

MICHIGAN TECHNOLOGICAL UNIVERSITY
RAIL TRANSPORTATION PROGRAM
2011 ANNUAL REPORT



Rail Transportation Program

Michigan Tech Transportation Institute • Michigan Technological University



DIRECTOR'S MESSAGE



Greetings from the Upper Peninsula of Michigan. It's once again time to start a new academic year and see how we succeeded during the previous one. It was a record breaking year for Michigan Tech's Rail Transportation Program (RTP), as we continue to make ourselves one of the premier North American universities for railroad education, research and outreach. We have introduced a new course to our curriculum, increased student enrollment to numbers higher than ever before, made great strides to the membership of our Railroad Engineering and Activities Club (REAC), and continued to expand and evolve with our international collaborations. But in the end, the true measurement is the success of our students. More companies have been actively recruiting on campus and our students have secured more internships than ever before. To top it all, twelve of our students were successful in securing highly competitive AREMA scholarships of which only 38 were available. These are all reasons that make me proud and grateful to have the opportunity to serve as the Director of the RTP.

We can't forget that all of our success requires hard work, and there was plenty of that last year. We had an extremely motivated group of students, both as researchers in our projects and as leaders of REAC. The rail industry has made it very clear that their greatest need is for future leaders. Our objective is to provide as many opportunities as possible for our students to try their wings, sometimes successfully and sometimes not, so they can develop their skills and capabilities. At the same time we also need to acknowledge that industry needs talented technical experts, so we can't forget to maintain the balance in the experiences and opportunities that we offer. I believe strongly that even with their limited technical experience these students are ready to make true contributions to the industry. Therefore, we continue to work with our industry partners to identify more opportunities for students, so they can improve their skills through hands-on educational activities.

Before I leave you to enjoy the rest of this annual report, I want to highlight a few more topics that you'll find from the following pages. First, I've been excited to see that our efforts to build a multidisciplinary program are making progress. Faculties in both the Mechanical Engineering and the Materials Science and Engineering departments have started rail-related research and our Railroad Engineering course is now approved as a technical elective for both civil and mechanical engineering students. Second, we've been delighted to see that after its second year, two students from our Rail and Intermodal Transportation Summer Youth Program have entered Michigan Tech as freshmen. Finally, we are absolutely delighted to see the continuous and expanding program support from our rail industry partners. They have always been encouraging, despite the challenging economy and perhaps even more, the challenging floods this past summer. These relationships gave the beginning thrust to our program when we started and they've grown stronger year after year as we've moved along. As fall turns the leaves golden in Houghton, we know that it's time for us to face another busy year of activities and growth.....and we're ready for it!

Pasi

RAIL INDUSTRY PARTNERS AND RECRUITMENT

Since the inception of the Rail Transportation Program, our industry partners and supporters have provided significant contributions to the growth and sustainability of the program, both financially and in the workforce development of our students.

In addition to operational program support, substantial scholarships are awarded each year to our students through donations by Union Pacific and CN. The CN Rail Transportation Education Center (CN RTEC) continues to provide a refuge to a growing number of students for study, research and collaboration, complimented by an expanding library of rail information. Industry partnership is a crucial component of the RTP expansion and one of the highest priorities to guide our development. We thank you for continuing to further the education of our students and the advancement of the RTP.

Program Partners:

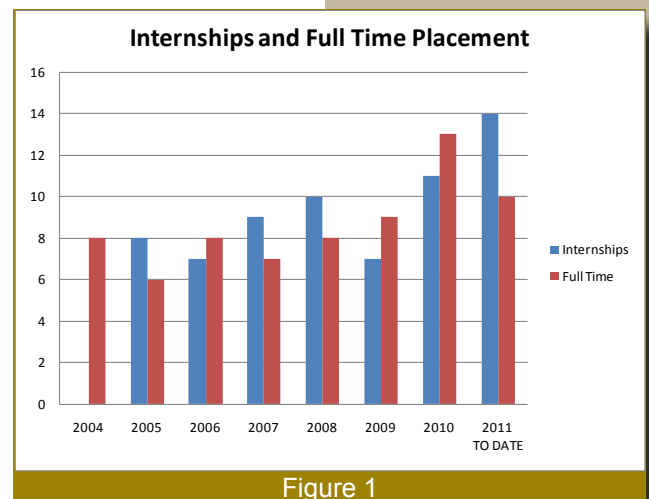


Other Companies with 2011 Financial Support:



Full Time and Internship Recruitment Trends

Each year, several Michigan Tech students and graduates join the rail industry for internships, co-ops, or to start their full time career. Both internships and full time positions have witnessed a steady growth and 2011 is expected to be a record year for both categories. Internship and full time recruitment trends are presented in Figure 1.





RTP FACULTY AND STAFF



Dr. Pasi Lautala

Dr. Pasi Lautala, P.E.

While still a Ph.D. student in Civil and Environmental Engineering, Pasi Lautala and then advisor Bill Sproule, started the Rail Transportation Program at Michigan Tech with the Summer in Finland International Engineering course. Now director of the Rail Transportation Program and a Research Assistant Professor in the Civil and Environmental Engineering Department, Dr. Lautala is an actively involved leader in re-establishing rail transportation education in North American universities. He has created and teaches several courses in railroad engineering and is currently the principal investigator for five funded research projects related to railroads, multimodal transportation and railway engineering education. He has several years of railroad and railroad consulting experience in planning, design, and operations in the United States and Finland, and is a member of several professional associations including AREMA, ASCE, ASEE and TRB.



Bill Leder

Bill Leder, P.E.

