A NATIONAL UNIVERSITY TRANSPORTATION CENTER
AT MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

CENTER FOR TRANSPORTATION INFRASTRUCTURE AND SAFETY

ADVANCED MATERIALS, TRANSITION-STATE FUELS AND NON-DESTRUCTIVE TESTING TECHNOLOGIES

Fifth Year Annual Report
July 1, 2010 – June 30, 2011

PART A: CORPORATE STYLE ANNUAL REPORT

Submitted by
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Interim Center Director

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Fifth Year Annual Report
Part A: Corporate Style Annual Report

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OVERVIEW: CENTER FOR TRANSPORTATION INFRASTRUCTURE AND SAFETY

Introduction

Throughout four years of operation as a National University Transportation Center (NUTC), the Center for Transportation Infrastructure and Safety (CTIS) has become a Center of Excellence on the theme areas of advanced materials, transition-state fuel vehicle infrastructure and non-destructive testing technologies.

CTIS has provided the faculty, staff and students at Missouri University of Science and Technology (Missouri S&T) with the means for establishing key relationships with transportation-oriented state and federal agencies and industry partners. With NUTC leverage, the research and development (R&D) projects carried out at Missouri S&T have created the critical mass and the track record necessary to establish a Center of Excellence.

In addition to contributing to successful and relevant R&D projects, with the development of significant educational resources and by facilitating the transfer of advanced technology developed within the Center's theme areas, CTIS has impacted the quality of available education for engineers and transportation professionals, equipping engineers with interdisciplinary skills and experiences. As a result of CTIS activities, new academic programs for educating better-prepared engineers have been created at Missouri S&T and the University has become, and continues to be, the provider of the Local Technical Assistance Program (LTAP) for the state of Missouri.

Since its inception, CTIS has performed work in accordance with its strategic plan to accomplish projected goals in the areas of education, research and technology transfer. CTIS has put forth significant efforts to become highly visible and credible with the aim to recruit and retain quality students, faculty and professionals and to make significant contributions to transportation-related fields.

Future

The future activities of CTIS will continue to draw on the capabilities and campus expertise in the areas of advanced materials, transition-state fuel vehicle infrastructure and non-destructive testing. Partnerships with industry professionals and organizations will be continuously sought out and developed.

In particular, CTIS aims to become the point of reference and preferred partner of industry organizations that have not traditionally been involved with transportation-related applications and activities. The intention is to improve the quality and lifespan of existing transportation infrastructure using the broadest-based technology possible and to stimulate the economic viability of U.S. corporations.

Mission and Theme

Mission: The mission of the Center for Transportation Infrastructure and Safety (CTIS) at Missouri S&T is to advance U.S. technology and expertise in the many disciplines comprising transportation through the mechanisms of education, research and technology transfer at university-based centers of excellence.

Theme: To address national needs in the areas of transportation infrastructure and safety, focusing on the following topical areas:

- **Advanced materials** including constructed facilities security, which will involve several tasks:
  - The development, manufacture and application of modern construction materials
  - Installation processes and engineering design
  - Standardization and code approval of products and design protocols

- **Transition-state fuel vehicle infrastructure** leading to a hydrogen economy, which will require two critical tasks:
  - Development of safety codes, standards and regulations
  - Infrastructure development and deployment

- **Non-destructive evaluation (NDE) technologies and methods** including monitoring and evaluation of new and repaired structures and system components.

Advanced materials developed for use in transportation infrastructure offer superior mechanical properties, long-term durability and design flexibility. R&D in advanced materials address the growing needs for strengthening/rehabilitation of aging structures and for the design/construction of new structures to more stringent requirements and for extended service life. These materials apply to all modes of surface transportation.

Alternative fuel vehicles face the same implementation challenges as that of hydrogen vehicles. Research, development, demonstration and deployment activities of alternative fuel (including hydrogen) vehicles and supporting infrastructure across all modes of transportation address the growing need for a successful transition to a hydrogen economy.

Recent advances in sensor technologies and NDE techniques offer new methods of non-intrusive, in-situ monitoring of the health, geometric, environmental and structural characterization of civil structures and their supporting systems. NDE sensor technologies and methods enable more accurate, sensitive, cost-effective, rapid and straightforward evaluations. Integration of NDE technology to existing and future infrastructure systems will improve network evaluation and enhance the safety of the transportation infrastructure.

The choice of the Center theme comes from an analysis of state and national needs/opportunities, as well as the strengths/potential of Missouri S&T. We are walking the bridge that connects the transportation infrastructure of the second millennium to that of the third millennium. Existing infrastructure was conceived to support vehicular traffic powered by fossil fuel and has dramatic shortcomings in terms of durability and congestion. But the future will be an intelligent

infrastructure incorporating advances in information technology and supporting a new generation of alternative fuels up to an ending point, which is conceivably hydrogen, with all the associated challenges in terms of safety, deployment and market acceptance.

Missouri S&T determined that it is of critical importance to its own mission and future, as well as the economical success of the state of Missouri, to focus on advanced materials in order to: a) help with the upgrade and maintenance (including security hardening) of existent infrastructure; and b) contribute to the development of new infrastructure. Similarly, NDE methods and techniques are a core area of expertise at Missouri S&T and their development and deployment continues to help with health monitoring of existing infrastructure and is becoming an integral part of new infrastructure to ensure both acceptance and safety. Finally, the Center takes a systematic approach to tackle the challenge of alternative fuels (including hydrogen) as the only viable methodology for the safe deployment of a new form of transportation.

MANAGEMENT STRUCTURE

This section presents an overview of the Center's management structure and staff, those individuals who actively contribute to the functioning of Center activities, as well as information about the composition and purpose of the Research Advisory Board.

Center Staff

In addition to the Interim Director, the following individuals actively contribute to the management/operation of the Center: one associate director, four office staff persons and three laboratory staff persons. The Research Scholar position is currently open.

Name	Title	Address/Phone/Fax/E-mail	Responsibilities
Myers, J. J.	Interim Director	325 Butler-Carlton Hall, Rolla MO 65409 573-341-6618/6215 jmyers@mst.edu	Center management
Sheffield, J.	Associate Director	331 Toomey Hall, Rolla MO 65409 573-341-6073/4607 sheffld@mst.edu	Research activities
Spitzmiller, G.	Admin. Assistant	221 ERL, Rolla MO 65409 573-341-7170/6215 spitz@mst.edu	Administration and accounting
Sherman, A.	Senior Secretary	222 ERL, Rolla MO 65409 573-341-7884/6215 abigayle@mst.edu	Clerical support/ student appointments
Geisler, C.	Secretary	223 ERL, Rolla MO 65409 573-341-4497/6215 geislerc@mst.edu	Clerical support
Dafni, J.	Technical Editor	220 ERL, Rolla MO 65409 573-341-7848/6215 dafnij@mst.edu	Publications/website
Open Position	Research Scholar	218 ERL, Rolla MO 65409 573-341-6223/6215	Research activities/mentoring
Cox, J.	Sr. Research Specialist	G-8 ERL, Rolla MO 65409 573-341-6742/6215 coxjn@mst.edu	Laboratory and field testing/coordination
Bullock, J.	Lab/Research Technician	G-8 ERL, Rolla MO 65409 573-341-7895/6215 bullockjr@mst.edu	Laboratory testing/ equip. maintenance

OVERVIEW OF EDUCATION, RESEARCH, AND TECHNOLOGY TRANSFER PROGRAMS

This section presents a summary and overview of all projects awarded during Year V (2010-2011).

Research Projects

R283— Imaging of Voids Beneath Bridge Bent Using Electrical Resistivity Tomography
[Anderson, N., PI – Missouri S&T, new in this reporting period]

In an effort to better understand and define the lateral and vertical extent of shallow water-filled voids beneath a bridge bent (I-44, across Gasconade River), MS&T will acquire electrical resistivity tomography (ERT) data along six traverses immediately adjacent to the bent in question. Four of the ERT traverses will be laid out parallel to the river, two on either side of the bridge bent in question. Depending on site access constraints, the other two ERT traverses will be laid out roughly perpendicular or at a skewed angle to the river on either side of the existing bridge bent. Our layout may need to change due to site access and potential issues working around the construction at the site. The intent is to use this non-invasive technology to map the lateral and vertical extent of the water-filled voids so that appropriate mitigation plans can be developed.

R282—Field Evaluation of Hybrid-Composite Girder Bridges in Missouri - UMC
[Washer, G., PI – University of Missouri-Columbia, new in this reporting period]

On August 11th, 2010 the allocation of $360,000 in Highways for Life funds was made for the use of Hybrid Composite Beams (HCB) on Route 97 over Sons Creek in Dade County, one of three bridge replacements as part of the Safe and Sound Bridge Improvement Program.

These HCBs are comprised of three main sub-components that are a shell, compression reinforcement and tension reinforcement. In the preferred embodiment, the shell is comprised of a fiber reinforced plastic (FRP) box beam. The compression reinforcement consists of cement or concrete which is pumped into a profiled conduit within the beam shell. The tension reinforcement consists of carbon, glass or steel fibers anchored at the ends of the compression reinforcement.

This study examines the field performance of these HCB members through in-situ monitoring and load testing over a two year period.

R281—Field Evaluation of Hybrid-Composite Girder Bridges in Missouri
[Myers, J., PI – Missouri S&T, new in this reporting period]

On August 11th, 2010 the allocation of $360,000 in Highways for Life funds was made for the use of Hybrid Composite Beams (HCB) on Route 97 over Sons Creek in Dade County, one of three bridge replacements as part of the Safe and Sound Bridge Improvement Program.

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This study examines the field performance of these HCB members through in-situ monitoring and load testing over a two year period.

R278— Lightweight Concrete Modification Factor for Shear Friction
[Volz, J., PI – Missouri S&T, new in this reporting period]

The objective of the proposed study is to design, test, and evaluate high-volume fly ash concrete mixtures. Traditional specifications limit the amount of fly ash to 40% or less cement replacement. This program attempts to increase the ash content to 75% while maintaining strength and durability characteristics. Various mixtures and chemical additives will be tested.

The funding would allow calorimetry studies of potential admixtures and additives necessary to increase the percentage of fly ash in the various concrete mixes. The calorimetry would allow a more diverse and extensive set of variables to be studied, and would assist the researchers in developing mixes specific to each type of fly ash available. The funding would also allow testing for leachability of the HVFA concrete to existing FA concrete and non-FA concrete using TCLP, ASTM 3987, and the new LEAF methods, and to potentially evaluate the various products for radioactivity.

R277—The NASP Bond Test as a Predictor of Strand Bond, Transfer Length, and Development Length
[Volz, J., PI – Missouri S&T, new in this reporting period]

The objectives of this project are to compare the results of the newer NASP Bond Test to the traditional Moustafa Pullout Test and evaluate the NASP test as a potential replacement for the Moustafa test, and to evaluate the ability of the NASP Bond Test to predict the transfer and development lengths of strand in unconventional concretes, such as SCC and HVFA concrete.

