

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

Welcome to 2010! We are looking forward to another year of new research, education and technology transfer activities at the Center for Transportation Infrastructure and Safety.

We are pleased to report that our First Annual MOVITE/University Showcase, held in early December 2009, was a great success. Read a summary of the day's events on page 3.

Our faculty profile section features Dr. Frank Liou of Missouri University of Science and Technology, one of our key researchers in the arena of Interdisciplinary Manufacturing Engineering and Mechanical Engineering. Read more about Dr. Liou's research on page 5.

Catch up with former UTC-student Daniel Koenigsfeld in this issue's "What Are They Doing Now?" series. Turn to page 4 to read about his work as Project Manager/Senior Structural Engineer with the Aviation & Facilities Group at Burns & McDonnell Engineering Co. in Kansas City, Missouri.

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We are happy to announce our 2009 UTC Outstanding Student of the Year: Kurt Bloch! Read more about Mr. Bloch on page 6.

Lastly, CTIS has recently assisted Missouri S&T researchers in upgrading the Composite Manufacturing Laboratory on campus. Learn more on page 2.

We wish you well this New Year. Happy reading!

Warm Regards,
John

UPCOMING EVENTS

Missouri Concrete Conference

May 4-5, 2010
Rolla, Missouri

More info on at
<http://concrete.mst.edu/>

GeoMO 2010

May 7, 2010
Rolla, Missouri

More info at <http://concrete.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



TRANSPORTATION TECHNOLOGY: THE MAGNUM VENUS PLASTECH METERING UNIT

Due to superior damage resistance and higher interlaminar shear strength, Polyurethane (PU) resin systems offer several advantages compared to traditional resin systems like polyester and vinyl ester. The pultrusion manufacturing facility at Missouri University of Science and Technology (Missouri S&T) was previously limited to epoxy, polyester and vinyl ester resin systems because the pultrusion of PU resin system requires the use of metering unit.

With support from the Center for Transportation Infrastructure and Safety (CTIS), an interdisciplinary team of faculty was formed to upgrade the Composite Manufacturing and Testing Facilities, thereby enhancing the composite research activities at Missouri S&T.

A customized metering unit from Magnum Venus Plastech was acquired and has been integrated with the pultrusion machine using an

injection box. Pultruded PU samples have been successfully manufactured using this modified setup. The system consists of a hydraulic motor to operate the metering cylinders, allowing for a consistent quantity of raw materials not possible with a pneumatic drive system, even at low flow rates.

The metering unit can be used to manufacture various composite parts using the pultrusion process. Composite test fixtures are required to conduct specialized tests like Compression After Impact, Open Hole Compression and Interlaminar Shear.

Faculty and students of the Mechanical and Aerospace Engineering; Civil, Architectural and Environmental Engineering; and the Chemistry Departments will all have access

to this equipment. The equipment will also be available for CTIS research projects as well as other research projects at Missouri S&T.



Metering unit setup for pultrusion process



FIRST ANNUAL MOVITE/UNIVERSITY SHOWCASE

MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY



The Center for Transportation Infrastructure and Safety (CTIS) and the Missouri Valley Chapter of the Institute of Transportation Engineers (MOVITE) hosted the First Annual MOVITE/University Showcase at the Havener Center at Missouri University of Science and Technology (Missouri S&T) on December 3, 2009.



The mission of the MOVITE/University Showcase was twofold: 1) Showcase noteworthy transportation research, innovative solutions, faculty and students at Missouri's universities and 2) Provide an opportunity to develop and foster relationships between transportation practitioners and academia.

More than 50 students, industry professionals, engineers and educators took advantage of the opportunity to network within the transportation community and to learn more about the wide variety of transportation research at Missouri S&T.



The day's events included presentations on the research needs of the Missouri Department of Transportation (MoDOT) as well as research presentations from MoDOT, CTIS Graduate Research Assistants and industry partners. A poster session during lunch provided time for networking and the event concluded with tours of the Missouri S&T campus, including the Hydrogen Fueling Station and Structures Laboratory.

Due to the generous sponsorship of both CTIS and MOVITE, the University Showcase was a free event.



||||| CATCHING UP WITH FORMER UTC STUDENT DAN KOENIGSFELD |||||

As a Project Manager with the Aviation & Facilities Group at Burns & McDonnell Engineering Co. in Kansas City, Missouri, Dan Koenigsfeld, PE, LEED® AP, manages all aspects of a project from the conceptual design phase through construction with a primary objective to make his clients successful. He leads multidiscipline teams including architects, civil engineers, structural engineers, mechanical engineers and electrical engineers for both design-build and traditional design-bid-build projects.