Bill Leder is the Roland A. Mariucci Distinguished Practitioner in Practice and Adjunct Professor of the Civil and Environmental Engineering Department at Michigan Tech. His interests include public transportation planning, engineering, airport planning and design, railroad engineering, design build contracting for large transportation projects, and project management. Professor Leder teaches courses in Public Transit Planning and Engineering and Introduction to Consulting Engineering. In addition, he applies his expertise from 34 years of service in the public sector to leading Senior Design Projects on campus.



Dr. Bill Sproule

Dr. Bill Sproule, P.E.

Bill Sproule is a Professor in the Department of Civil and Environmental Engineering with over 35 years of service in government, consulting, and university research and teaching in Canada and the U.S. He assisted in the development of the current Rail Transportation Program at Michigan Tech and teaches various transportation courses. Dr. Sproule's interests include transportation planning, traffic engineering, airport planning and design, public transit, automated people movers, and consulting engineering. Canadian born and a true ice hockey fan, Bill also teaches a class titled "Hockey History and Culture". Dr. Sproule has been recognized with several awards including a Michigan Tech Distinguished Teaching Award and the ASCE Horonjeff Award.



Pam Hannon

Pam Hannon

Pam Hannon is the Coordinator of the Michigan Tech Transportation Institute and provides support for the Rail Transportation Program in administration, development, and event organization.

Additional faculty and individuals actively involved in rail related activities at Michigan Tech include Dr. Tess Ahlborn, Dr. Bernie Alkire (retired), Joan Chadde, Dr. Devin Harris, Dr. John Hill, Dr. Ralph Hodek, Adam Johnson and Dr. Paul Sanders.

Ph.D. student Hamed Pouryousef and undergraduate students Stephen Chartier, Luke Gublo and Ed Statzer have provided invaluable assistance to the RTP on numerous research projects.

ALUMNI HIGHLIGHT

Tom Bartlett, Union Pacific

Tom graduated with a bachelor's degree in Electrical Engineering in 2008. He is currently the Assistant Manager of Methods and Research with Union Pacific Railroad in Omaha, Nebraska. Tom's career with Union Pacific began with a co-op from June to December of 2006. He was hired as a full-time employee in August of 2008.

"My first involvement in rail was through MTU's "Summer in Finland" rail education study abroad program. At the time, my professional interests lied elsewhere, but I welcomed the opportunity to travel abroad. During the program, I found the course material to be very interesting, and was particularly excited about the opportunities inside the railroad industry for EE's. Following the program, I received job offers into a co-op program from three railroad companies. I picked Union Pacific because they already had projects lined up for me, all of which had a high "cool-factor": remote-control locomotives and classification yard automation. When I returned to school, I became an officer in MTU's Railroad Engineering and Activities club, which allowed industry involvement while still in school. Following graduation, job offers came easy since there was a high demand for EE's in the railroad industry, and there were very few candidates with railroad-specific experience. I again chose Union Pacific because of my positive experience during the co-op, and advancement opportunities within the organization.

Union Pacific, along with most of the other large railroad companies in the US have designed a year-long training program that allows new-hire engineering grads to see and participate in a wide berth of the railroad business. I found the program extremely valuable. The travel and workload were intense, yet my principal responsibility was to learn; not to design/manage/produce. This was an ideal arrangement, since it allowed the knowledge to soak in. Some of my favorite experiences during this time included operating a freight train, changing the brushes of a locomotive traction motor, and meeting the faces on the ground that keep the railroad running. Near the end of the program, I began shadowing an engineer responsible for "wayside detectors": sensors and equipment that monitor passing trains for safety defects, such as out-of-round wheels and overheated wheel bearings. I'll be taking full responsibility for this position in the near future. The position is particularly exciting because the projects have a multi-department influence and allow involvement of all project phases, including R&D, construction, and subsequent maintenance.

Because of the railroad industry's eagerness to embrace new technology such as LIDAR, Machine Vision, Infrared Imaging, and much more, a motivated individual in the industry is not only guaranteed to have a stable and rewarding career, but also an interesting one."



Tom Bartlett: Former RTP student and current Assistant Manager of Methods and Research with Union Pacific Railroad.



GRADUATE HIGHLIGHTS



Brandon Maurisak displaying Krech Ojard Rail equipment at AREMA conference.

Brandon Maurisak, Krech Ojard and Associates

Brandon graduated in December, 2010 with a BS in Civil Engineering. Brandon has been working for Krech Ojard and Associates (KOA) since January 2011.

"My grandfather is a retired locomotive engineer, so I always had a dormant interest in the industry. Ultimately, the unique program offered at Michigan Tech helped spark a renewed interest in rail.

My work experience so far has dealt with designing connections between industry and the railroads. KOA works with many mine operators in the Midwest and Ontario to design the rail infrastructure needed to serve their mines. In the past few months the majority of my time has been spent designing a 10,000 foot pad adjacent to CN trackage to allow US Customs to selectively search intermodal trains. I enjoy the variety of projects that I've worked on; however, it can be challenging to keep track of the standards for each of the railroads."



Steffanie Pepin underneath the CSX railroad bridge that spans the Ohio River between Cincinnati, OH, and Covington, KY.

Steffanie Pepin, CSX Transportation

Steffanie graduated in May 2010 with a BS in Civil Engineering. She has been working with CSX Transportation since May of 2011.

"This job is my first experience in the rail industry. I learned of this position at the MTU 2011 Spring Career Fair. I was looking for a job related to bridges, but I didn't want to work for a consulting firm. I didn't realize I could pursue a career in bridges while working in the rail industry until I spoke with the CSX representative at MTU.