The bond of prestressing strand to concrete is an important part of a strand's ability to develop passable transfer lengths and development lengths. While some tests have been recommended for testing bond of prestressing strand, there is currently no ASTM standard bond test. The Moustafa Pullout Test has typically been used to evaluate bond, but recently, a newer bond test from the North American Strand Producers (NASP) has been gaining popularity. However, it is still unclear how the NASP test compares to the Moustafa test. In addition to the uncertainty regarding the most suitable test method, another problem with bond testing is the limited applicability of the results. The recommended procedures for both of these tests specify a mix or mortar for the specimens, and while this procedure is adequate for comparing the relative bond of different strands from different sources, the results do not give a definitive indication of how the strands will perform in actual conditions, especially if the strand is in an unconventional concrete, such as self-consolidating concrete (SCC) or high-volume fly ash (HVFA) concrete.

R276—Lightweight Concrete Modification Factor for Shear Friction
[Sneed, L., PI – Missouri S&T, new in this reporting period]

This project is aimed at studying the influence of aggregate type on direct shear transfer across an interface of concretes cast at different times. The shear friction design concept is applicable in conditions where direct shear must be transferred across a structural concrete plane or interface, such as an existing crack or an interface between dissimilar materials or concretes cast at different times. Shear friction provisions are commonly used in the design of precast-prestressed concrete elements and connections in building and/or bridge structures including corbels, dapped double tees, beam bearings, and diaphragms. These types of connections are critical because there is little or no redundancy.

Data used to develop shear friction provisions in both the ACI 318 Code and the PCI Design Handbook are predominantly from experiments with specimens constructed of normalweight concrete (NWC). Only a limited number of studies have been performed on lightweight concrete (LWC), and particularly for conditions with concrete surfaces cast at different times. This condition may exist, however, due to precast plant practices and the increasing use of self-consolidating concrete (SCC), and where projecting elements might be cast after the underlying concrete has partially hardened. Alternatively, projecting elements might be cast in advance and inserted into the fresh concrete when the main member is cast, resulting in a similar condition. It should also be noted that the influence of SCC on the interface shear has not been thoroughly studied. In summary, lack of LWC test data and clear and consistent design provisions underscore the need for a systematic approach to isolate and examine the influence of factor λ on the interface friction so that it can be applied clearly and confidently in shear friction design.

R275—Bridge on Arnault Branch, Washington County, Missouri
[Chen, G., PI – Missouri S&T, new in this reporting period]

The objective of this study is to further validate two fiber reinforced polymer (FRP) reinforcement concepts and one low corrosion application of cladding steel in field condition of a replaced three-span bridge with a long-term monitoring system. The three spans of the new bridge will be constructed with precast FRP-reinforced concrete panels on steel girders, precast FRP-reinforced concrete panels on concrete girders, and precast FRP-reinforced concrete box girders. The two spans with conventional bridge girders are considered in order to extend the applicability of validated technologies into both new construction and the deck replacement of existing bridges. The conventional girder spans will also provide good benchmarks for the third span with box girders. The high grade cladding steel will be used to reinforce abutments and piers to reduce corrosion potential. The entire superstructure will be constructed with precast members built off the bridge site.

R274—Development of a Quantitative Model for the Mechanism of Raveling Failure in Highway Rock Slopes and Cuts
[Maerz, N., PI – Missouri S&T, new in this reporting period]

Rock falls along highways constitute a significant geological hazard, causing financial loss, damage to vehicles and infrastructure, and even injury and occasional loss of life. There is no

way to model them or protect their progress or severity. Even the mechanisms are poorly understood. In Missouri rock falls or continuous issue for the Missouri Department of Transportation.

A new technology called lidar [light detection and ranging] can make precise measurements of rock slopes and cuts, detecting minute differences over time and the profile of the rock face. Multiple scans over time can reveal the timing and sequence of material falling off the face and accumulating on the ground below up to and including the fall of very small individual blocks. Rock fall events can be precisely correlated with it external stimuli such as rainfall, freeze/thaw, and seismic activity. From data obtained in this manner a model of rattling will be developed particle flow code [PFC 2-D] modeling will be used to develop a predictive capability.

This proposal seeks funding to do a pilot study of raveling in the field under various conditions in several different types of rock that are necessary to begin the study of the raveling process under natural conditions, and to model the rattling with PFC.

R273—Field Evaluation of Alternative and Cost-Efficient Bridge Approach Slabs – UMKC
[Thiagarajan, G., PI – University of Missouri-Kansas City, new in this reporting period]

The main objective of the proposed project is to evaluate and compare the field performance of recommended BAS designs, their constructability, and their impact on cost and schedule to the current MoDOT BAS design. Based on collected field data, researchers will recommend improvements in terms of construction practices, sequencing, design details, and other issues for a successful implementation of the new BAS designs in the future.

Economic feasibility of using a flowable fill mixture as a base for bridge approach slabs will be evaluated. Prior and on-going research has investigated the environmental impact of using fly ash products for road construction and for CLSM mixtures (Folliard et al. 2008, Wang 2009). Results of these studies will be considered in terms of the selection process for the CLSM material used in this study. If found to be economically feasible, researchers will collaborate with MoDOT, contractors, and Missouri ready mixed concrete suppliers to use a suitable flowable fill mixture under one of the new BAS designs constructed in this project. Impact of using flowable fill on BAS performance, cost, and schedule will also be documented.

R272—Field Evaluation of Alternative and Cost-Efficient Bridge Approach Slabs
[Myers, J., PI – Missouri S&T, new in this reporting period]

The main objective of the proposed project is to evaluate and compare the field performance of recommended BAS designs, their constructability, and their impact on cost and schedule to the current MoDOT BAS design. Based on collected field data, researchers will recommend improvements in terms of construction practices, sequencing, design details, and other issues for a successful implementation of the new BAS designs in the future.

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material used in this study. If found to be economically feasible, researchers will collaborate with MoDOT, contractors, and Missouri ready mixed concrete suppliers to use a suitable flowable fill mixture under one of the new BAS designs constructed in this project. Impact of using flowable fill on BAS performance, cost, and schedule will also be documented.

R271—Use of Coal Fly Ash and Other Waste Products in Soil Stabilization and Road Construction – Including Non-Destructive Testing of Roadway - Columbia
[Rosenblad, B., PI – University of Missouri-Columbia, new in this reporting period]

The objectives of the proposed research are twofold. 1) To identify waste products, including coal fly ash and lime kiln dust, in soil stabilization to reduce the cost while enhancing road construction. 2) To develop innovative non-destructive testing technologies to evaluate the physical and engineering properties of the stabilized subgrade, subbase and base materials and provide a guideline of use of fly ash and other waste products in Missouri.

Beneficial use of coal fly ash has an overall economic and environmental benefit. Fossil fuel power plants produce large quantity of coal fly ash each year. These fly ashes are mostly disposed of in landfills and ponds. Nationwide, only approximately 40% of coal fly ashes are beneficially used. The use of fly ash in road subgrade applications can provide better properties and performance, and is superior to it being otherwise disposed and becoming a possible environmental liability. Meanwhile, MoDOT is also looking for non-destructive testing methods to evaluate the effectiveness of these materials in strengthening the road subgrade which can enhances inspection of other areas of roadwork.

R270—Use of Coal Fly Ash and Other Waste Products in Soil Stabilization and Road Construction – Including Non-Destructive Testing of Roadway
[Ge, L., PI – Missouri S&T, new in this reporting period]

The objectives of the proposed research are twofold. 1) To identify waste products, including coal fly ash and lime kiln dust, in soil stabilization to reduce the cost while enhancing road construction. 2) To develop innovative non-destructive testing technologies to evaluate the physical and engineering properties of the stabilized subgrade, subbase and base materials and provide a guideline of use of fly ash and other waste products in Missouri.

Beneficial use of coal fly ash has an overall economic and environmental benefit. Fossil fuel power plants produce large quantity of coal fly ash each year. These fly ashes are mostly disposed of in landfills and ponds. Nationwide, only approximately 40% of coal fly ashes are beneficially used. The use of fly ash in road subgrade applications can provide better properties and performance, and is superior to it being otherwise disposed and becoming a possible environmental liability. Meanwhile, MoDOT is also looking for non-destructive testing methods to evaluate the effectiveness of these materials in strengthening the road subgrade which can enhances inspection of other areas of roadwork.

R269—Evaluation of LED Roadway Luminaries
[Long, S., PI – Missouri S&T, new in this reporting period]

Objectives of the research include a detailed photometric performance analysis of LED roadway luminaries, evaluation of existing lighting infrastructure to determine compatibility with LED luminaries, a thorough cost-benefit analysis, and analysis of light output from the perspective of safety and driver perception.

This study compares LED luminaries with traditional High Pressure Sodium luminaries to evaluate their effectiveness in terms of energy consumption, environmental benefit, and safety. Objectives of the research include a detailed photometric performance analysis of LED roadway luminaries, evaluation of existing lighting infrastructure to determine compatibility with LED luminaries, a thorough cost-benefit analysis, and analysis of light output from the perspective of safety and driver perception.

This project will provide guidance on the effectiveness of LED roadway luminaries in terms of performance, economic feasibility, environmental and energy benefit, and safety to the Missouri Department of Transportation, other DOTs, and communities considering LED technology for roadway lighting applications.

R268—Design and Evaluation of High-Volume Fly Ash Concrete Mixes
[Volz, J., PI – Missouri S&T, new in this reporting period]

The objective of this research project is to design, test, and evaluate HVFA concrete mixtures. This study will focus on the hardened properties of HVFA concrete containing aggregates and fly ash indigenous to the state of Missouri and will develop guidelines on its use in infrastructure elements for MoDOT.

Traditional concrete specifications limit the amount of fly ash to 35 or 40 percent cement replacement. Recent studies, including those by the investigators, have shown that higher cement replacement percentages – even up to 75 percent – can result in excellent concrete in terms of both strength and durability. Referred to as high-volume fly ash (HVFA) concrete, this material offers a viable alternative to traditional portland cement concrete and is significantly more sustainable.

However, HVFA concrete is not without its problems. At all replacement rates, fly ash generally slows down the setting time and hardening rates of concrete at early ages, especially under cold weather conditions, and when less reactive fly ashes are used. Furthermore, with industrial by-products, some variability in physical and chemical characteristics will normally occur, not only between power plants but also within the same plant. Consequently, to achieve the benefits of HVFA concrete, guidelines are needed for its proper application in bridges, roadways, culverts, retaining walls, and other transportation-related infrastructure components.

R266—Leaching Behavior of Coal Combustion Products and the Environmental Implication in Road Construction: Phase 4
[Wang, J., PI – Missouri S&T, new in this reporting period]

The overall objective of this project is to help the construction industry and the energy industry in selecting the appropriate types of fly ashes for road construction and other beneficial use applications. Specifically, this research will: (1) generalize the leaching behavior of major oxyanionic elements for various fly ashes (generated from different coal sources and/or different

power generation process – NOx and mercury control); (2) understand the leaching mechanisms of oxyanionic elements for different ashes (as effects of pH, ash type, ash composition, ammonia, activated carbon, presence of other trace elements, etc.; and (3) quantify the leaching behavior of oxyanionic metals under various leaching conditions.

