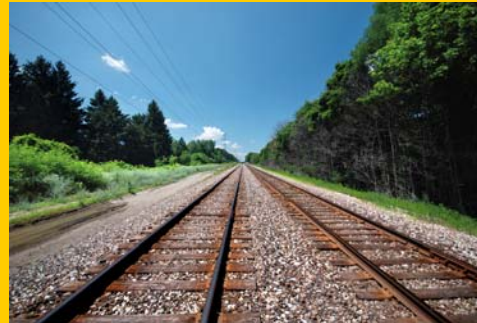




MiSTI

*U.S. DOT University Transportation Center for
Materials in Sustainable Transportation Infrastructure*



2009-2010 Annual Report



Michigan Technological University
1400 Townsend Drive
Houghton, Michigan 49931
www.mtu.edu

UTC-MiSTI
301 Dillman Hall
906.487.3154
www.misti.mtu.edu

2009-2010 Annual Report

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Director's Message

Dr. Lawrence Sutter, PhD
 Professor
 301A Dillman Hall
 Michigan Technological University
 Houghton, Michigan 49931
 906.487.2268
 lsutter@mtu.edu

This report highlights the Center's 2009-2010 annual accomplishments but also provides an overview of the program growth realized through four years of SAFETEA-LU funding. Our typical approach for the Center's annual reports has been to highlight specific accomplishments in each of the four program areas: research, education, technology transfer, and workforce development. In the past we have included progress with respect to our program metrics at the end of each report as a recap of our incremental annual growth. In this issue however, we are starting with the numbers because we believe the metrics tell the story of our success in building a program that is meeting the needs of state and national transportation stakeholders.

Larry Sutter

2006-2010 Accomplishments

Center faculty, staff and students conducted **50** internal investigations and externally sponsored research projects.

To date, **30** reports and papers on the Center's research activities have been published in various journals, trade publications, proceedings and for sponsored research clients.

3 new courses were developed, one for undergraduate students and two at the graduate level.

108 student positions were created over the four-year period to support the Center's research investigations and sponsored projects. These positions provided supplemental educational financial support while offering university-based research experience to undergraduate and graduate students following Michigan Tech's reputation of providing hands-on learning experiences. Our students continue to be highly sought by industry upon graduation.

Center faculty and staff conducted **64** technology transfer opportunities for professionals. These events reached **3917** participants.

In just four years, the civil infrastructure materials program at Michigan Tech realized a **23%** increase in the number of students annually pursuing a MS degree with a concentration in transportation materials. The PhD program grew by an astonishing **300%**.

2009-2010 Center Staff

Center Director	Dr. Lawrence Sutter, PhD
Assistant Director	Elizabeth Hoy
Office Students	Miranda Thompson Emily Lang
Web Development / Publications Editors	Scott Bershing John Velat

Technical Advisory Council

Federal Highway Administration	Suneel Vanikar
Federal Rail Administration	Donald Plotkin
Michigan DOT	Kirk Steudle
Minnesota DOT	Roger Olson
We Energies	Bruce Ramme
Vulcan Materials	Robin Graves
Klett Construction	Jim Klett
Precast/Prestressed Concrete Institute	Emily Lorenz
Holcim, Inc.	Al Innis
American Engineering and Testing	Richard Stehly

Baseline Faculty

Dr. Theresa Ahlborn, P.E.	Associate Professor, Structural Engineering
Dr. George Dewey	Associate Professor, Structural Engineering
Dr. Ralph Hodek	Associate Professor, Geotechnical Engineering
Dr. Lawrence Sutter	Professor, Cementitious Materials
Dr. Stanly Vitton	Associate Professor, Geotechnical Engineering
Dr. Zhanping You	Assistant Professor, Pavement Materials
Dr. Jacob Hiller	Assistant Professor, Pavement Materials
Dr. Pasi Lautala	Research Assistant Professor, Rail Trans.
Dr. Devin Harris	Assistant Professor, Structural Engineering
Dr. Karl Peterson	Research Assist. Prof., Cementitious Materials
Dr. Amlan Mukherjee	Assistant Professor, Construction

Center Information

Our Center continues to develop programs and increase our involvement within the transportation industry. To maintain this growth and outreach it is necessary for us to turn to others for support of the day-to-day operations.