I am currently training to be either a Bridge Inspector, Bridge Manager, or Construction Engineer at CSX. I have been learning about the Engineering, Transportation, and Mechanical departments at CSX through classroom instruction and on the job training. I have also spent some time inspecting bridges and interacting with bridge construction crews at various job sites. I travel a lot in order to see different parts of our railroad system, and have been to 10 different states since I started. The best part about this job is that every day is different, there is always work to be done, and I am hardly ever in an office."



Andy Manty (right) at Norfolk Southern Railway.

Andy Manty, Norfolk Southern Railway

Andy Manty graduated in May 2010 with a BS in Civil Engineering. He has been working with Norfolk Southern Railway since July of 2010.

"Growing up in the Upper Peninsula of Michigan there wasn't much railroad activity, but I did grow up around the Lake Superior and Ishpeming Railroad (LS & I) which services the CCI iron mines in the Ishpeming area. At Michigan Tech I started to get involved with REAC and my interest in the rail industry grew. I got a 7 month co-op with Union Pacific Railroad in their Structures Department. I worked in Chicago and St. Paul, MN on bridge maintenance projects. After my co-op with UP my involvement with REAC continued and I worked for the Rail Transportation Program during the summer of 2009. I assisted a summer research project which looked at alternative material railroad crossties as well as on plans for the CN RTEC. I worked on the LS&I Rehabilitation and Pine Hill Scale project which covered several aspects of design, construction and operational impacts. After graduation I came to work for Norfolk Southern in their Maintenance of Way Department.

In my current position I work on different territories as needed or if there is a large project going on. Usually, I will inspect track or work with the section gangs to learn the finer points of railroading while on a territory. There is a large group of people retiring in the coming years, and a lot of railroad knowledge needs to be passed on to a new generation of railroaders. The best part about my job and the industry is that there will be something different everyday that will challenge you, and you can count on that happening every day."

STUDENT INTERNS/CO-OPS

Several Michigan Tech students were involved in rail industry internships or co-ops in 2010-2011.

David Rotter, Amtrak

"This summer I worked for Amtrak. Most of the summer I was working at 30th Street Station in Philadelphia, PA, where Amtrak has their main track engineering office. I enjoyed working there because I had the opportunity to apply skills and knowledge gained throughout my college career, especially what I learned from the Rail Transportation Program's Track Design Course. The main project that I worked on this summer was the 2012 turnout replacement program. As part of this project I combined standard plans for turnouts as well as survey data of the existing turnout using Microstation. This created a drawing that notes any special features or geometry issues to be sent to the manufacturer. I also had many opportunities to get out of the office for trips that greatly increased my knowledge of railways. Some of these trips included touring a Rockla concrete cross-tie manufacturing plant, riding Amtrak's track geometry cars, track inspection at New York Penn Station in the East River Tunnels, riding a Sperry rail defect detection car, surveying tracks to be replaced, and traveling the North East Corridor."



David Rotter, 2011 Amtrak Intern.

Dylan Anderson, CN Railway

"This past summer I had the opportunity to intern with CN Railway. I worked with track inspectors to collect curve data for a large portion of CN's Southern Region. This data was then compiled to be later used by a surfacing gang to correct any issues. I had the opportunity to hy-rail about 2000 miles of track and meet a large variety of people. Other experiences included riding on a geometry car and in the locomotive of Amtrak. The practical knowledge that I gained through this internship is invaluable as I look toward my potential future in the railroad industry."



Dylan Anderson, 2011 CN Intern.

Mandy Workman, MDOT High Speed Rail Department

"This past summer, I worked as an intern for the Michigan Department of Transportation High Speed Rail Department. "On the typical day my responsibilities in the office included organizing or revising funding applications, working on track charts, organizing bid packets & much more. The main project I worked on was upgrading Amtrak service between Kalamazoo and Dearborn to 110 mph. I also worked on several new projects to start commuter rail, one between Ann Arbor and Detroit, and another between Howell and Ann Arbor. For these new services, MDOT recently purchased old cars from the METRA service in Chicago. These cars are currently in the process of being renovated and upgraded. For the seats to be installed, the cars had to undergo safety hazard analysis. I got to participate in accelerating the seats with a dummy inside and bringing them to a rapid halt to simulate a crash. My favorite part was when the dummy went flying out of his seat and got all mangled up. Overall this job was a great way to get involved in passenger rail. I learned a lot from my experience and hope to remain working in the rail industry."



Mandy Workman, 2011 MDOT Intern.



RAILROAD ENGINEERING AND ACTIVITIES CLUB



Stephen "Sven" Chartier.

Since 2005, the Railroad Engineering and Activities Club (REAC) has served both the community and students of Michigan Technological University through education pertaining to the benefits and opportunities of the rail industry. At the same time, REAC provides valuable networking opportunities within the rail industry.

REAC was the first student chapter (in 2006) of the American Railway Engineering and Maintenance-of-Way Association (AREMA) and has grown into a multidisciplinary organization with over 60 members. REAC is highly active hosting monthly meetings, social events, field trips, volunteer events as well as participating in/hosting multi-organizational events.

During the 2010-11 curricular year REAC's meeting presentations covered a vast array of topics including electrical power generation for passenger trains and a comparison of Class 1 railroad to short line railroad work environments and operations. Being able to provide a versatile group of speakers and presenters reinforces REAC's vision to educate our multi-disciplinary organization. Some of last year's speakers included Michigan Tech interns speaking about their summer work experiences: Andy Manty (NS), Brent Maron (WSRR), Mike Stanfill and Ryan Mills (BNSF); Chao Ma (visiting scholar from China); Phil Pasterak (PB); and Jim Spiegel (EMD).