The use of coal fly ash in road base and sub-base applications can provide better properties and performance, and is superior to it being otherwise disposed and becoming a possible environmental liability. Understanding the metal leaching behavior for various fly ashes can help the construction industry and the energy industry in selecting the environmentally benign fly ash for road construction and for other beneficial use applications, and determining the long term environmental impact of fly ash during road construction. Due to the implantation of several new air emission control regulations, future fly ash may contain elevated concentrations of volatile trace elements especially oxyanionic elements. Since oxyanionic elements have greater mobility in the environment, being less studied previously, and are generally more toxic than cationic elements, understanding the leaching behavior of oxyanionic elements from fly ash is significant in determining the potential environmental impact of fly ash during disposal or beneficial use, selecting the appropriate fly ash for road construction, and developing methods to control the leaching of oxyanionic elements. This research becomes more urgent due to the implementation of more stringent arsenic standards in drinking water that will become effective in January 2006.

R265—Self-Consolidating Concrete for Infrastructure Elements
[Myers, J., PI – Missouri S&T, new in this reporting period]

The objective of the proposed research is to determine the structural implications of using SCC mixes compared to traditional concrete mixes. This study will focus on the hardened properties of SCC mixes containing Missouri aggregates and will develop guidelines on its use in infrastructure elements for MoDOT.

The proposed research plan includes a description of the seven (7) tasks necessary to reach this goal, as well as the task durations and level of effort. The research tasks consist of the following:

1. Literature Review,
2. Mix Development,
3. Bond and Development of Prestressing Strand and Mild Steel,
4. Hardened Properties of SCC Mixes,
5. Shear Properties of SCC Mixes,
6. Recommendations and Specifications for SCC Implementation, and
7. Value to MoDOT and Stakeholders to Implementing SCC

R264—Soy-based UV Resistant Polyurethane Pultruded Composites: Phase II
[Chandrashekhara, K.C., PI – Missouri S&T, new in this reporting period]

Development of affordable soy-based aromatic and aliphatic PU composites with improved mechanical and environmental performance is the focus of the proposed study. In our previous study, we have successfully manufactured both aromatic and aliphatic PU composites with 20% soy content. Neat resin samples of base PU and soy-PU were manufactured to evaluate the performance of the resin system. As the polyol and the isocyanate components of the PU resin

system are susceptible to moisture, a novel mixing process was developed to make void free neat resin samples. A new metering unit system and an injection box were integrated with the pultrusion machine to manufacture PU composites. The mechanical performance of the neat resin samples and pultruded composites was evaluated. The performance of the soy-based resin is comparable to the base PU resin. However, aromatic PU based composites have poor environmental stability under UV light exposure and require specialized painting to provide protection. Aliphatic PU resins provide improved UV resistance but exhibit lower mechanical performance in comparison to aromatic polyurethanes. We have conducted preliminary studies on feasibility of incorporating nano-engineered fillers in the aliphatic PU resin system to compensate for the reduction in mechanical properties. In the proposed research, the current on-going work will be expanded to manufacture aromatic and aliphatic PU composites with increased soy content. Also, the initial study conducted for incorporating nano-engineered fillers in the aliphatic PU resin system will be used to manufacture PU nanocomposites. Fillers such as titanium dioxide will be mixed with the resin to obtain desired color for the finished part. The cure kinetics of the PU systems will be studied by differential scanning calorimetry (DSC) and the reaction rates of the aliphatic and aromatic polyurethanes will be compared. Mechanical and environmental performance will be evaluated by conducting tensile, flexure, impact, salt fog and UV exposure tests. The economics of aromatic and aliphatic systems will be assessed.

R263—Soy-based UV Resistant Polyurethane Pultruded Composites: Phase II
[Chandrashekhara, K.C., PI – Missouri S&T, new in this reporting period]

Development of affordable soy-based aromatic and aliphatic PU composites with improved mechanical and environmental performance is the focus of the proposed study. In our previous study, we have successfully manufactured both aromatic and aliphatic PU composites with 20% soy content. Neat resin samples of base PU and soy-PU were manufactured to evaluate the performance of the resin system. As the polyol and the isocyanate components of the PU resin system are susceptible to moisture, a novel mixing process was developed to make void free neat resin samples. A new metering unit system and an injection box were integrated with the pultrusion machine to manufacture PU composites. The mechanical performance of the neat resin samples and pultruded composites was evaluated. The performance of the soy-based resin is comparable to the base PU resin. However, aromatic PU based composites have poor environmental stability under UV light exposure and require specialized painting to provide protection. Aliphatic PU resins provide improved UV resistance but exhibit lower mechanical performance in comparison to aromatic polyurethanes. We have conducted preliminary studies on feasibility of incorporating nano-engineered fillers in the aliphatic PU resin system to compensate for the reduction in mechanical properties. In the proposed research, the current on-going work will be expanded to manufacture aromatic and aliphatic PU composites with increased soy content. Also, the initial study conducted for incorporating nano-engineered fillers in the aliphatic PU resin system will be used to manufacture PU nanocomposites. Fillers such as titanium dioxide will be mixed with the resin to obtain desired color for the finished part. The cure kinetics of the PU systems will be studied by differential scanning calorimetry (DSC) and the reaction rates of the aliphatic and aromatic polyurethanes will be compared. Mechanical and environmental performance will be evaluated by conducting tensile, flexure, impact, salt fog and UV exposure tests. The economics of aromatic and aliphatic systems will be assessed.

R262—Mapping Subsurface In Proximity To Newly-Developed Sinkhole Along Roadway
[Anderson, N., PI – Missouri S&T, new in this reporting period]

MS&T will acquire electrical resistivity tomography profiles in immediate proximity to a newly-developed sinkhole in Nixa Missouri. The sinkhole has closed a well-traveled roadway and threatens proximal infrastructure. The intent is to characterize the subsurface expression of the sinkhole so that appropriate mitigation efforts can be designed and implemented. This sinkhole is of very real concern to the City of Nixa because it developed only one block from a huge sinkhole (90 feet deep) that swallowed half of house in 2007.

The MS&T researchers will determine optimum ERT data acquisition and processing parameters. We will utilize both short and long electrode spacings in an attempt to determine optimal field parameters (best combination of depth of investigation and resolution). Boring control will constrain and verify interpretations.

Education and Technology Transfer Projects

ETT280— Minority Engineering Scholarships Renewal
[Perkins, W., PI - Missouri S&T, new in this reporting period]

This project will make scholarships available to minority students interested in engineering and science and will increase significantly the number of minority students that Missouri S&T can recruit to its science and engineering programs. Recipients of scholarships will also be exposed to career opportunities in transportation.

Minority Engineering and Science Program (MEP) scholarships provide critical financial support for under-represented students majoring in engineering and science programs at Missouri S&T. MEP scholarship students receive professional and academic support through the close-knit MEP network of friends, mentors, and Missouri S&T staff. MEP has a rich 30 year tradition of sponsoring events, activities and organizations that ensure its students are prepared for personal and professional success.

ETT279—Women In Science & Engineering Scholarships and Summer Camp Outreach Programs, Year 6
[Elmore, C., PI - Missouri S&T, new in this reporting period]

This project will make scholarships available to minority and women students interested in engineering and science and will increase significantly the number of minority and female students that Missouri S&T can recruit to its science and engineering programs. Recipients of scholarships will also be exposed to career opportunities in transportation.

Women in Science and Engineering (WISE) scholarships are awarded to support female Missouri S&T students studying science and engineering. Missouri S&T's WISE program provides a campus focal point for increasing the number of women in science, engineering, math, and technology fields through outreach, recruitment, and retention efforts from middle school age through undergraduate levels. WISE provides support programs such as mentoring, advising, professional/technical workshops, and social activities, with the goal of providing a rich academic and social experience for young women at Missouri S&T.

Since the inception of this scholarship program in 2004-2005, women's enrollment has increased in the following transportation- related fields of study: architectural engineering-80%, chemical and biological engineering-57%, civil engineering-56%, computer science-37%, engineering management and systems engineering-35%, information science & technology-69%, materials science and engineering-27%, and mechanical engineering-58%. Also, the female students who have enrolled in undeclared engineering as freshman has increased by 65%, so those students have the potential to major in a transportation-related field.

EET267—2011 Missouri Local Technical Assistance Program (LTAP) at Missouri S&T
[Pickerill, H., PI - Missouri S&T, new in this reporting period]

The objective of this project is to manage the Missouri LTAP program for the Missouri Department of Transportation (MoDOT). The LTAP program was established by the Federal Highway Administration (FHWA) in 1982 and operates in each state to provide community leadership through advocacy and implementation of education and training.

The Missouri LTAP program will provide a resource center and technology transfer activities for local officials, counties, parishes, townships, cities and towns throughout the state of Missouri in the form of: workforce development services; resources to enhance safety and security; solutions to environmental concerns, congestion, capacity and other issues; technical publications; and training materials and videos.

DOT PRODUCTS

Because the Center's theme areas focus around safety in transportation infrastructure as well as new technologies in fuel and infrastructure monitoring, many of the awarded research projects are tied to the U.S. and state Departments of Transportation, particularly Missouri Department of Transportation (MoDOT).

Below are brief explanations of a few research projects meant to serve as examples of how work and research at CTIS serves the transportation and infrastructure needs of our state and nation.

Soy-Based UV Resistant Polyurethane Pultruded Composites – RE263
Development of affordable soy-based aromatic and aliphatic PU composites with improved mechanical and environmental performance is the focus of this study. The use of soy-based composites allows for the much more environmental production of pultruded composites for use in our infrastructure. The cure kinetics of the PU systems is being studied by differential scanning calorimetry (DSC) and the reaction rates of the aliphatic and aromatic polyurethanes is undergoing comparisons. Mechanical and environmental performance is being evaluated by conducting tensile, flexure, impact, salt fog and UV exposure tests. The economics of aromatic and aliphatic systems is also being assessed for production implementation. This newer generation of composites technology is produced in a more environmentally sustainable fashion and should serve to allow for a much longer service life compared to traditional steel reinforcing materials that corrode.

Self-Consolidating Concrete for Infrastructure Elements– RE265
Because of its unique nature, self-consolidating concrete (SCC) has the potential to significantly reduce costs associated with transportation-related infrastructure, benefiting both MoDOT as well as the Nation's needs. SCC is a highly flowable, nonsegregating concrete that can be placed without any mechanical consolidation, and thus has the following advantages over conventional concrete. This reduces the labor needs to fabricate infrastructure elements, speeds up construction, and reduces costs. However, concerns exist over the structural implications of SCC in cast-in-place and precast elements. Specifically, higher paste contents, higher fines contents, and the use of smaller, rounded aggregates may significantly alter the creep, shrinkage, bond, and shear strength of SCC mixes as compared to traditional concrete mixes with the same compressive strength. This study is investigating these remaining concerns and holds great promise for wide implementation.