John Velat joined the Center's communications team to support the development of Center publications. John holds a Masters of Science in Rhetoric and Technical Communications from Michigan Tech. John has worked with a variety of transportation programs including Michigan's Local Technical Assistance program and is currently with the Tribal Technical Assistance Program at Michigan Tech.

Miranda Thompson is an undergraduate student in Civil Engineering from Clarkston, Michigan. She is focusing on transportation engineering and wants to work as a traffic or municipal engineer



upon graduation. Her role with the Center changes daily. She serves as the primary office support person but has also contributed in the laboratories on sponsored research and as a teaching assistant with the National Summer Transportation Institute.

People Highlights - - - - -

Sutter Appointed to CUTC Executive Board

UTC-MiSTI Center Director, Larry Sutter was appointed to the Executive Committee of the Council of University Transportation Centers (CUTC). The CUTC organization was established in 1979 by leading university-based transportation centers and institutes. The organization grew significantly with the passage of SAFETEA-LU and the authorization of sixty UTCs boosting the CUTC membership to more than 130 academic institutions.

The organization meets as a whole twice a year for annual meetings. The winter meeting is scheduled to coincide with the Transportation Research Board meeting in Washington DC. The summer meeting is held at a member university. Michigan Tech is scheduled to host the 2012 summer meeting in Houghton.

Enterprise Program Expanded

The Pavement Design, Construction and Materials (PDCM) Enterprise program at Michigan Tech is an undergraduate, hands-on program where student teams work towards solutions for real world problems or challenges.

In 2009-2010, plans were made to expand the PDCM's focus from pavements to the broader area of transportation. This expansion will allow for projects in other areas of transportation where Michigan tech has active programs.



Jim Klett, current UTC-MiSTI Technical Advisory Council member, was acknowledged during a recent event in Houghton for his years of service as an Advisory Board member for the Pavement Design, Construction and Materials Enterprise program.

For the 2010-2011 academic year, four projects have been identified.

- Complete Streets and Electric Vehicle Infrastructure
- Rail Tie Supplier Sustainability Plan
- Synthesis of Warm Mix Asphalt Applications in Northern States
- Calculating a Predictive Model for the Aggregate Wear Index

In addition to the types of projects students would be pursuing, the funding model for the program was also changed. At its inception, the PDCM Enterprise was funded through a generous gift from Bob and Ellen Thompson. These funds primarily provided scholarships to students in the program but also support for laboratory improvements. With the change in focus it is a goal to partner with a broader group of industry sponsors to help identify and support student team projects. To assist, the UTC-MiSTI has committed to provide up to \$5,000 for each project to match 1:1 any industry partner's contribution.



Pictured above are Dr. Robert Bertini, Deputy Administrator, US DOT's bureau of Research and Innovative Technology Administration and MDOT Director, Kirk Steudle, addressing participants, below, at the 2009 Transportation Forum.



University Partnership

In November 2009, UTC-MiSTI, in partnership with the Michigan Tech Transportation Institute (MTTI), hosted Michigan Tech's 2nd Transportation Forum. Together, MTTI and UTC-MiSTI share the goal of expanding the role of all disciplines at Michigan Tech in transportation research and education. This year's Forum featured Dr. Robert Bertini, Deputy Administrator of the Research and Innovative Technology Administration at the U.S. DOT and Kirk Steudle, Director of the Michigan Department of Transportation. Bertini and Steudle met with the University's administrative team including the President, Vice-Presidents, Provost, Deans and Department Chairs to talk about the future of transportation and outlining needs and opportunities, and highlighting the academia's role in conducting innovative research and educating the next generation of transportation professionals.

The Transportation Forum also provided an opportunity for students to showcase their work at a student poster session. The Forum concluded with a public event highlighting new areas of transportation research at the university, and gave Bertini and Steudle an opportunity to share their visions for state and national transportation development and future needs.