Field trips and conferences are an important and notable part of the REAC's activities. These give students firsthand experience with the rail industry. In addition, the 6th Annual Railroad Night was another success, pulling in over 130 participants including students, rail industry representatives, faculty, and the public. This year's speaker, Mr. Michael Franke, Assistant Vice President of State and Commuter Partnerships for Amtrak, presented "Passenger Rail Service in the United States".

REAC Membership

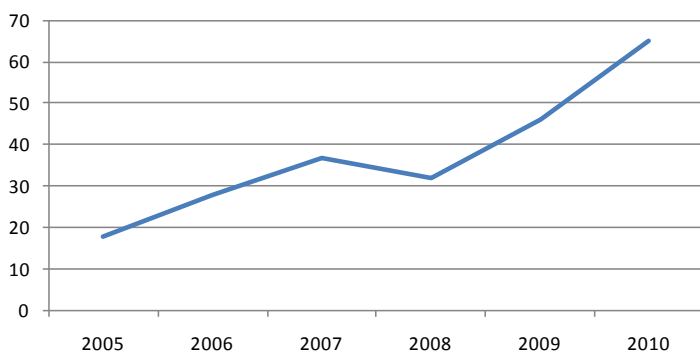


Figure 1: REAC Membership Growth.

As a new year begins, REAC can look upon last year as another successful and eventful year. As REAC presses forward and continually expands its student-industry involvement and education, we can start looking into the greater future to assist our current classmates as well as the youth that will one day take our places. Our drive and dedication have greatly increased our membership numbers (Figure 1). Similar to the rail industry and the expanding Rail Transportation Program (RTP), REAC is continually expanding its knowledge and resources in order to understand how to best educate students and the general community. REAC is proud to be part of this industry and will continue to push both educational and personal development to new levels.

Stephen Chartier
REAC President

STUDENT ACTIVITIES AND SCHOLARSHIPS

REAC Spring Trip, Wisconsin & Southern Railroad-Milwaukee Facilities

Wisconsin & Southern Railroad REAC field trips and conference visits offer great opportunities for students, providing them with a unique look into the rail industry. For our spring field trip, students visited the Wisconsin & Southern Railroad's (WSOR) Milwaukee facilities. Our day started with a safety briefing and an excellent presentation about WSOR's history (by Ken Lucht) and how their trains operate (by Steve Beske). This was a great opportunity for students to see the difference between operational and managerial tasks for a short line railroad in comparison to a Class 1 Railroad. After the presentation students were able to see two transload facilities (Plastic Pellets and Kerosene) off of WSOR's Milwaukee Subdivision at North Milwaukee Yard. From here, Brent Marsh (Tech Alumni) and Dave Bierman, of WSOR's Engineering Department, took us on a tour of three bridge structures (two steel and one concrete) along with four crossings. At each segment Mr. Marsh and Mr. Bierman described the status of the structure, date built, and future planned upgrades. They also pointed out several different signs to watch for and when maintenance should take place. This allowed students to learn about general maintenance to help prepare them for their future careers in the industry. Finally, the WSOR trip finished up with a look at an old Soo Line steam locomotive 1003 being restored at the Wisconsin Automotive Museum. The trip was concluded with a stop at the Green Bay Railroad Museum where we were able to tour Dwight D. Eisenhower's European Train and as well as listen to a few historic stories on some of the other incredible trains in their collection. REAC's spring trip was another success, providing students with a great look into the rail industry, both present and past.



Group photo at the Wisconsin Automotive Museum with the Soo Line 1003 (above). Students looking at a newly constructed crossing (below).

Rail Transportation Program Congratulates Scholarship Winners

The Michigan Tech Rail Transportation Program (RTP) students received the majority of scholarships offered by the American Railway Engineering and Maintenance-of-Way Association (AREMA) Educational Foundation this year. Twelve of the thirty eight available scholarships totaling \$15,000 were awarded to the following RTP students. In addition, seven Tech students were internally awarded Union Pacific and CN scholarships, totaling \$10,000.

Dylan Anderson - AREMA Committee 12 - Rail Transit Scholarship, CN Scholarship
 Ryan Blessing - AREMA Committee 27 - Maintenance-of-Way Work Equipment Scholarship, CN Scholarship
 Stephen Chartier - Elizabeth Ann Porterfield Memorial Scholarship, Union Pacific Scholarship
 Luke Gublo - AREMA Committee 33 - Electrical Energy Utilization Scholarship, Union Pacific Scholarship
 John Hatch - Michigan Tech Alumni Scholarship
 Tyler Kuzee - John J. Cunningham Memorial Scholarship 1, CN Scholarship
 Lars Leemkuil - HNTB Founder's Scholarship
 Adam Newton - Michigan Tech Alumni Scholarship
 Ryan Rintamaki - AREMA Committee 27 - Maintenance-of-Way Work Equipment Scholarship, Union Pacific Scholarship
 Edward Statzer - AREMA Committee 27 - Maintenance-of-Way Work Equipment Scholarship, CN Scholarship
 David Sutton - AREMA Committee 30 - Ties Scholarship
 Damian Wallner - Robert & Sue Boileau Rail Engineering Scholarship



YOUTH ACTIVITIES

Rail and Intermodal Transportation Summer Youth Program

For the second consecutive year, the Rail Transportation Program at Michigan Tech and the Transportation and Logistics Management Program at the University of Wisconsin-Superior organized the Rail and Intermodal Transportation Summer Youth Program (SYP). As with our first group of high school students, we were pleasantly surprised at the knowledge level and excitement of this summer's attendees who came from four different states all around the US.