Design and Evaluation of High-Volume Fly Ash Concrete Mixes– RE268
Traditional concrete specifications limit the amount of fly ash to 35 or 40 percent cement replacement. Recent studies, including those by the investigators, have shown that higher cement replacement percentages– even up to 75 percent – can result in excellent concrete in terms of both strength and durability. Referred to as high-volume fly ash (HVFA) concrete, this material offers a viable alternative to traditional Portland cement concrete and is significantly more sustainable. The reuse of fly ash in higher volumes eliminates their traditional disposal into landfills and limits the higher levels or amount of Portland cement in concrete which reduces the level CO_2 emissions during manufacturing by limiting its usage. Results of this work is expected to yield more "green" concrete alternatives that are much more sustainable and cost effective.

Missouri S&T Hydrogen Transportation Test Bed Equipment & Construction – RE254
The hydrogen transportation test bed serves as a focal point for CTIS, 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. The project objectives include the development of safety codes, standards and regulations alternative fuel technologies and infrastructure development and deployment of those technologies.

Women in Science & Engineering Scholarships and Summer Camp Outreach Programs – ETT279
The purpose of this program is to provide support for women and minorities interested in engineering and science particularly in the fields of infrastructure and transportation engineering. The program supports scholarships and various programs including *"The Women's 'Lock-In' Program at Missouri S&T," the "Expanding Your Horizons in Math, Science, Engineering & Technology Program at Missouri S&T," the "Summer Solutions Girl Camp Program at Missouri S&T," the "It's A Girl's Thing Program at Missouri S&T," the "Girl's Go Green Program at Missouri S&T"* to cite a few of the programs.

To detail what just a couple of these programs involve:

Summer Solutions Girls Camp: Summer Solutions camp for young women has evolved into a one-week camp which introduces 9th and 10th grade girls to the exciting world of engineering and science careers. Through hands-on laboratory, field trip and interactive learning sessions, the students are encouraged to "get their hands dirty" and discover that female students often enjoy and excel in work that science and engineering careers are focused around.

Girls Go Green: Starting in 2008, a week-long summer camp for rising juniors and seniors that will give students the opportunity to explore career options that help society while protecting the environment including discussions about the transportation fields. Students will live in a residential hall, meet current students and professors, participate in team projects and field trips, and gain a better understanding of the science and engineering behind a green environment.

It's a Girl Thing!: This one week middle-school pilot program started in July 2006. It is designed to provide a fun and introductory engineering experience to girls entering 7th and 8th grades. The students will be exposed to the various STEM career fields and encouraged to explore their personal interests through group projects and design oriented competitions.

They are focused on bringing more females into the engineering and science fields with content included through the NUTC support on infrastructure and transportation. Similar programs are extended to the traditionally underrepresented minority areas as well.

MTI/MoDOT Transportation Geotechnical Research Program - R247-R242
The Geotechnical Research Program has led to substantial cost savings by avoiding excessive conservatism in cases where it is not warranted and by avoiding excessive maintenance and rehabilitation costs in cases where performance is unacceptable. The execution and completion of this program will address many of MoDOT's most pressing research needs while making notable improvements to the state of the art and practice of geotechnical engineering at a national and international level. The objective, as a whole, is to achieve significant and recurring cost

savings for Missouri Department of Transportation (MoDOT) by developing improved, technically sound design specifications. The new specifications will be based on LRFD concepts which produce consistent and appropriate performance/risk factors for the local conditions and consequences involved.

MTI/MoDOT Structural Collaborative Research Program - R241-R233

The Structural Collaborative Research Program recently addressed the Missouri Department of Transportation's (MoDOT) and the nation's needs in developing better, faster and cheaper solutions for transportation structures with superior long-term performance, innovative construction technologies and effective maintenance and preservation strategies. For MoDOT, emphases has been placed on critical needs, reducing costs of inspection, maintenance and repair, ensuring bridge safety and providing durable solutions.

SUCCESS STORIES

This section lists a sampling of "success stories" for Year V, including notable Center events; NUTC News articles of interest; faculty and student awards; and media articles about the Center, faculty or campus. Articles, awards and events with corresponding clips are available in the Appendix.

Featured Articles in the NUTC News

- "Changing Aggregate Evaluation." Volume 6, Issue 1.

- "Opportunities for Future Transportation Professionals." Volume 6, Issue 3.

Awards

- Kandi Spraggs, a civil, architectural and environmental engineering M.S. student, was named Missouri S&T's 2010 UTC Outstanding Student of the Year.

- Mikhil Shetty, a graduate student in environmental engineering, won first prize in a student poster presentation at the 7th International Phytotechnologies Conference, held in Parma, Italy

- Dr. Daniel B. Oerther, the John A. and Susan Mathes Chair of Civil Engineering and director of the Environmental Research Center, received the LEGACY Next Generation Leader Award

- Three graduate students from S&T won awards at the 42nd North American Power Symposium. The first prize was shared by Murali Bottu and Himanshu Hirlekar and the third prize went to Ravi Bhatt.

- Dr. William P. Schonberg, professor and chair of the civil, architectural and Environmental Engineering Department received a NASA Engineering and Safety Center (NESC) Honor Award.

- Thirty-four Missouri University of Science and Technology faculty members received the Committee for Effective Teaching (CET) Outstanding Teaching Award for 2009-2010 including CTIS investigators Dr. Jason Baird, Dr. John J. Myers, Dr. David Richardson, Dr. Lesley Sneed, and Dr. Reza Zoughi.

Missouri S&T in the News

External Media Sources

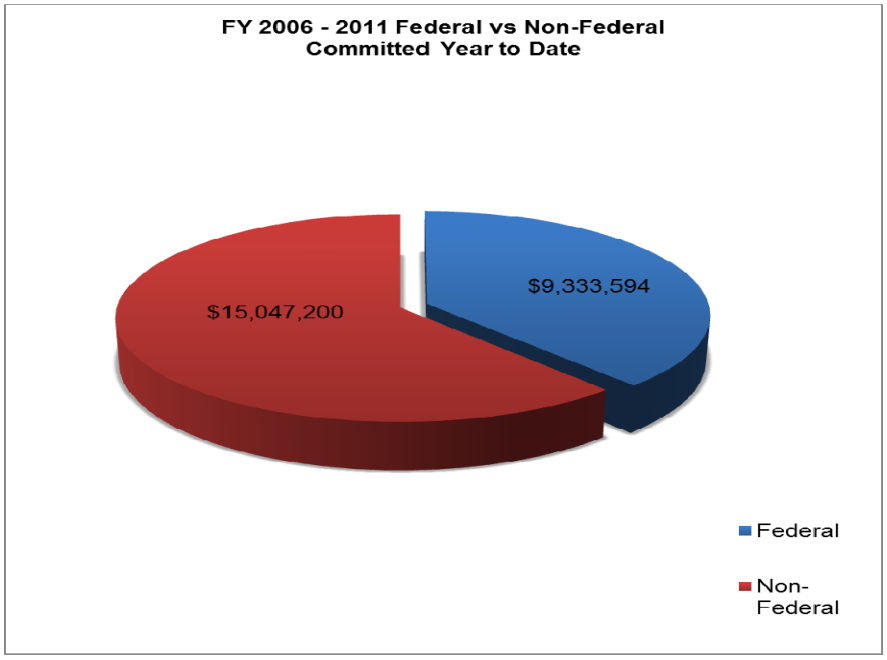
- “Female students, international students lead S&T increase.” Rolla Daily News. October 06, 2010.
- “S&T students awarded $33,500.” Rolla Daily News. November 09, 2010.
- “New Chinese campus joins S&T.” Rolla Daily News. December 07, 2010.
- “S&T researcher thinks "inside the box" to create self-contained wastewater system for soldiers, small towns.” Rolla Daily News. September 25, 2009.
- “S&T offers explosives degree.” Rolla Daily News. December 14, 2010.
- “Enrollment up this spring at Missouri S&T.” Rolla Daily News. January, 19 2011.