Education



UTC Student of the Year

For heavy haul freight transportation, the gradual deterioration of concrete at the rail-tie interface is one of the most prevalent failure mechanisms for concrete ties. Russ Lutch, the 2009 UTC-MiSTI Student of the Year, did his graduate work on developing an under-

standing of railroad track structure, with a focus on the use of prestressed concrete railroads ties. His study of concrete rail ties was initiated by the project "Synthesis of Railroad Engineering Best Practices in Deep Seasonal Frost and Permafrost Areas," sponsored through the University of Alaska at Fairbanks. Russ served as a graduate research assistant on the project and was tasked with examining the use of concrete railroad ties in arctic conditions. He also participated as a graduate student mentor in the 2009 UTC-MiSTI Summer Scholars Program co-advising an undergraduate team in their investigation of material and life-cycle assessment of cross-tie alternatives for rail applications.

As a graduate student, Russ was an active participant in rail scholarship and research advancement presenting at the 14th ASCE Cold Regions Engineering Conference, "*Causes and Preventative Methods for Railseat Abrasion in North*

America's Railroads" and at the 2009 American Railway Engineering and Maintenance-of-Way Association (AREMA) Conference, "*Prestressed Concrete Railroad Ties in North America.*"

In January 2010 he began his professional career as a consultant for Kiewit Construction in Omaha, Nebraska.

Michigan Department of Transportation-TRAC Pipeline Program 2009-2010 Scholarship Recipients

UTC-MiSTI is offering a first-year, one-time scholarship to incoming civil engineering students who have completed, prior to their application and acceptance at Michigan Tech, the TRAC program and TRAC Pipeline internship with MDOT. These scholarships enable students to pursue their interest in transportation engineering as a focus and career choice. The 2009-2010 recipients include:

- Kevin Wilks
- Logan Waltz
- Christian Velasano
- Micah Tate Trierweiler

These four students will begin their baccalaureate civil engineering degree program at Michigan Tech in August of 2010. We wish them well!

Workforce Development



2009-2010 Pre-college Outreach

UTC-MiSTI continued supporting national programs designed to engage pre-college youth in transportation career discovery. For the third year, the Center provided school transportation funds to allow more than 1700 youth to attend Michigan's 3rd Construction Career Days.



Michigan Tech hosted Michigan's 2nd National Summer Transportation Institute Program where 27 high-school students spent two weeks discovering educational opportunities supporting a multi-modal national transportation system. The students met with faculty specializing in railroad engineering and human factors research and toured a local sand and gravel operation to learn about construction materials. The students also built bridges from balsawood and strength tested their designs. The winning bridge teams got a special tour to the top of the tower of the Mackinaw bridge!



More photos of these activities can be viewed on the Center's website <http://www.misti.mtu.edu>

2009-2010 Undergraduates Engaged in Research

Includes those students who worked on a UTC-MiSTI research investigation

Emily Lang- <i>Wisconsin</i>	Luke Gublo- <i>Michigan</i>
Miranda Thompson- <i>Michigan</i>	Lars Leemkuil- <i>Wisconsin</i>
Nick Ryan- <i>Michigan</i>	Ben Longmire- <i>Wisconsin</i>
Nick Weinman- <i>Mississippi</i>	Morgan Hansen- <i>Michigan</i>
Matt Throop- <i>Michigan</i>	Travis Brush- <i>Michigan</i>
Michael Urena- <i>Michigan</i>	David Carmody- <i>Michigan</i>
Brad Anderson - <i>Michigan</i>	Amanda Hartman- <i>Michigan</i>
Joshua Cardinal- <i>Michigan</i>	Tianlu Shen- <i>People's Republic of China</i>
Kekoa Kaaikala - <i>Michigan</i>	Corey Tebo- <i>Michigan</i>