"My favorite part of the week was my trip to Duluth, MN. Something I learned was how to calculate grade, curve and rolling resistance."
-SYP student

The week long SYP exploration is a scholarship program which takes place

on both university campuses with classroom learning modules in rail and intermodal transportation along with trips to industry venues. Classroom topics included: operations, international railroads, urban transit, track structure, magnetic levitation, signals, and safety. Learning modules were supplemented by classroom visits from academia and industry experts.

Students visited the Lake Superior & Ishpeming Railroad (LS&I) in Marquette, MI as well as the Lake Superior Railroad Museum, the Maritime Museum and the BNSF Rail Yard in Duluth, MN. The week ended with a trip to the Houghton County Historical Museum and rides on the old Lake Linden and Torch Lake Railroad.

We look forward to hosting students again for a third year. Applications and information about joining us for 2012 can be found on the SYP website starting in November at <http://youthprograms.mtu.edu/students-prospective-syp.php>

National Summer Transportation Institute (NSTI)

This competitive, full-scholarship program continues to attract students with the highest GPAs and academic recommendations. Funded for the third year by the Federal Highway Administration (FHWA), 30 students from across the nation arrived on the Michigan Tech campus for a two week stay.

NSTI is geared towards educating today's youth about the opportunities available in the transportation industry. Classroom learning sessions, hands-on activities and competitions, industry expert presentations, and numerous field visits to transportation venues throughout the Upper Peninsula provided a broad range of topics to the students. Rail transportation was also discussed during several NSTI modules.

Construction Career Days

A specific objective of all USDOT-RITA sponsored University Transportation Centers is education and workforce development. For the 4th consecutive year, the University Transportation Center for Materials in Sustainable Transportation Infrastructure (MiSTI) and the Center for Technology and Training (CTT) have joined with the Michigan Construction Career Days team to sponsor the Construction Career Days event.

The annual event provides a combination of construction education, training and career informational booths and hands-on learning activities, including the operation of construction equipment. Students are able to interact with construction professionals on site as well as experience the usage of tools and equipment used daily in these careers.

Funding support provided by the UTC-MiSTI allows Michigan's schools to offset transportation costs to the event for middle and high school students. Undergraduate and graduate students and staff from the UTC-MiSTI, the Department of Civil and Environmental Engineering, and the Rail Transportation Program answered questions and provided information at Michigan Tech's information booth to the 2,400 student attendees.



Field visit to BNSF rail yard in Superior, WI.



Students load test their self constructed bridges. Winners get to visit the very top of the Mackinac Bridge.



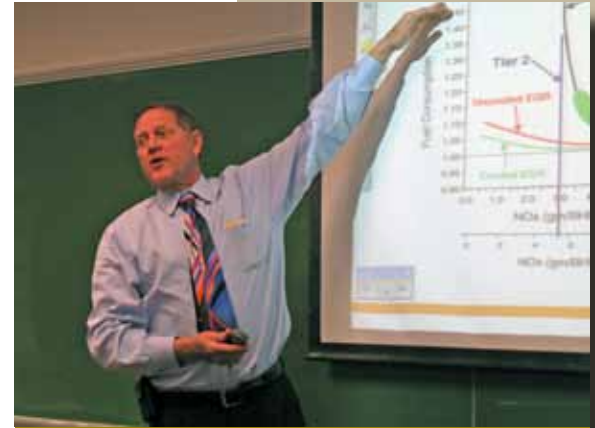
"Hands-on" at Construction Career Days.

RAILROAD EDUCATION AT MICHIGAN TECH

In addition to the past course offerings of CE 4404-Railroad Engineering; CE 5409-Track Engineering and Design; and CE 5408-Public Transit Planning and Engineering, Michigan Tech introduced a new course, CE 4490-Rail Transportation Seminar for the academic year 2010-2011. Also, students from the Transportation Enterprise completed an industry funded project.

CE 4490 – Rail Transportation Seminar

Ten students enrolled in the inaugural Rail Transportation Seminar which is a one credit course to discuss the current technologies and developments in the rail industry. Students performed a literature review of main industry magazines and selected a list of topics to be included in the course. Some of the topics covered included High Speed Rail in the Midwest (presentation by Phil Pasterak, PB) and Positive Train Control (presentation by Matthew Glynn, CN). Students also conducted their own research on a selected topic, followed by group presentations. All presentations were followed by reflections and group discussion.



Mark Stehly presenting at Rail Transportation Seminar.

CE 4404 – Railroad Engineering

In spring 2011, Railroad Engineering was approved as a technical elective for Mechanical Engineering students. The course has been designed to introduce students to various aspects of rail transportation and railroad engineering, making it an ideal candidate for a multi-disciplinary audience. As a result, nine out of 25 students in the fall of 2011 have come from the Mechanical Engineering department.

Transportation Enterprise Project – CXT/CN Sustainability Assessment

Sustainability is a growing concern for many companies in the twenty first century. The objective of this project was to provide a definition for sustainability and to create sustainability metrics that fit the defined views on sustainability. These are beneficial to society as a whole and can be used to measure current and future sustainable progress by CXT Concrete Ties, Inc. Michigan Tech's Transportation Enterprise was sponsored by L.B. Foster's Subsidiary company, CXT, Michigan Tech's Rail Transportation Program (RTP), CN Railroad, the University Transportation Center for Materials in Sustainable Transportation Infrastructure (UTC-MiSTI), and the Great Lakes Cement Promotion Association to complete this project.