Koenigsfeld's area of expertise includes the design and construction of airspace manufacturing facilities. For the past several years, he and team members have provided the Lockheed Martin Co. design and construction services for numerous projects related to the production of the new Joint Strike Fighter (JSF) F-35 Lightning II aircraft. Past projects include the Aircraft Final Finish Facility, Flightline Run Station Hangars, Flightline Operations Center, Final Assembly Infrastructure, and multiple utility plant projects. Other airspace related projects he has worked on include a Jet Engine Test Facility in Dubai, United Arab Emirates (UAE) capable of testing GE90 jet engines and an Aircraft Maintenance Hangar in Coronado, CA for C-40 (737-700 militarized) aircrafts.

Koenigsfeld earned a M.S. in Civil/Structural Engineering in 2003 and a B.S. in Civil Engineering in 2002 both from the University of Missouri – Rolla (now Missouri University of Science and Technology). In 2002, he received the UMR UTC Student of the Year Award. Koenigsfeld is also a Professional Engineer (PE) registered in the state of Missouri and became a LEED Accredited Professional

(Leadership in Energy and Environmental Design) in 2008.

As a graduate student working with the UTC, Koenigsfeld's research topic was Secondary Reinforcement for FRP Reinforced Concrete Panels. The objective of the project was to investigate the development of an empirical secondary reinforcement ratio for FRP based on experimental tests which examined both early-age and later-age effects of various reinforcement ratios on the formation of shrinkage/temperature and flexural cracks.



Koenigsfeld cites the opportunity to get hands-on experience and apply what was learned in the classroom as key reasons for getting involved with UTC research. "GRA positions give students the opportunity to provide solutions or recommendations to unknowns within our industry through hands-on work in the laboratory," says Koenigsfeld. These experiences, as well as "working

in teams with other students and faculty," directly apply to his project management responsibilities at Burns & McDonnell Engineering Co.

In the future, Koenigsfeld intends to strengthen his construction background, as well as his sales and marketing skills, and expand from design project management to Engineer-Procure-Construct (EPC) Project Management.

Koenigsfeld is an active member of the Structural Engineers Association of Kansas & Missouri (SEAKM) and the Society of American Military Engineers (SAME). He has been married to his wife, Stephanie, for six years. They have an 18-month old son named Ryan.



FRANK LIOU, PH.D., ASME FELLOW

INTERDISCIPLINARY MANUFACTURING ENGINEERING AND MECHANICAL ENGINEERING

Dr. Fuewen Frank Liou is the Director of the Interdisciplinary Manufacturing Engineering Program and a Professor of Mechanical Engineering at Missouri University of Science and Technology (Missouri S&T). Dr. Liou's research focuses on Direct Laser Deposition, CAD/CAM Integration, Rapid Manufacturing and Rapid Prototyping.

Recently, Dr. Liou researched and developed a hybrid laser deposition and machining process to produce precision metal parts, such as titanium and steels. His research has been applied to transportation in such areas as fuel cell development, part repair and landing gear enhancements.

As author or co-author, Dr. Liou has published more than 170 technical papers, one of which was selected for the Dick Aubin Distinguished Paper Award (with Mary Kinsella) from the Society of Manufacturing Engineers (SME) in 2009. The winning paper must have a significant impact on rapid prototyping or additive manufacturing and must have practical value beyond pure research. He also received a Highly Commended Paper Award for the Rapid Prototyping Journal, selected by Emerald Literati Network Awards for Excellence in 2008. Dr. Liou is the author of *Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development*, published by CRC Press in September 2007.

He has served as Associate Editor of *Mechanism and Machine Theory*, the journal of the

International Federation for the Theory of Machines and Mechanisms (IFTOMM) since 2000 and Associate Editor of *SME Journal of Manufacturing Systems* from 2001-2008. Dr. Liou is a senior member of the Society of Manufacturing Engineers (SME), a Fellow of the American Society of Mechanical Engineers (ASME) and a Member of the American Society for Engineering Education (ASEE).