2009-2010 Graduate Students Engaged in Research

Includes those students who worked on a UTC-MiSTI research investigation

Melanie Kueber- <i>Michigan</i>	Mary Christiansen- <i>Michigan</i>
Jerry Anzalone- <i>Michigan</i>	Haizu Lu- <i>People's Republic of China</i>
Chris DeDene- <i>Michigan</i>	Matt King- <i>Michigan</i>
Darrell Cass- <i>Michigan</i>	Kristin Roth- <i>Michigan</i>
Shane Ferrell- <i>Michigan</i>	Russell Lutch- <i>Minnesota</i>
Corey Shorkey- <i>Michigan</i>	Eric Kreiger- <i>Michigan</i>
Justin Hicks - <i>Wisconsin</i>	Rita Lederle- <i>Minnesota</i>
Jayeeta Sarkar- <i>India</i>	Yinghong Qin- <i>People's Republic of China</i>
Kevin Mears- <i>Michigan</i>	Zeyad Ahmed- <i>Iraq</i>
Timothy Colling- <i>Michigan</i>	Paul Koning- <i>Michigan</i>
Julian Mills-Beale- <i>Ghana</i>	Baron Colbert- <i>Michigan</i>
Shu Wei Goh- <i>Malaysia</i>	

2009-2010 Graduate Degrees Granted

Includes those students who worked on a UTC-MiSTI research investigation

Shane Ferrell (MS Civil Engineering) <i>Hansen Professional Services</i>
Shu Wei Goh (MS Civil Engineering) <i>PhD Program-Michigan Tech</i>
Justin Hicks (MS Civil Engineering) <i>HDR, Inc.</i>
Russell Lutch (MS Civil Engineering) <i>Kiewit Construction</i>
Julian Mills-Beale (MS Civil Engineering) <i>PhD Program-Michigan Tech</i>
Kristin Roth (MS Civil Engineering) <i>Hartwig & Associates, Inc.</i>
Jayeeta Sarkar (MS Civil Engineering)
Timothy Colling (PhD Civil Engineering) <i>Michigan's Local Technical Assistance Program</i>



Technology Transfer

Technology Enhancements Offer Improved Delivery

In 2009, the Michigan Tech Transportation Institute acquired additional space on campus for the development of a media center. The renovations and equipment purchases were funded in part by a gift from Canadian National Railway (CN). This space now offers state-of-the-art webinar and video conferencing capabilities to aid in the delivery of technology transfer and educational efforts. The state-of-the-art technology was quickly put into use by the Center for Technology and Training (CTT) who offer a wide range of training activities, including

those supporting the RoadSoft™ asset management software developed at Michigan Tech and used by cities and all county road agencies throughout Michigan. UTC-MiSTI will benefit from this technology and expertise for the delivery of webinars, meetings, and other technology transfer and outreach activities.



UTC-MiSTI May Feature for Spotlight Piece

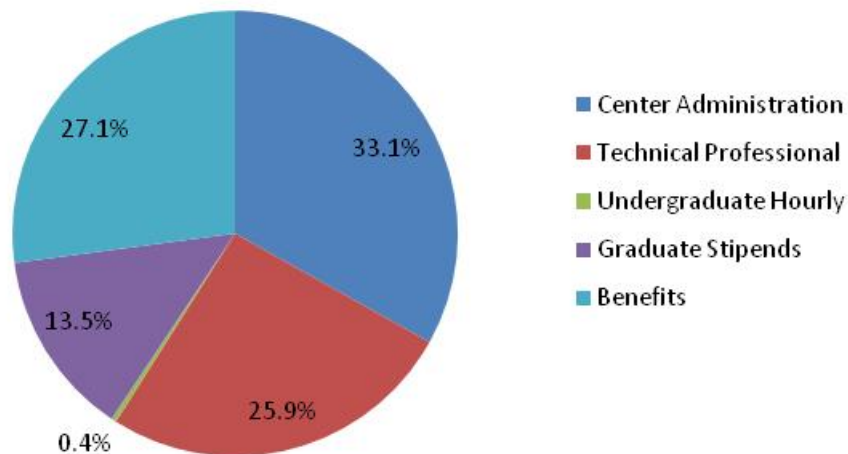
UTC MiSTI was featured in the May 2010 RITA Spotlight publication for their technology transfer on a recently completed pooled fund research project. The project, lead by the South Dakota Department of Transportation examined the deleterious effects of chemical deicers on portland cement concrete. To view a copy of this publication, visit the Center's website at <http://www.misti.mtu.edu>