During the first semester the Enterprise team members laid the foundation for determining metrics through research of CXT's operations and the goals of their client (CN railroad), and of sustainability and ways to model sustainability. The main focus of the second semester was to create a model for CXT's Spokane tie production facility that can be used annually to provide metrics for environmental sustainability that could serve as benchmarks. The main outcome of the project was a prototype environmental sustainability model to calculate the CXT Spokane tie production facility's carbon footprint and to assess possible areas of improvement. Additionally, the team performed research activities related to recycling methods for concrete ties.



Transportation Enterprise team members visiting CXT Concrete Tie facility.



CONFERENCES & PROFESSIONAL DEVELOPMENT



Pasi Lautala, Janne Vartiainen and Hamed Pouryousef at the TRB Annual Meeting.



Henri Frey, Bill Leder, and Francois Blin at the APM Conference Welcoming Reception in Paris, May 2011 in the Palais de Congres, co-sponsored by ASCE and CNISF.

Conferences and professional development are an important part of the RTP at Michigan Tech. In 2010-2011, students, staff and faculty published ten journal or conference papers and participated in (or helped to organize) seven conferences or professional events outside campus. The following is a listing of papers, conferences and workshops in 2010-2011.

- **American Railway Engineering and Maintenance of Way (AREMA) 2010 Annual Conference, Orlando, FL, August, 2010.** Five RTP students participated in this year's conference. RTP graduate Shane Ferrell and Dr. Pasi Lautala also presented a paper "Rail Embankment Stabilization on Permafrost – Global Experiences".
- **Transportation Research Board (TRB) Annual Meeting, Washington, D.C., January, 2011.** Pasi Lautala presented a poster "Spatially-Based Model to Determine Price-Optimal Log Transportation by Trucks and Rail in the Upper Mid-West – Development and Outcomes". Ph.D. student Hamed Pouryousef also presented "High Speed Rail Access to Existing Stations in Downtowns". Visiting student Janne Vartiainen (Finland) and visiting scholar Han Mei (China) also participated in the conference.
- **Joint Rail Conference 2011 (JRC), Pueblo, CO, March, 2011.** Dr. Pasi Lautala served as Chairman for the Railroad Infrastructure Engineering Track as well as presented the paper "Railway Education Today and Steps toward Global Education" co-authored by our first visiting scholar, Chao Ma. Hamed Pouryousef presented his paper "Sensitivity Analysis of Track Maintenance Strategies for the High Speed Rail (HSR) Services". Visiting scholar Han Mei also participated in the conference.
- **High Speed Rail (HSR) 2011 Workshop, Baltimore, MD, May, 2011.** Pasi Lautala participated in the High Speed Rail 2011 workshop organized by the American Public Transportation Association.
- **Automated People Mover (APM) Conference, Paris, France, May, 2011.** Bill Leder, Adjunct Professor and Distinguished Practitioner in Residence was one of the coordinators of this year's international conference.
- **9th World Congress for Railway Research (WCRR), Lille, France, May, 2011.** Pasi Lautala presented the paper "Universities in Europe and the United States Collaborate to Develop Future Railway Engineers".
- **Finnfest 2011, San Diego, CA, August, 2011.** Pasi Lautala gave a presentation titled "U.S. vs. Finland Transportation Issues" as part of the festival.
- **2011 International Heavy Haul Association Conference - Railroading in Extreme Conditions, Calgary, CA, June, 2011.** Shane Ferrell attended the annual conference and presented "Embankment Stabilization Techniques for Railroads in Permafrost Soils". Additionally, Dr. Devin Harris, co-PI on the cold climate railroad research project with the University of Alaska-Fairbanks, presented the paper "Responding to Emerging Demand - New Generation of Cold Climate Rail Lines in the World".

In Print:

- Harris, D.K., Lutch, R.H., Ahlborn, T.M., and Duong, P. (2010 – accepted). "Optimization of a Prestressed Concrete Railroad Cross-tie for Heavy-Haul Applications." ASCE Journal of Transportation Engineering. Publication expected in November, 2011.
- Lautala, P.T., "Global Railroads", invited article submitted to the Encyclopedia of Global Studies. Sage Publications. Publication expected in 2011.

In Film:

RTP Director Pasi Lautala spent two weeks this year in China and Tibet serving as an expert in cold climate railroads for the making of a National Geographic documentary titled "Megastructures: Extreme Railways". The film, produced by the British film company Gamma Project, highlights the construction of the highest railway line in the world, the Qinghai-Tibet Railway. The film focuses on the challenges of building the railway over hundreds of miles of permafrost in extreme elevations and temperatures. The documentary aired in the United Kingdom on the National Geographic Channel in May 2011.

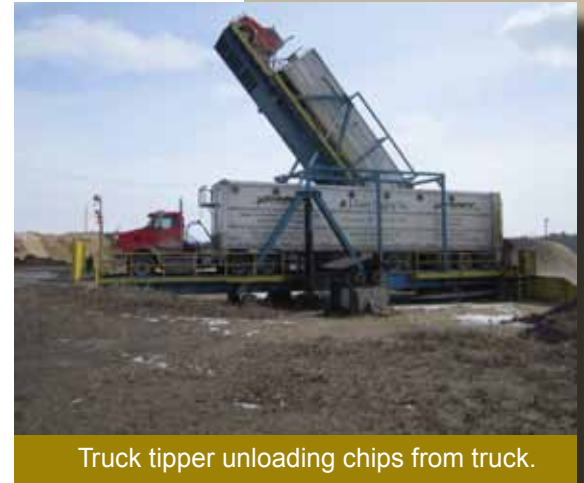
RTP RESEARCH PROJECT HIGHLIGHTS

Improving Log Transportation with Data Based Monitoring and Analysis in Northern Wisconsin and Upper Peninsula of Michigan

Minimizing transportation costs is essential in the forest products industry, but an understanding of system inefficiencies requires sufficient data. The objective of this project, sponsored by the National Center for Freight and Infrastructure Research & Education (CFIRE), was to use inexpensive Global Positioning System (GPS) tracking devices to analyze truck movements and to identify potential improvements to the log transportation system in Northern Wisconsin and the Upper Peninsula of Michigan.