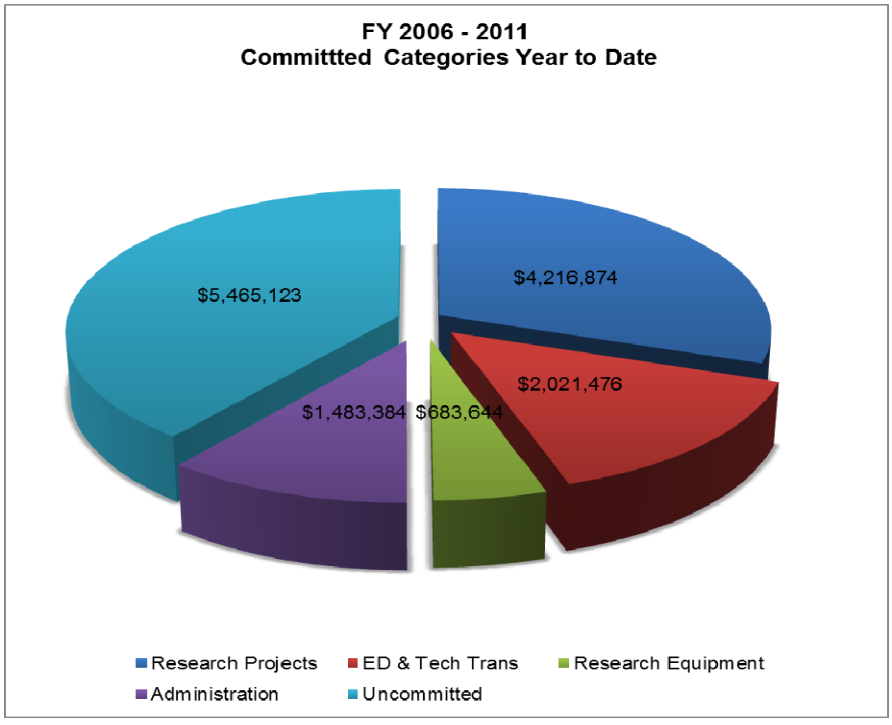
Internal Media Sources

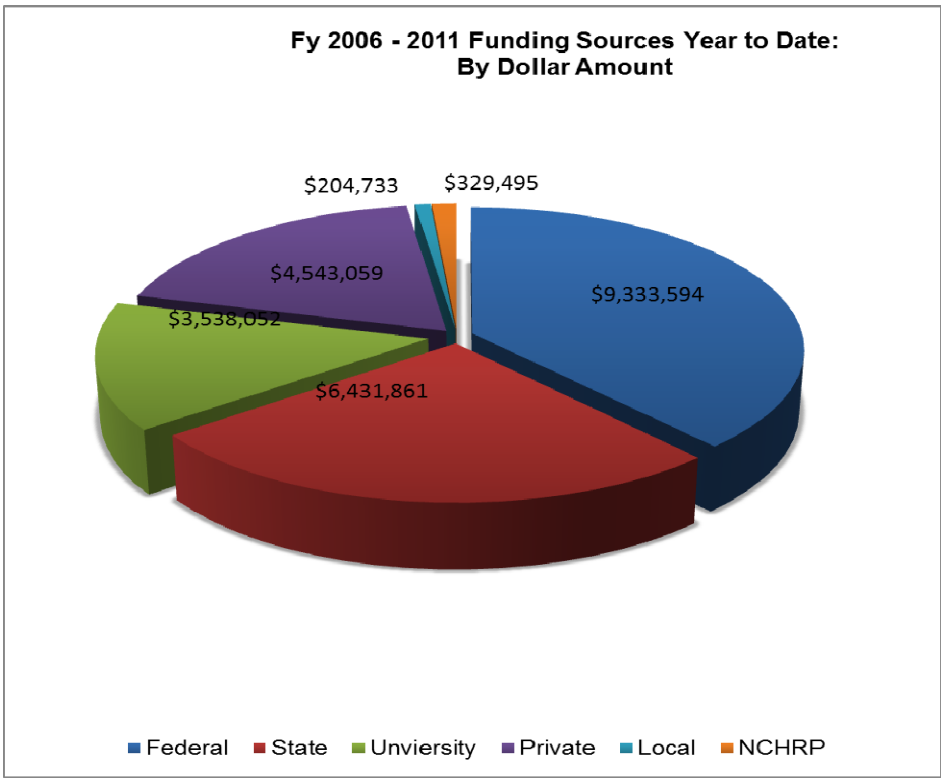
- “Shipping containers get new life, soldiers get safer water.” Missouri S&T Public Relations. September 2009.
- “Starting salaries remain strong for S&T grads.” Missouri S&T Public Relations. July 27, 2010.
- “Enrollment exceeds 7,000.” Missouri S&T Public Relations. August 24, 2010.
- “Luna to give keynote at Panama university event.” Missouri S&T Public Relations. September 16, 2010.
- “22 faculty members hired this year at S&T.” Missouri S&T Public Relations. September 27, 2010.
- “S&T's Solar Village nears completion.” Missouri S&T Public Relations. September 29, 2010.
- “Find out how students helped companies cut energy, environmental costs.” Missouri S&T Public Relations. September 9, 2010.
- “S&T to award nation's first master's degrees in explosives engineering.” Missouri S&T Public Relations. December 2, 2010.
- “Missouri S&T again recognized for value, ROI.” Missouri S&T Public Relations. January 4, 2011.

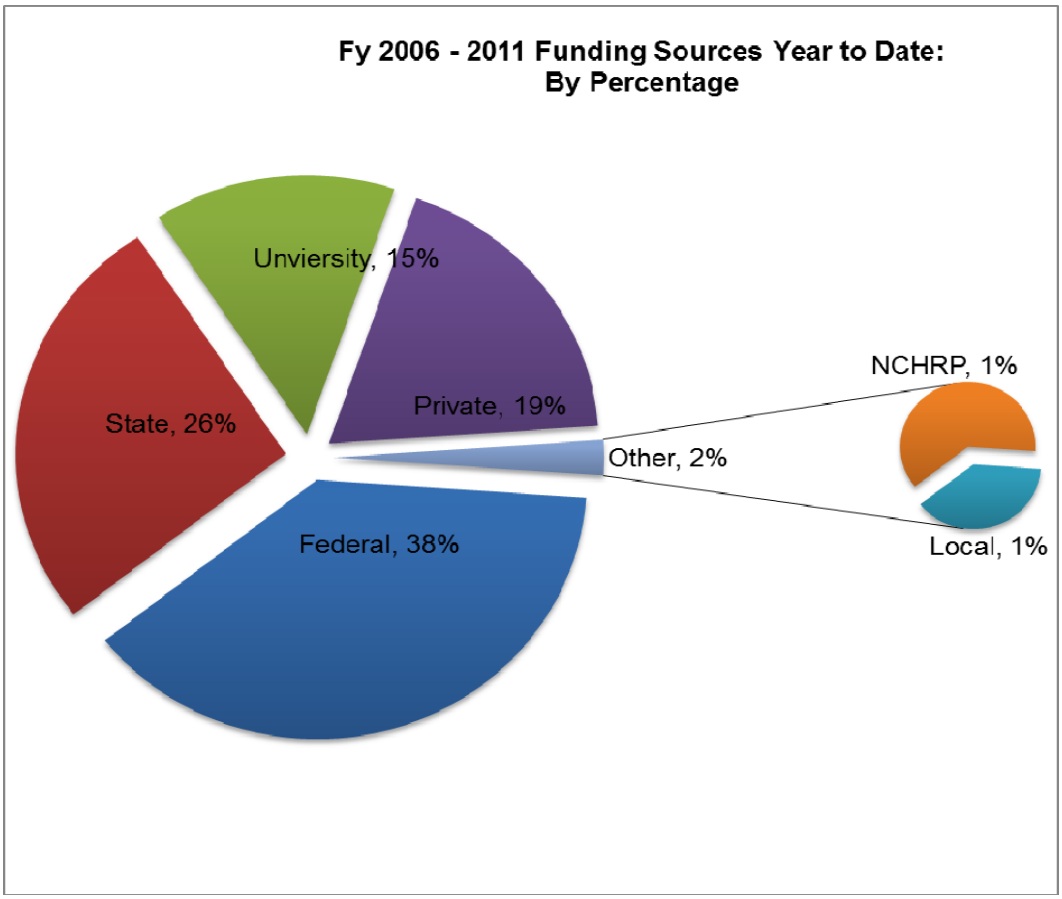
FUNDING SOURCES AND EXPENDITURES

This section provides information on Funding Sources and Expenditures for Years I-V of the NUTC grant. The following funding charts and tables show committed revenues; expenditure categories; match funding sources; pending project allocations; and funding sources and expenditures for both awarded and pending projects.






Fy 2006 - 2011 Funding Sources Year to Date:
By Dollar Amount
$204,733
$329,495
$4,543,059
$9,333,594
$3,538,052
$6,431,861
Federal
State
Unviersity
Private
Local
NCHRP


Fy 2006 - 2011 Funding Sources Year to Date:
By Percentage
Unviersity, 15%
Private, 19%
State, 26%
NCHRP, 1%
Other, 2%
Federal, 38%
Local, 1%

Funding Sources and Expenditures

Amounts and Sources of Funding: July 1, 2006–June 30, 2011

Seq. No.	Non-Federal * Source	Amount	UTC	Total
R195	NCHRP-NYSDOT-MS&T CE	$ 157,873	$ 78,936	$ 236,809
ETT196	Industry	$ 394,450	$ 187,500	$ 581,950
R197	NCHRP-MS&T CE	$ 120,000	$ 60,000	$ 180,000
R198	MoDOT-UMC CE	$ 283,162	$ 100,087	$ 383,249
ETT199	MoDOT	$ 200,054	$ 99,537	$ 299,591
R200	General Motors	$ 26,902	$ 13,776	$ 40,678
R201	EPRI	$ 68,980	$ 42,985	$ 111,965
R202	MS&T GS&E	$ 58,087	$ 115,000	$ 173,087
R203	MS&T Depts.	$ 500,000	$ 250,000	$ 750,000
R204	GTI	$ 600,000	$ 250,000	$ 850,000
ETT205	MS&T DCE	$ 19,366	$ 10,000	$ 29,366
RE206	LGA	$ 133,880	$ 66,939	$ 200,819
R207	CDOT	$ 21,960	$ 9,286	$ 31,246
R208	Roesch, Inc	$ 10,000	$ 5,000	$ 15,000
R209	Coreslab Structures	$ 7,746	$ 3,873	$ 11,619
R210	Transystems, Inc.	$ 21,200	$ 10,599	$ 31,799
R211	USB	$ 50,000	$ 24,944	$ 74,944
ETT212	Industry	$ 23,400	$ 7,525	$ 30,925
R213	Ameren	$ 25,000	$ 12,500	$ 37,500
R214	EPRI	$ 68,658	$ 29,330	$ 97,988
ETT215	MS&T VPR	$ 19,115	$ 19,115	$ 38,230
ETT216	Industry	$ 415,750	$ 187,500	$ 603,250
ETT217	Retired	$ -	$ -	$ -
R218	MoDOT	$ 44,813	$ 23,877	$ 68,690
R219	MoDOT	$ 59,997	$ 34,161	$ 94,158
ETT220	MoDOT	$ 211,885	$ 211,885	$ 423,770
R221	SCI Engineering	$ 23,431	$ 11,715	$ 35,146
R222	HNTB Corp.	$ 10,387	$ 5,116	$ 15,503
R223	Lake Sherwood Estates	$ 3,239	$ 2,250	$ 5,489
ETT224	MS&T-VPR	$ 26,102	$ 26,102	$ 52,204
R225	MS&T Departments	$ 1,115,215	$ 900,000	$ 2,015,215
ETT226	Industry	$ 77,125	$ 20,769	$ 97,894
R227	Egyptian Concrete	$ 28,172	$ 14,087	$ 42,259

R228	Ameren	$ 25,000	$ 12,500	$ 37,500
ETT229	MoDOT	$ 35,358	$ 17,679	$ 53,037
R230	NYSERDA	$ 50,000	$ 50,000	$ 100,000
R231	MS&T Departments	$ 500,000	$ 250,000	$ 750,000
R232	ASNT	$ 15,000	$ 7,475	$ 22,475
R233	MoDOT MS&T-CE	$ 121,555	$ 75,972	$ 197,527
R234	MoDOT MS&T-CE	$ 194,612	$ 121,633	$ 316,245
R235	MoDOT MS&T-CE	$ 78,192	$ 48,870	$ 127,062
R236	MoDOT Missouri S&T-CE	$ 363,590	$ 152,981	$ 516,571
R237	MoDOT Missouri S&T-CE	$ 60,217	$ 48,077	$ 108,294
R238	MoDOT UMC-CE	$ 80,033	$ 37,750	$ 117,783
R239	MoDOT UMC-CE	$ 109,309	$ 50,178	$ 159,487
R240	MoDOT UMC-CE	$ 102,444	$ 53,928	$ 156,372
R241	MoDOT UMKC-CE	$ 133,165	$ 35,612	$ 168,777
R242	MoDOT / UMC CE	$ 151,296	$ 35,965	$ 187,261
R243	MoDOT / Missouri S$T CE	$ 141,116	$ 97,406	$ 238,522
R244	MoDOT / Missouri S$T CE	$ 64,473	$ 55,927	$ 120,400
R245	MoDOT / UMC CE	$ 89,047	$ 50,863	$ 139,910
R246	MoDOT / Missouri S&T CE	$ 132,890	$ 91,620	$ 224,510
R247	MoDOT / UMC CE	$ 915,596	$ 43,218	$ 958,814
ETT248	MoDOT	$ 343,261	$ 218,261	$ 561,522
ETT249	MoDOT	$ 30,506	$ 11,438	$ 41,944
R250	City of Rolla	$ 169,733	$ 165,000	$ 334,733
ETT251	Industry	$ 367,250	$ 187,500	$ 554,750
RE252	Spirit Aerosystems	$ 25,000	$ 12,500	$ 37,500
R253	NCHRP/MAPA/MS&T CE	$ 144,996	$ 95,449	$ 240,445
R254	Industry	$ 1,208,409	$ 604,205	$ 1,812,614
R255	USB	$ 50,000	$ 25,000	$ 75,000
R256	KH	$ 2,469	$ 3,500	$ 5,969
R257	CRSI	$ 30,000	$ 15,000	$ 45,000
ETT258	Industry	$ 376,250	$ 187,500	$ 563,750
ETT259	MoDOT	$ 218,289	$ 218,289	$ 436,578
R260	MoDOT	$ 99,978	$ 49,966	$ 149,944
R261	University of Arkansas	$ 40,011	$ 20,005	$ 60,016
R262	GEI	$ 3,500	$ 2,400	$ 5,900
R263	USB	$ 50,000	$ 25,000	$ 75,000
R264	MS&T-MRC	$ 15,000	$ 7,500	$ 22,500
R265	MoDOT	$ 120,000	$ 60,000	$ 180,000
R266	EPRI	$ 15,000	$ 7,500	$ 22,500
ETT267	MoDOT	$ 218,289	$ 218,290	$ 436,579
R268	MoDOT	$ 100,000	$ 50,000	$ 150,000
R269	MoDOT	$ 74,924	$ 37,195	$ 112,119