Year Four Budget Overview

FY 4 Total Budget Allocations



FY 4 Salaries & Benefits



The 2009-2010 budget included \$463,400.00 in federal funds and an additional \$463,400.00 in matching funds from allowable sources. For planning purposes, this fiscal year award was budgeted over two years to include a one-year grant closeout period after the 2009-2010 fiscal year as a requirement of the program. This accounts for slightly higher administrative allocations to cover staff time for budget reconciliation closeout and final reporting.

As of July 1, 2010, UTC-MiSTI had identified and reported more than 2 million dollars towards its required 1:1 match on the cumulative federal award. Sources and approximate percentages of total available to the Center are outlined below.

Sponsored research contracts (61%) with the following :

- Michigan Department of Transportation
- Wisconsin Department of Transportation
- National Cooperative Highway Research Program
- Sub contract from the University of Alaska-Fairbanks
- Corporate sponsored gifts in support of research

Internal University sources (39%) including the following:

- Department of Civil and Environmental Engineering
- Michigan Technological University Graduate School
- Vice President for Research Office
- Michigan Tech Transportation Institute
- Internal Research and Development Funds
- Other University Divisions

These percentages change annually as new sources, both internal and external, are identified.

Outreach and Leadership

UTC-MISTI continued an aggressive schedule of participation at regional and national meetings, conducting technology transfer activities, Center outreach, and building relationships towards future partnerships.

July

- National Local Technical Assistance Program Association (NLTAPA), Pittsburgh, Pennsylvania
- Mississippi Valley Conference, Grand Rapids, Michigan
- AASHTO Research Advisory Council (RAC), Orlando, Florida

August

- Portland Cement Association, Chicago, Illinois
- Michigan Department of Transportation, Lansing, Michigan

September

- Euroseminar for Microscopy Applied to Building Materials, Dortmund Germany
- Federal Demonstration Partnership, Washington, DC

October

- National Concrete Consortium, St. Louis, Missouri

November

- American Concrete Institute, New Orleans, Louisiana
- Transportation Engineering Road Research Alliance, St. Paul, Minnesota

December

- ASTM, Atlanta, Georgia

January

- Transportation Research Board, Washington, DC
- Wisconsin Ready Mix Association, Wisconsin Dells
- Federal Demonstration Project, Washington, DC

February

- Asphalt Paving Association of Michigan, Mt. Pleasant, Michigan
- Michigan Concrete Association, Pontiac, Michigan
- Transportation Engineering Road Research Alliance, St. Paul, Minnesota
- Minnesota Paving Conference, St. Paul, Minnesota
- Michigan Department of transportation, Lansing, Michigan

March

- TRB Research and Technology Coordinating Committee, Irvine, California
- American Concrete Institute, Chicago, Illinois
- International Cement Microscopy Association, New Orleans, Louisiana

April

- Wisconsin Ready Mix Concrete Association, Rice Lake, Wisconsin
- Construction Career Days, Davisburg, Michigan

May

- Federal Highway Administration, Washington, DC
- Michigan Department of Transportation-Research Summit, Lansing, Michigan
- Federal Demonstration Project, Washington, DC
- Joint Deterioration Pooled-Fund, Skokie, Illinois

June

- CUTC/UTC Program Meetings, College Station, Texas
- Sustainable Construction Materials Conference, Ancona, Italy