The one year project included the selection and testing of GPS technology through a pilot study, followed by two rounds of data collection with analysis. Since the GPS systems did not have real time tracking capabilities, one month of movement data was collected by the devices for each test and supplemented with log sheets kept by the drivers. Both log and chip trucks were analyzed for features such as operational patterns, stop time and reason, truck mileage and performance records, identification of unloading locations, and idling truck fuel consumption analysis.

The research revealed that both log and chip trucks spent a significant portion (40-50%) of their daily operation stopped for activities. From a comparative point of view, chip truck unloading times were significantly shorter than log trucks, mainly due to the truck tippers used for chip trucks. Chip trucks also moved approximately 40 miles more per day than log trucks. One of the topics under investigation was truck idling. Idling is an important consideration, as truck engines are rarely turned off during daily operations. The fuel consumption analysis during idling showed that for each dollar increase in the fuel price, an additional \$700 was spent on average annually due to idling costs.



Truck tipper unloading chips from truck.



The effect of diesel fuel price on the average annual cost of idling.

Tuning Transatlantic Cooperation in Rail Higher Education (TUNRail)

This is a policy oriented project to study the demand and availability of rail higher education in the European Union (E.U.) and the United States (U.S.) The project is in its final stages. The focus of TUNRail was to increase the transparency of railway higher education programs, as well as to increase the understanding of the synergies and differences of railway systems and higher education on both sides of the Atlantic. In essence, TUNRail developed an inventory of the current learning opportunities and competencies and compared them to the demands of industry. The outcomes were used to make recommendations to close identified gaps as well as to encourage strategies for "transatlantic" cooperation and knowledge exchange within the framework of rail higher education. The outcomes of research will be released in an Electronic Handbook at www.tunrail.info and through a web conference organized by the research team.

ON-GOING RESEARCH PROJECTS

Three projects are in the final stages of research with final reports currently being drafted:



Logs and loaded rail cars at Verso paper facility, site visit, Aug 2010.

“Project 3 of Frontier Renewable Resources Center of Energy Excellence: Improving Forest Feedstock Harvesting, Processing and Hauling Inefficiencies”

A final report for the collaborative project with Michigan State University is being drafted focusing on the results of the two year research with recommendations for an efficient, sustainable and cost effective forest feedstock harvesting, processing and hauling of forest biomass to a proposed cellulosic ethanol production facility in Kinross, Michigan.

Our role was to evaluate the current biomass transportation systems and develop an inventory of existing road, rail and water infrastructure. Operational aspects of the current transportation system were evaluated for the capability of the system to provide sufficient levels of equipment and services to deliver raw materials required for full operation. Principle Investigator: Dr. Pasi Lautala, CEE.

“Forestry Biofuel Statewide Collaboration Center (MI) Transportation Study”

The project sponsored by the Michigan Economic Development Corporation focused on assisting and evaluating the capabilities of the state of Michigan’s transportation system to deliver biomass feedstock to a factory gate. An evaluation of current road, rail and marine transportation infrastructures was conducted as well as other potential supply chain variables such as seasonal weight restrictions, location, multi-modal challenges and conditions of truck/rail landings, yards, docks and access roads. An inventory of the quantity and current types of transportation equipment in use was conducted and the team identified challenges between modes for efficient use of a full multi-modal transportation network. Principle Investigator: Pasi Lautala, CEE.

“Synthesis of Railroad Engineering Best Practices in Deep Seasonal Frost and Permafrost Areas”

This final report is in its last review stage. One of the first research projects for the RTP, the objective of this study was to advance understanding of the requirements for the design, construction and maintenance of rail infrastructure in arctic environments. Cold climate regions present special circumstances for the development of railroads in areas of deep seasonal frost and permafrost.

The two year research project, led by PI Dr. Pasi Lautala, included scan tours of existing and planned railways located in cold climate areas, a literature review focusing on relevant railway transportation research as well as an investigation of current design practices in the performance of concrete ties in arctic conditions. Principle Investigator: Pasi Lautala, CEE.

On Going Research Projects:

Amsted Materials Research

Amsted Rail is working with the Michigan Tech Materials Science and Engineering Department to develop advanced bearing materials for freight car applications. Principle Investigator: Paul Sanders, MSE.

Driver Behavior at Rail Crossings

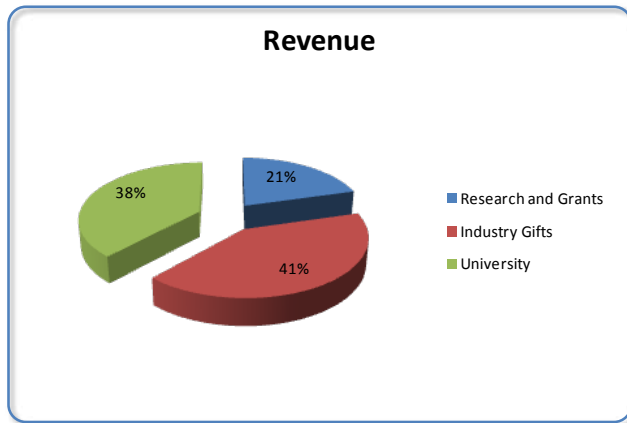
The objective of this research project is to understand how drivers respond to rail crossings on rural, low-traffic roads. In this study we present a variety of rail crossings with different markings and safety features using a NADS Minsim driving simulator with a recently developed set of train crossing scenarios and train cars and engines. In some cases, a train is present and in others there is no train. Driver response is measured both physiologically through heart rate measurements as well as by measuring vehicle characteristics such as braking distance and deceleration profiles as the driver approaches a crossing. Among the issues studied are driver responses to various rail crossing signs as well as the driver behavior related to the expectation of a train approaching. The end result of this project will be a better understanding of how drivers recognize crossing situations, and how they behave in rural low-traffic conditions where train traffic is rare. Principal Investigator: Dr. John Hill, MEEM.