R270	MoDOT	$ 60,000	$ 30,000	$ 90,000
R271	MoDOT UMC-CE	$ 76,615	$ 20,000	$ 96,615
R272	MoDOT	$ 48,173	$ 23,057	$ 71,230
R273	MoDOT	$ 80,000	$ 40,000	$ 120,000
R274	UM-RB	$ 25,800	$ 12,899	$ 38,699
R275	MoDOT/WCM	$ 225,000	$ 112,500	$ 337,500
R276	PCI	$ 20,000	$ 10,000	$ 30,000
R277	PCI	$ 20,000	$ 10,000	$ 30,000
R278	GEI	$ 10,000	$ 5,000	$ 15,000
ETT279	Industry	$ 186,170	$ 93,085	$ 279,255
ETT280	Industry	$ 239,000	$ 99,501	$ 338,501
R281	MoDOT	$ 59,425	$ 39,500	$ 98,925
R282	MoDOT	$ 46,995	$ 31,238	$ 78,233
R283	GEI	$ 3,333	$ 1,667	$ 5,000
				$ -
				$ -
				$ -
				$ -
Facilities & Admin. Indirect Costs			$ 1,483,384	$ 1,483,384
TOTAL		**$ 12,992,219**	**$ 8,405,378**	**$ 21,397,597**

Legend:
CDOT=California Department of Transporation
CRSI= Concrete Reinforcing Steel Institute
EPRI=Electrical Power Research Institute
FMSME=Fuller, Mossberger, Scott & May Engineering
GEI=GeoEngineers Inc.
GTI=Gas Technology Institute
KH=Knight Hawk
LGA=Leica Geosystems Advantage
MODOT = Missouri Department of Transporation
MODOT/WCM = Missouri Department of Transporation & Washington County Missouri
MS&T DCE = Missouri Uniersity of Science & Technology Distance & Cont. Education
MS&T GS&E = Missouri Uniersity of Science & Technology Geological Science & Engineering
MS&T-CE= Missouri University of Science and Technology-Civil Engineering
MS&T MRC = Missouri Uniersity of Science & Technology Materials Reserach Center
MS&T-VPR= Missouri University of Science and Technology-Vice Provost of Research
NCHRP=National Cooperative Highway Research Program
NYSDOT=N**e**w York State Depart. of Transporation
NYSERDA= New York State Energy Research and Development Authority
PCI=Precast Concrete Institute
UM-RB =University of Missouri-Reserach Board
UMC-CE =University of Missouri-Columbia Civil Engineering
UMKC-CE=University of Missouri Kansas City-Civil Engineering
UNR=University of Nevada-Reno
USB=United Soybean Board

APPENDIX: SUCCESS STORIES CLIPS

Featured Articles in the NUTC News

CHANGING AGGREGATE EVALUATION

Point Load Device

Dr. David Richardson, associate professor of civil, architectural and environmental engineering, has been studying rocks as a construction material for most of his 25 years in academia, and for several years before that. In recent years, aggregates in concrete, asphalt and highway base layers have been a focus for Richardson and he has completed nine funded projects for National Science Foundation (NSF) and Missouri Department of Transportation (MoDOT) in these areas. Most recently, he developed two separate aggregate evaluation systems for prediction of the durability of concrete and for prediction of the amount of harmful deleterious materials present in aggregate. Both systems are based on a concept he developed during his Ph.D. research.

Aggregate makes up the largest proportion of concrete and asphalt mixtures. Thus, the properties of the aggregate, such as durability, have a strong effect on the properties of the concrete or asphalt of which the aggregate is a part. With support from MoDOT and the Center for Transportation Infrastructure and Safety (CTIS), Richardson's first project focused on freeze-thaw durability of concrete. Some aggregates used for concrete pavements do not stand up well to winter conditions. The most definitive predictive test for aggregate durability is the freeze-thaw test, which takes up to 90 days to complete and involves extremely expensive equipment that few entities can afford. These two issues create a roadblock in MoDOT's quest for field-friendly test methods that can be used in its movement toward performance-based specifications. In contrast, Richardson's prediction system involves low-cost, fast-turnaround time tests that estimate the results of the more involved freeze-thaw method with up to 95% accuracy. The system is based on test methods that mimic the various destructive mechanisms in aggregate during freeze-thaw attack. The method is presently being validated by MoDOT for adoption.

The second aggregate project, also supported by MoDOT and CTIS, concerned prediction of the amount of deleterious materials in aggregate used for three end-products: concrete, asphalt and highway base materials. Presently, MoDOT uses a visually-based method of determination of the types and amounts of deleterious materials in aggregate, such as soft rock, shale and chert. The problem is the subjective nature of the test methodology. Different inspectors report significantly different results for the same sample, leading to disputes in acceptance/rejection of materials. Again, using a combination of test methods that are easily performed, yet objective in nature, Richardson was successfully able to develop a predictive system that mimics various destructive mechanisms in different types of objectionable materials. This method is also presently being validated by MoDOT.

Vacuum Saturated Specific Gravity Work Station

article continues on the last page...

Opportunities for Future Transportation Professionals

Each summer, Missouri S&T offers middle and high school students educational opportunities to explore various math, science, engineering and technology careers. With support from CTIS, the summer 2010 offerings include several opportunities for students to explore the world of transportation, creating a mutual investment for both the future of participating students and the future of transportation infrastructure and safety.

EcoCAR Summer Camp

July 10-14, 2011 • *For rising high school sophomores, juniors and seniors*

This week-long residential camp will allow students to learn first-hand how Hydrogen Fuel Cell Plug-In Hybrid Electric Vehicles (FC-PHEV) reduce global environmental impact by minimizing the vehicle's fuel consumption and reducing its emissions while retaining performance, safety and consumer appeal.

At camp, students will take a mini course on energy and the environment; visit Missouri S&T's E^3 Commons; perform total fuel cycle well-to-wheel modeling; conduct fuel cell vehicle simulations; and participate in a hydrogen vehicle design contest.

For more information, visit http://precollege.mst.edu/ecocar.html.

Girls Go Green

July 17-22, 2011 • *Rising 11th and 12th grade girls*

This week-long residential program is designed to provide an opportunity to explore career options that help society while protecting the environment. Attendees live together in a residential hall, meet current female student leaders and professors, participate in team projects and field trips and explore the science and engineering behind a green environment.

For more information, visit http://precollege.mst.edu/girlsgogreen.html.

Introduction to Engineering

July 10-14 & 24-28, 2011 • *Rising high school juniors and seniors*

Students spend summer camp mornings learning about engineering disciplines from leaders in their fields, while rubbing shoulders with some of the brightest students in the nation. Participants gain practical engineering experience during lab and industry visits in the afternoon and test their skills in friendly student competitions during the evening. Hands-on activities introduce various disciplines while offering a taste of campus life.

For more information, visit http://precollege.mst.edu/intro.html.

Aerospace Camp

July 12-14 & 26-28, 2011 •

Students aged 10-13

Students experience aeronautics and space flight from a ground-up perspective, learning about the history of flight, astronomy and space exploration. This camp offers computer simulations, interactive teamwork activities and practical hands-on experiences, including: Computer-based Flight Simulation, Hands-on Robotics and Rocket Construction and Launching, among other activities.

For more information, visit http://precollege.mst.edu/aerospace.html.

Awards

KANDI (WIEBERG) SPRAGGS
2010 OUTSTANDING CTIS-NUTC STUDENT OF THE YEAR AWARD

Kandi (Wieberg) Spraggs has been named Outstanding Missouri S&T UTC Student of the Year. The award was made based on her excellent academic performance, the technical merit of his research topic and her service to both Missouri S&T and the surrounding community.

Spraggs earned a B.S. degree in Civil Engineering with Magna Cum Laude honors from the Missouri University of Science and Technology (Missouri S&T) in December 2008 and graduated from the Missouri University of Science and Technology (Missouri S&T) with her M.S. degree in Civil Engineering in August 2010.

During her undergraduate career, Spraggs was a member of the Missouri S&T chapters of the American Society of Civil Engineers (ASCE) and Chi Epsilon (the National Civil Engineering Honor Society). She was also highly involved as a varsity athlete (softball) where she served as Team Captain, M-Club Vice-President, Academic All-American, 2nd Team All-American, President of the Student Athlete Advisory Committee, and Student Assistant Coach.

As a graduate student, Spraggs was involved with the American Concrete Institute (ACI) and was awarded the Missouri S&T Woman Student of the Year Award in 2009.

As a graduate student, Spraggs studied the causes of spalling in partial-depth precast prestressed concrete bridge decks using non-destructive testing techniques. Her work advances the current state of knowledge on these bridge deck systems including field investigation techniques to evaluate bridge deck deterioration. This work has been sponsored by the Missouri Department of Transportation (MoDOT) and the CTIS-NUTC at Missouri S&T. During her graduate work, Spraggs has been advised by Dr. Lesley H. Sneed.

S&T environmental engineering students win international honor

January 17, 2011 3:27 PM | Permalink | Comments (0) | SHARE

A group of students from Missouri University of Science and Technology won first prize in a student poster presentation at the 7th International Phytotechnologies Conference, held in Parma, Italy, last fall.