As principal investigator, Dr. Liou's research has been supported by the National Science Foundation (NSF), Air Force Research Laboratory (AFRL), Army Research Office (ARO), The Boeing Company, Spartan Light Metal Products, Inc., NIST, Software Systems Specialist Inc., Ford Motor Co., Metal Container Co., Brewer

Science Inc., Westinghouse Electric Corporation, Product Innovation and Engineering, LLC, Rolls Royce, Titanova Inc., RPM and Associates, and more.

Dr. Liou received his Ph.D. in Mechanical Engineering from the University of Minnesota at Minneapolis in 1987. He received a Master's Degree in Mechanical Engineering from North Carolina State University at Raleigh in 1984 and a Bachelor's Degree in Naval Architecture and Marine Engineering from National Cheng-Kung University in Taiwan in 1980. He joined the faculty at University of Missouri – Rolla (now Missouri S&T) in 1987 where he has been recognized for excellence in teaching and advising on numerous occasions.



KURT E. BLOCH

2009 OUTSTANDING MISSOURI S&T UTC STUDENT OF THE YEAR

Kurt E. Bloch has been named Outstanding Missouri S&T UTC Student of the Year. The award was made based on his excellent academic performance, the technical merit of his research topic and his service to both Missouri S&T and the surrounding community.

Bloch earned B.S. in Civil Engineering with Summa Cum Laude honors from Missouri University of Science and Technology (formerly University of Missouri-Rolla) in May 2008. During his undergraduate career, Bloch was a member of the Missouri S&T chapters of the American Society of Civil Engineers (ASCE), Chi Epsilon (the National Civil Engineering Honor Society) where he served as Service Chair and Vice President, Order of Omega (Greek Honor Society) where he served as Secretary, Delta Tau Delta Fraternity where he served as Philanthropy Chair, Stewart, Director of Risk Management, and Vice President External and Phi Kappa Phi (National Honor Society). Bloch was awarded the Academy of Civil Engineers Outstanding Senior Award in May 2008. He is also highly involved in his church where he is the organist and a choir member. As a graduate student, Bloch was involved with the Missouri S&T PCI Big Beam Competition Team.

Advised by Dr. John J. Myers during his graduate career, Bloch has studied and made technical contributions to the understanding

of High-Strength Concrete (HSC) and High-Strength Self-Consolidating Concrete (HS-SCC) for accelerated construction, including: the design, instrumentation and erection of two innovative precast/prestressed HSC and HS-SCC bridges located in Rolla, Missouri. Sponsored by the City of Rolla and the CTIS-NUTC at Missouri S&T, his work furthers the current knowledge base on these advanced materials, including knowledge of mechanical and material behavior under field conditions.



The field of civil engineering appealed to Bloch “because it was an engineering field that would produce a tangible result.” He chose Missouri S&T because of the program, faculty and research environment available to students, believing it would provide “the exact education... needed to succeed in the engineering world.” Of his research on HSC and HS-SCC, Bloch says: “HS-SCC has the potential to create high strength durable structures rapidly and with less labor.” These advances could result in more sustainable structures with longer service lives.

Bloch anticipates graduating from the Missouri S&T with his M.S. in Civil Engineering in May 2010 and plans to work in industry as a structural engineer, “getting the necessary experience in civil engineering that can only be obtained in the work world.”



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2010

SHAMSHER PRAKASH FOUNDATION RESEARCH AWARD IN GEOTECHNICAL ENGINEERING

Shamsher Prakash Foundation solicits nominations for young practicing engineers (40 years or younger) from all over the world. Candidates should be specialists in Geotechnical Engineering and/or Geotechnical Earthquake Engineering and must have made significant independent contributions to research in the field as well as show promise of excellence in research. The award, consisting of \$1,100 and a plaque, will be announced on September 30, 2010. Nominations will be accepted until March 31, 2009.

Nominations may be made on plain paper or submitted electronically. All nominations will be reviewed by a judging committee of international experts from Canada, Japan, Ireland, Taiwan and the United States.

2009 RESEARCH AWARD WINNERS:

~TARA HUTCHINSON, ASSOCIATE PROFESSOR
UNIVERSITY OF CALIFORNIA SAN DIEGO USA

~L.H.J. GORZIC, ASSOCIATE PROFESSOR
UNIVERSITY OF CALGARY, CANADA

~JEAN FRANCOIS SEMBLAT, LABORATTOIRE CENTRAL
PONTIS ET CHAUSSEES, FRANCE

Visit http://yoga10.org/research_award.html for more information and/or to contact Dr. Shamsher Prakash directly.