NADS Driving Simulator.

RTP Funding

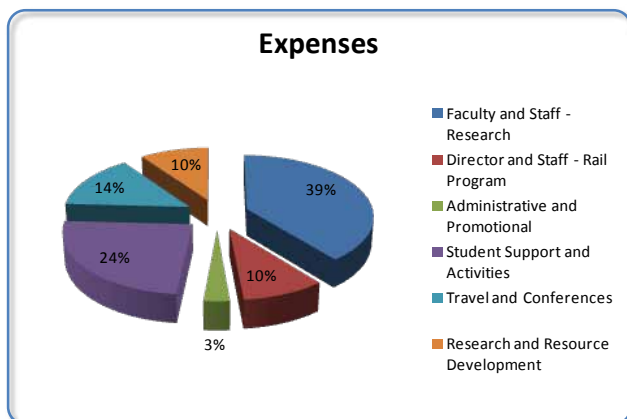
Financial support for the Rail Transportation Program is received internally at Michigan Tech from the Office of the Provost and Vice President for Academic Affairs, the Department of Civil and Environmental Engineering (CEE), and the Michigan Tech Transportation Institute (MTTI). External funding consists of sponsored program research projects, industry contributions and gifts from private individuals.



RTP Expenditures

Expenditures to support the rail transportation activities have been divided into several categories:

- **Faculty and Staff**- Research expenses are wages and salaries plus overhead charges specific to sponsored research projects.
- **Director and Staff**- Rail program expenditures include director and staff salaries used to support and continue development of the Rail Transportation Program.
- **Student Support and Activities** includes expenses which benefit students directly such as tuition and stipends, expenses from conference fees and field visits, travel, and sponsorship for student events and REAC activities.
- **Travel and Conferences** includes all non-student support for travel and participation in rail and educational conferences and meetings to facilitate the development of the rail transportation program. This includes travel expenses incurred in sponsored research projects.
- **Administrative and Promotional** expenditures are expenses incurred in the operation of the rail program.
- **Research and Resource Development** expenditures are invested by the RTP to increase its resources (books, software, etc) or to conduct internally funded research activities.



FINANCES

Michigan Tech Rail Transportation Program Vision

The vision of the Rail Transportation Program is to expand its service to the rail industry by offering an interdisciplinary program in railroad engineering and urban rail transit that will provide opportunities for our students and faculty to participate in the development and operation of rail transportation in the 21st century. For more information, visit the Rail Transportation website at <<http://www.rail.mtu.edu>>.



About the Michigan Tech Transportation Institute

The Michigan Tech Transportation Institute serves as an umbrella organization bringing together the cross-disciplinary centers, programs and researchers from across campus conducting transportation related research and education initiatives that address national and global needs. A collaborative effort in providing education, outreach, technology transfer, workforce development and multi-disciplinary research, MTTI is comprised of:

Center for Technology and Training (CTT), www.ctt.mtu.edu

The Center for Technology & Training provides transportation outreach and education; software development; and research services to support agencies that manage public infrastructure.

Rail Transportation Program (RTP), www.rail.mtu.edu

The multi-disciplinary Rail Transportation Program uses three integrated activity groups to increase rail exposure and to engage students, faculty and industry partners in rail transportation—Projects and Research, Education, and Events and Extracurricular Activities.

University Transportation Center for Materials in Sustainable Transportation Infrastructure (UTC-MiSTI), www.misti.mtu.edu

The UTC-MiSTI is one of sixty US Department of Transportation funded University Transportation Centers conducting research, education, technology transfer, and workforce development to assist state and national transportation agencies in achieving their respective missions.

Tribal Technical Assistance Program (TTAP), www.ttap.mtu.edu

The Tribal Technical Assistance Program is one of seven regional programs which make up a nationwide effort jointly financed by the Federal Highway Administration (FHWA) and the Bureau of Indian Affairs (BIA) to provide the latest technology, training, and information resources to tribal transportation and planning personnel.

Center for Structural Durability (CSD), www.mtti.mtu.edu

The mission of the Center for Structural Durability is to promote new opportunities for research, education and technology in the area of durable structural highway systems that will directly assist MDOT in achieving its performance goals of safety, mobility and productivity of the Michigan Transportation System.

Transportation Materials Research Center (TMRC), www.tmrc.mtu.edu

The Transportation Materials Research Center is a Michigan Department of Transportation (MDOT) funded research center established to provide expertise and facilities in support of MDOT's material research and investigations.

About Michigan Technological University

Michigan Technological University (mtu.edu) is a leading public research university developing new technologies and preparing students to create the future for a prosperous and sustainable world. Michigan Tech offers more than 130 undergraduate and graduate degree programs in engineering; forest resources; computing; technology; business; economics; natural, physical and environmental sciences; arts; humanities; and social sciences.



www.mtu.edu