structural hazard mitigation. She has studied the behavior and shear strength of large-scale reinforced concrete beams, as well as the repair and strengthening of structural concrete members using externally-bonded carbon reinforced polymer plates and has participated in the development of procedures for post-disaster structural evaluation for the state of Indiana.

As a former consulting engineer, Dr. Sneed is particularly interested in research that has a direct impact on structural design provisions and practice, as well as on existing structures. Her industry experience in structural design, investigation and rehabilitation and her enjoyment of experimental research related to structural behavior all directly led to her current NUTC research on spalling of precast-prestressed concrete bridge deck panels, rapid repair of concrete columns and the development of hooked bar reinforcement.

Dr. Sneed's research has been supported by the Missouri Department of Transportation (MoDOT), Portland Cement Association (PCA) and the Concrete Reinforcing Steel Institute (CRSI). She is an active member of the American Society of Civil Engineers (ASCE) and the American Concrete Institute (ACI), including the ACI/ASCE Committee 445, Shear and Torsion, and the ACI Collegiate Concrete Council.

As a doctoral student at Purdue University, Dr. Sneed received the Portland Cement Association (PCA) Education Foundation Fellowship for a research project titled "Effect of Member Depth on the Shear Strength of Reinforced Concrete Flexural Members" (2005). Her research findings have appeared in an ACI Special Publication and ASCE conference proceedings with pending publications in the ACI Structural Journal and PCI.

Dr. Sneed received a Ph.D. in Civil Engineering at Purdue in December 2007. She received a M.S. in 1997 and a B.S. in 1995, both in Civil Engineering from Georgia Institute of Technology.

NUTC Student Solutions: Ding Chu

Ding Chu has been awarded a one-year graduate assistantship from the Center for Transportation Infrastructure and Safety to pursue doctoral studies in a transportation-related field. The award was made based on an exemplary academic career and the merit of his proposed research.

Under the supervision of Dr. Sanjay Madria, Ding Chu's research at Missouri University of Science and Technology focuses on data dissemination of sensor networks, or finding a secure and efficient way to transport data from device to device within a network with Network Coding.

With the use of mobile devices, global positioning systems and sensor technology on the rise, it's crucial that data networks be both safe and able to disseminate information quickly. Because of the current format in which data is transmitted, data dissemination is often not fast enough to meet user demand. The current system keeps information separate, though it travels the same route within a network. With the implementation of Network Coding, several bits of information or messages can be combined and routed through a network as one package, thereby reducing traffic and demand on the network itself.

The main goal of Chu's research is to develop a Network Coding model which addresses the vulnerabilities of the raw model. His research will introduce a mechanism with robust properties which will prevent potential malicious users from infecting a large portion of a network with polluted information. The result will be a network which is both faster and safer for the average user.

A recommendation from one of his professors in China, the available research opportunities and the research interests of his current advisor led Chu to pursue doctoral studies at Missouri S&T. After completing his research and Ph.D. at Missouri S&T, Chu hopes to become a university professor or a researcher in a research institution. "But, I prefer to be university professor," he says.

Chu completed a Bachelor's of Science in Software Engineering in 2005 and a Master's of Science in Computer Architecture in 2008, both at the University of Electronic Science and Technology of China (UESTC) in Chengdu. As an undergraduate student, Chu was an active member of the Microsoft Club at UESTC and a recipient of the UESTC People's Scholarship.

In addition to his academic achievements, Chu is also active in humanitarian efforts. In 2008, he worked for the non-government organization Save the Child to help those injured during the large earthquake in his home town of Chengdu City, China.

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Renewable Energy Transit Depot

The Missouri S&T Renewable Energy Transit Depot is a new "green-building" fabricated from four recycled shipping containers. The overall design emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, material and resource selection and indoor environmental quality. This transit depot is a multifunctional building acting as the terminus of the hydrogen shuttle bus service from Rolla to Fort Leonard Wood, Missouri, home of the Missouri S&T EcoCAR team offices and training space, architectural wind turbines and a solar photovoltaic canopy. Phase II involves the erection of the four recycled shipping containers and the installation of the solar PV panels, architectural wind turbines and the hydrogen electrolyzer with chiller.

E³ Commons

Phase II involves the installation of a 330 kVA buck transformer to ensure a more secure 480 volt service to the E³ Commons as a whole.

Upgrading the Missouri S&T E³ Commons provides a unique transportation testbed for both current and future university transportation research projects focused on transition-state fuel vehicle infrastructure leading to the vehicular use of hydrogen as a fuel in both internal combustion engines and fuel cell plug-in hybrid electric vehicles at Missouri S&T.