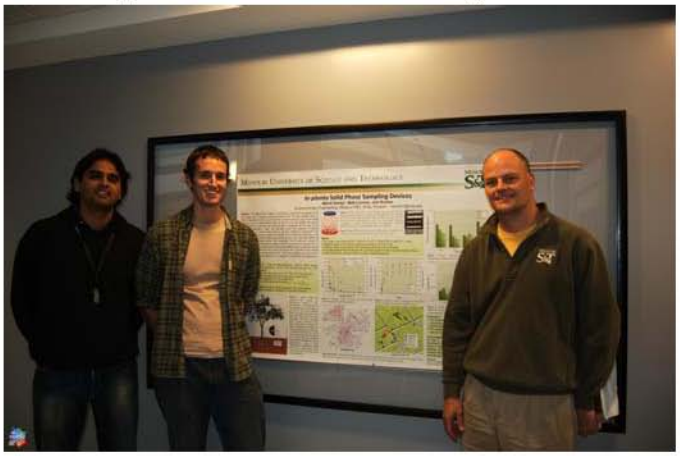
Mikhil Shetty, a graduate student in environmental engineering from Poona, India, presented the poster, titled "In-planta Solid Phase Sampling Devices," and received the top award for the student-delivered research poster contest.

The poster was co-authored by Matt Limmer, a graduate student in environmental engineering from Oregon, Ohio, and Dr. Joel Burken, professor of civil, architectural and environmental engineering.

The conference featured more than 100 posters and had attendees from more than 45 countries representing six continents.

The S&T contingent, including Cailie Carlile, a junior in environmental engineering from Sedalia, Mo., were funded to attend the conference as part of a grant from the National Institute of Environmental Health Sciences to Missouri S&T. Using the NIEHS grant, S&T funded the International Phytotechnologies Scholars program that brought 22 students from eight countries to the conference to present their individual research and learn together.

"The scholars program is intended to utilize the conference as a unique learning experience for students studying phytoremediation in their studies," says Burken, who chairs the program. "Students attending the conference coordinated their activities to meet self-established learning objectives and also interacted with the other students and attendees in a unique cultural and scientific exchange."



New chair receives leadership award

August 9, 2010 8:48 AM | Permalink

Dr. Daniel B. Oerther, the John A. and Susan Mathes Chair of Civil Engineering and director of the Environmental Research Center, received the LEGACY Next Generation Leader Award at the organization's reception on July 29, in Ohio. From more than 170 nominations, a panel of 34 judges selected Oerther as the winner in the architecture, engineering and construction industry category. Oerther joined Missouri S&T on July 1, after serving on the faculty of the University of Cincinnati for the past ten years.

Categories: Announcements

Grad students shine at power symposium

October 7, 2010 8:55 AM | Permalink

Three graduate students from S&T won awards at the 42nd North American Power Symposium that was held Sept. 26-28 in Arlington, Texas. The first prize was shared by Murali Bottu and Himanshu Hirlekar and the third prize went to Ravi Bhatt. Nearly 80 papers were presented at the symposium.

Bottu's paper, "Design of a Conditioner for Smoothing Wind Turbine Output Power," was co-authored by Drs. Mariesa Crow and Curt Elmore. Hirlekar's paper, "Reconciling Motor performance Indicators from Theoretical Calculations and Laboratory Tests," was co-authored by Dr. Badrul Chowdhury and S&T graduate Steve Ruffing. Ravi Bhatt's paper, titled "Implementing Frequency Regulation Capability in a Solar Photovoltaic Power Plant," was co-authored by S&T graduate Venkata Pappu and Chowdhury.

Schonberg to receive award for NASA work

November 5, 2010 9:12 AM | Permalink | Comments (3) | SHARE

Dr. William P. Schonberg, professor and chair of the civil, architectural and environmental engineering department at Missouri University of Science and Technology, has been selected to receive a NASA Engineering and Safety Center (NESC) Honor Award.

The award recognizes Schonberg's outstanding leadership, technical insight and support of micrometeroid and orbital debris (MMOD) protection and damage prediction for the NESC. He will receive the award at the NESC Honor Awards Ceremony on Nov. 16 in Huntsville, Ala.

A member of the S&T faculty since 1999, Schonberg received his bachelor's degree from Princeton University and his master's and doctorate degrees from Northwestern University. He is a fellow of the American Society of Mechanical Engineers.

- Jeanne Stanley, assistant professor of arts, languages and philosophy
- Dr. Greg Story, associate professor of physics
- Dr. Ralph Wilkerson, professor of computer science
- Dr. Reza Zoughi, professor of electrical and computer engineering.

Missouri S&T in the News

External Media Sources

Female students, international students lead S&T increase

By Staff reports
The Rolla Daily News
Posted Oct 06, 2010 @ 12:47 PM

Recommend Be the first of your friends to recommend this.

Rolla, Mo. — The enrollment numbers are in and show a record number of female and international students are attending Missouri University of Science and Technology this fall.

The fall semester student enrollment at Missouri S&T is its highest level since implementing selective admission standards in 1988, and the fourth highest in the university's history.

The fall 2010 enrollment census – officially recorded at the end of the semester's fourth week – is 7,206 students, up 391 students from the official fall 2009 figure, a growth of 5.7 percent over fall 2009, said Registrar Laura Stoll.

This year's new students include 1,170 first-time freshmen, 388 new transfer students and 476 new graduate students.

TheRollaDailyNews.com

S&T students awarded $33,500

By Staff reports
The Rolla Daily News
Posted Nov 09, 2010 @ 11:05 AM

Rolla, Mo. — A group of Missouri University of Science and Technology students received a total of $33,500 in scholarships from the Women's Auxiliary to the American Institute of Mining and Metallurgical and Petroleum Engineers Inc. (WAAIME), a division of the Society for Mining, Metallurgy and Exploration. The students were honored during a luncheon held on campus Oct. 5.

WAAIME scholarships are designed to assist full-time junior or senior university students and graduate students in earth sciences as they support the efforts of the minerals industry.

The following Missouri S&T students received WAAIME scholarships:

Allyson Buchelt, a junior in ceramic engineering from Blaine, Minn.
Andrea Els, a junior in ceramic engineering from Hermann
Crystal Twenter, a senior in geology and geophysics from Rolla
Daniel Meier, a junior in mining engineering from Steeleville, Ill.
Forrest Huebner, a senior in metallurgical engineering from Rolla
Grace Harper, a junior in geological engineering from Wentzville
Gregg Crannick, a junior in nuclear engineering from Sunrise Beach
John Van Gels, a senior in petroleum engineering from St. Peters
Jorge Quiroz, a senior in petroleum engineering from Kimberling City
Kate Schlarman, a senior in geology and geophysics from St. Louis,.
Matthew Crinnian, a sophomore in nuclear engineering from Webb City
Matthew McHale, a junior in mining engineering from Rolla
Max Boeh, a junior in mining engineering from Independence
Natalie Tedford, a senior in petroleum engineering from Edwardsville, Ill.
Neil Rapp, a senior in mining engineering from Tulsa, Okla.
Paul Schmidt, a junior in mining engineering from Fenton
Stephanie Mieth, a junior in metallurgical engineering from Norfolk, Neb.
Thomas Herbst, a senior in geology and geophysics and math from Rolla

TheRollaDailyNews.com

New Chinese campus joins S&T

By Staff reports
The Rolla Daily News
Posted Dec 07, 2010 @ 11:00 AM

Rolla, Mo. — Representatives from the China University of Petroleum, Beijing (CUPB) visited Missouri University of Science and Technology to discuss opportunities for collaboration.

Last year the Chinese university's Huadong campus began a partnership with the university, the first American partnership for CUP.

During the recent visit, Missouri S&T Provost W. Kent Wray and CUPB Chancellor Jiang Qingzhe signed both a Memorandum of Academic Cooperation and a transfer agreement, which allows CUPB students to transfer to Missouri S&T after their first two years of study in geology and geophysics.

Transfer programs in other academic areas are also being discussed.

TheRollaDailyNews.com

S&T offers explosives degree

By Staff reports
The Rolla Daily News
Posted Dec 14, 2010 @ 10:22 AM

Rolla, Mo. — Missouri University of Science and Technology will award the nation's first master's degrees in explosives engineering Dec. 18.

The program, which was officially approved last spring, is part of Missouri S&T's mining and nuclear engineering department.

The university offers 10 explosives courses at the graduate level, five of which are offered through distance education. Two more classes are expected to be added in the coming year.

Missouri S&T started offering a minor in explosives engineering at the undergraduate level in 2005.

TheRollaDailyNews.com

Enrollment up this spring at Missouri S&T

Ninth consecutive year spring class is bigger than the year before

By Staff reports
The Rolla Daily News
Posted Jan 19, 2011 @ 01:06 PM

Rolla, Mo. — Once again, Missouri S&T has posted a spring semester in which it saw enrollment climb above where it was the year before.

Enrollment for the first day of classes, which began Monday, was 6,447, a 4.3 percent increase from last year's first day of enrollment, said Laura Stoll, S&T's registrar.

"This is the ninth consecutive year we had an increase for the spring semester," said S&T Communications Director Andrew Careaga.

Last spring, 6,182 students were enrolled on the first day of the spring semester. This year's increase added another 265 students.

Growth is nothing new for the university, which has made it a talking point in the last several years.

The university saw its overall student population grew by 5.7 percent in the fall semester, with 7,206 students enrolled, the vast majority of whom were on campus.

Students are allowed to enroll during the first few weeks of the semester. More than 100 students are still expected to enroll, while financial assistance is still available.

The official enrollment figures for the semester will be released after the fourth week of classes.

University officials have being saying, while the enrollment has continued to climb, that admission caps may have to be put in place, unless expanded facilities become an option.

Internal Media Sources

e³ energy, environment, education — Missouri S&T

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Shipping containers get new life, soldiers get safer water

Permalink

Dr. Jianmin Wang, professor of civil, architectural and environmental engineering at Missouri University of Science and Technology, has created a wastewater system "in a box." Each system, built by re-purposing a shipping container, is low power, low maintenance and highly efficient. Built from weathering steel, these containers are designed to be tough and can be dropped on site by helicopters.

This pilot-scale testing unit demonstrates how the wastewater treatment system would work. Recently Wang received approval for full-scale system demonstration.

The system's scorecard is so good that it could be deployed anywhere - from small, rural communities to forward operating bases, like those in Iraq or Afghanistan. Currently, the typical 600-soldier forward operating base requires a daily convoy of 22 trucks to supply the base with fuel or water and dispose of wastewater and solid waste. With few mechanical parts and a small footprint, the system is ideal for military use, Wang says.

"Currently, human wastes are typically burned in burn pits, and the wastewater is usually hauled away and dumped by local contractors," Wang explains. "This results in high costs, security issues, potential health risks, negative environmental impacts to the hosting country and a potential negative image.

"Moreover, almost all fresh water used in the camp - including water for drinking, bathing, showering, laundry, car washing and toilet flushing ?- is from outside sources in the form of bottled and surface water. A deployable and easy-to-use water reclamation station, which transforms wastewater into reusable water within the base, would improve the base environment, security, soldiers' health, stewardship of foreign lands and concurrently reduce cost and fresh water demand from off-base sources."

Current wastewater treatment options include membrane bioreactor, activated sludge, fixed film or on-site septic systems. Similar to these methods, Wang's process uses microorganisms to break down the organic pollutants. Membrane bioreactor, activated sludge process and fixed-film process have been built using standard shipping containers, too. But that's where the similarities end.