Fiscal Year Four Baseline Performance

DESCRIPTION	2005-06 Baseline	2006-07	2007-08	2008-09	2009-2010
RESEARCH SELECTION					
Basic	0	0	0	0	0
Advanced	0	0	0	0	0
Applied	0	12	12	13	13
Total Projects	0	\$ 100,443.00	\$ 238,197.00	\$ 553,622.62	\$ 697,563.71
RESEARCH PERFORMANCE					
Published Reports	0	0	3	3	4
Papers Published	0	0	2	8	13
EDUCATION					
Undergraduate Courses <i>(added)</i>	7	1	0	0	0
Graduate Courses <i>(added)</i>	11	0	1	1	0
Students Engaged in Research	0	14	23	30	41
Undergraduate	0	6	11	15	18
Graduate	0	8	12	15	23
HUMAN RESOURCES					
Masters Programs Offered <i>(added)</i>	2	0	0	0	0
Doctoral Programs Offered <i>(added)</i>	1	0	0	0	0
Students Enrolled in MS Program	13	13	12	13	16
Students Enrolled in PHD Program	4	11	10	10	12
MS Degrees Granted	5	2	6	5	7
PhD Degrees Granted	0	0	1	2	1
TECHNOLOGY TRANSFER					
Seminars, Workshops etc. Conducted	0	2	7	21	34
Number of Participants	0	169	231	2068	1449

In 2009-2010 UTC-MiSTI achieved a number of new milestones. The Center's research activity grew to expenditures approaching \$700,000. This is significant when considering the federal portion of the Center's budget is less than \$500,000. This is a key strength of the UTC program, the ability to leverage the federal investment in transportation education and research.

In other areas, significant growth was realized in the number of peer-reviewed and conference publications and also the number of students engaged in research activities, specifically the number of graduate students. Center staff and faculty conducted a record setting number of presentations, seminars and workshops to advance the Center's efforts in technology transfer.



Dr. Tess Ahlborn, PhD, P.E. is an Associate Professor in the Department of Civil and Environmental Engineering at Michigan Tech. She also directs the Center for Structural Durability. Her areas of research include pre-stressed concrete, ultra high performance concrete and bridge engineering.



Dr. George Dewey, PhD, is an Associate Professor in the Department of Civil and Environmental Engineering at Michigan Tech. He serves as the advisor of the Pavement Design, Construction and Materials student Enterprise. His areas of research include pavement design and structural engineering.



Dr. Ralph Hodek, PhD, P.E. , is an Associate Professor in the Department of Civil and Environmental Engineering at Michigan Tech. He is the chair-elect of the ABET Applied Science Accreditation Council. His areas of research include the use of cement kiln dust as a base stabilizer and geotechnical engineering.



Dr. Amlan Mukherjee, PhD, is an Assistant Professor in the Department of Civil and Environmental Engineering at Michigan Tech. His areas of research include developing platforms and tools that support informed decision making for construction processes.



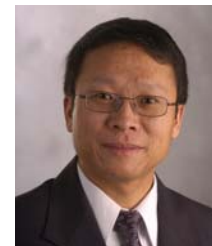
Dr. Jacob Hiller, PhD, is an Assistant Professor in the Department of Civil and Environmental Engineering at Michigan Tech. His areas of research include pavement mechanics and the interaction between materials, analysis and performance.



Dr. Lawrence Sutter, PhD, is a Professor and Director of the Michigan Tech Transportation Institute. His areas of research include the effects of deicing chemicals on pavement materials, use of fly ash and other recovered industrial materials in pavements and materials characterization.



Dr. Stanley Vitton, PhD, P.E. , is an Associate Professor in the Department of Civil and Environmental Engineering at Michigan Tech. His areas of research include geotechnical engineering, geomechanics, slope stability and dust management.



Dr. Zhanping You, PhD, P.E. is an Assistant Professor in the Department of Civil and Environmental Engineering at Michigan Tech. His areas of research include bituminous materials, asphalt binders, use of recycled asphalt pavements and sustainability related to asphalt materials.



Dr. Pasi Lautala, PhD, is a Research Assistant Professor within the Michigan Tech Transportation Institute and serves as the Director of the Michigan Tech's new Rail Transportation Program.



Dr. Devin Harris, PhD, is an Assistant Professor in the Department of Civil and Environmental Engineering at Michigan Tech. His areas of research include innovative materials for civil infrastructure and behavior and design of bridges.

Dr. Karl Peterson (not pictured), PhD, is a Research Assistant Professor in the Department of Civil and Environmental Engineering at Michigan Tech. His areas of research interest include Petrography and materials characterization.



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