The membrane bioreactor process, while similar in size and quality of effluent produced, has extremely higher energy and maintenance costs, and up to 10 times more expensive parts.

"The fixed-film system, as developed by other companies, needs to be monitored and controlled constantly," Wang says. "Plus our system is much smaller than their systems - only 20-30 percent of the size of these systems for the same treatment capacity. Our system does not use any media, which significantly reduces construction and maintenance cost."

Wang's system, named a baffled bioreactor (BBR) by Wang, modifies the conventional activated sludge process by using baffles to create a maintenance-free intermediate settling chamber for sludge return. It uses off-the-shelf, low-tech parts to treat wastewater at a level that exceeds federal standards. The water can be used for non-contact applications, including toilet flushing and car washing.

Although this project is focused on military needs, Wang says the small, low-maintenance and low-power system makes sense for small communities, mobile home parks, motels and even facilities in remote areas, such as highway rest areas and camps.

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About this Entry

This page contains a single entry by Mindy Limback published on *September 17, 2009 4:02 PM*.

Professor named to leadership of environmental group was the previous entry in this blog.

$3 million donation for energy chair is the next entry in this blog.

Find recent content on the **main index** or look in the **archives** to find all content.

A few days ago, the U.S. Army approved Wang's request to demonstrate a full-scale, company-size water reclamation station for advanced wastewater and non-potable reuse. During this project, he will also explore the feasibility of producing potable water from wastewater in emergency situations.

"A lesson learned from Hurricane Katrina is that untreated sewage can cause many health and psychological problems for displaced people," Wang adds. "The transportable, modular baffled reactor units could even be deployed to regions where natural disasters occur to quickly prevent untreated wastewater discharge and improve hygiene."

Starting salaries remain strong for S&T grads

July 27, 2010 4:30 PM | Permalink | Comments (4) | SHARE

Graduates of Missouri University of Science and Technology earn some of the highest starting salaries in the nation, according to a recent report by Payscale Inc., a Seattle-based research firm.

PayScale's 2010-11 College Salary Report puts Missouri S&T second among Midwestern public and private universities in terms of starting median salary for graduates.

The starting median salary for Missouri S&T graduates is $56,700, second to Rose Hulman Institute of Technology ($59,400). The starting median salary for a Missouri S&T graduate is higher than that of graduates from all other Midwestern universities in the survey, including the University of Notre Dame, the University of Illinois, Northwestern University, Washington University in St. Louis and Purdue University.

The report also ranked Missouri S&T third in the nation for starting salaries among public universities and 25th in the nation among all universities, public and private.

With an emphasis on engineering, science and technology, Missouri S&T prepares students who will play crucial roles in addressing many of the nation's technological and business challenges, says Missouri S&T Chancellor John F. Carney III.

"This report underscores the importance of choosing the right university and major," he adds. "It also shows our students and their families that their investment in a Missouri S&T education pays off."

The PayScale report is based on surveys with employees who possess only bachelor's degrees. It includes 999 campuses, most of which have more than 5,000 undergraduate students. The report is available online at www.payscale.com/best-colleges.

Enrollment exceeds 7,000

August 24, 2010 4:16 PM | Permalink | Comments (5) | SHARE

Missouri University of Science and Technology has seen its enrollment rise for the seventh consecutive year, even though the university limited enrollment into its nationally recognized freshman engineering program.

This fall's total enrollment is expected to exceed 7,000 registered students, making it the largest enrollment since the university implemented selective admission standards in 1988. Students began classes for the fall semester on Monday, Aug. 23.

"We are excited to welcome back our returning students and another outstanding freshman class," says Chancellor John F. Carney III. "The nation continues to face significant challenges dealing with global issues, and I have great confidence in our students' ability to become the nation's future leaders and innovators."

First-day student enrollment was 6,952, a 5 percent increase over last year's figure of 6,614, says Registrar Laura Stoll. Missouri S&T's enrollment has increased significantly over the past decade. In 2000, first day fall enrollment at the university was 4,256. This year's enrollment reflects a 63 percent increase in the student body since 2000.

"We have grown slightly beyond our strategic enrollment goals for the size of our campus infrastructure and faculty," says Dr. Warren K. Wray, provost and executive vice chancellor for academic affairs. "To protect the quality of our programs, this year we focused on diversifying the enrollments and restraining the growth in overloaded programs."

Due to capacity limitations, the university capped the freshman engineering class in June and limited the new undergraduate enrollment growth to 4.6 percent. Enrollment this week includes more than 1,160 freshmen, 351 new transfer students and 416 new graduate students.

The university's student achievement and quality ratings are among the highest in the nation for public universities. The average freshman high school GPA was 3.8 on a 4.0 scale and ACT entrance score average was 27.7, ranking the class in the upper 10 percent of college-bound students in the United States.

By the fourth-week enrollment census, Missouri S&T expects to set new enrollment records for student diversity. Enrolled students this fall will come from 47 states and

54 foreign nations. The female student enrollment, which is typically low at engineering-dominant schools, has increased again. The more than 1,529 female students may be a record for the university.

Ninety percent of S&T's students pursue science, technology, engineering or mathematics degrees. In the last two years, more than 80 percent of the students reported securing firm career plans by graduation. In May 2010, graduates reported an average starting salary of $57,800, placing Missouri S&T among the top three public universities in the nation.

The official fall enrollment figures will be released after the fourth week of classes.

Luna to give keynote at Panama university event

September 16, 2010 9:03 AM | Permalink

Dr. Ronaldo Luna, professor of civil, architectural and environmental engineering, will give the keynote address at the Universidad Technologica de Panama during its "Semana de la Ingenieria Civil" (Civil Engineers' Week), scheduled from Oct. 11-15. Luna's address will be on Oct. 13. Find out more about Panama's development in the last 10 years online, including its Canal expansion project and the future metro subway for mass transit.

22 faculty members hired this year at S&T

September 27, 2010 4:00 PM | Permalink | Comments (0) | SHARE

Twenty-two new faculty members began teaching and research at Missouri University of Science and Technology since January 2010.

The new faculty are:

- Joon-Ho Choi, assistant professor, civil, architectural and environmental engineering
- Amitava Choudhury, assistant research professor, chemistry
- Craig Claybaugh, assistant professor, business and information technology
- Richard Dawes, assistant professor, chemistry
- Joel Dittmer, assistant teaching professor, arts, languages and philosophy
- Rohit Dua, assistant teaching professor, electrical and computer engineering
- Andreas Eckert, assistant professor, geological sciences and engineering
- Nobuyuki Fukawa, assistant professor, business and information technology
- Grzegorz Galecki, associate professor, mining and nuclear engineering
- Ralph Hanke, assistant professor, business and information technology
- Xiaoming He, assistant professor, mathematics and statistics
- Amber Henslee, assistant professor, psychological sciences
- Yew San Hor, assistant professor, physics
- Natalie James, instructor, economics
- Lindgren Johnson, assistant visiting professor, English and technical communication
- Nishant Kumar, assistant teaching professor, mechanical and aerospace engineering
- Daniel B. Oerther, professor and the John A. and Susan Mathes Chair of Civil Engineering, civil, architectural and environmental engineering
- Joy Piazza, lecturer, arts, languages and philosophy
- Yiyu Shi, assistant professor, electrical and computer engineering
- Kelly Tate, lecturer, English and technical communication
- Wan Yang, associate professor, geological sciences and engineering
- Yanzhi Zhang, assistant professor, mathematics and statistics.

S&T's Solar Village nears completion

September 29, 2010 3:37 PM | Permalink | Comments (0) | SHARE

Now that the final house in the Solar Village at Missouri University of Science and Technology has been placed on its foundation, attention has been turned to landscaping. The idea is to make the village blend in with its neighborhood, according to Dr. Paul Hirtz, interim director of S&T's Student Design and Experiential Learning Center.

The four-house experimental village is located on 10th Street across from the Gale Bullman Multi-Purpose Building in Rolla. In the past week, new sod and an underground sprinkler system have been installed. Hirtz says all of the landscaping work will be completed by next spring.

Missouri S&T students began building the solar houses in 2000 at a rate of one every two or three years. As the homes were finished, they were made available to students for rent. But there has always been a lot of activity around the existing homes, making the village seem less than a finished part of a community. "With the last house in this village complete and the landscaping work being done, we are seeing the culmination of a long-term vision," Hirtz says.

In addition to being used for housing, the solar homes are monitored for academic purposes. The goal is for the houses to produce enough energy to be self-sustaining. "By day, the homes produce more than enough energy for hot water and electricity, so we can sell some back to the grid," Hirtz says. "At night, we have to buy from the grid. Some of the houses are better than others when it comes to being net-zero on energy."

Hirtz explains that technology has improved a lot since 2000. The last house built by S&T students, he says, has solar cells that are almost 30 percent more efficient than the first.

Despite the solar panels on the roofs, the houses in the village look a lot like most

small homes. But, even with the new landscaping, there will be one thing missing that most people in Rolla are accustomed to seeing in their yards -- trees. Tall trees, especially on the south side of a solar house, impact the amount of energy that reaches the solar panels.

S&T's Solar Village does have residents, but public tours of the houses are arranged periodically. For more information, call 573-341-6782.

Find out how students helped companies cut energy, environmental costs

September 9, 2010 8:52 AM | Permalink

Nine engineering students from Missouri S&T, MU and UMKC got paid this summer to identify ways for Missouri companies to cut energy costs, conserve water and reduce hazardous waste. Three of these Pollution Prevention (P2) interns will discuss their methods, findings and how they applied their engineering knowledge to solve these real world problems. The presentation will be held at 3:30 p.m. Thursday, Sept. 23, in Room 125 Butler-Carlton Civil Engineering Hall. All students, faculty and staff are invited to attend.

Representatives from the MU Environmental Assistance Center, moeac@missouri.edu, will be on hand to describe how students can apply for a P2 internship in 2011.

S&T to award nation's first master's degrees in explosives engineering

December 2, 2010 2:51 PM | Permalink | Comments (0) | SHARE

Missouri University of Science and Technology will award the nation's first master's degrees in explosives engineering Dec. 18.

The program, which was officially approved last spring, is part of Missouri S&T's mining and nuclear engineering department. The university offers 10 explosives courses at the graduate level, five of which are offered through distance education. Two more classes are expected to be added in the coming year. Missouri S&T started offering a minor in explosives engineering at the undergraduate level in 2005.

Fifteen graduate students are currently enrolled in the explosives engineering program at Missouri S&T, and applications are "rolling in," according to Dr. Paul Worsey, professor of mining engineering and director of the explosives program. The following are the first to complete a master's level education in explosives engineering:

-- Buck Hawkins of Seaman, Ohio
-- Nathan Rouse of Willow Springs, Mo.
-- Charles Zdazinsky of New Albany, Ind.

Explosives engineers work in various industries, including mining, construction and entertainment. The military is also a major employer of explosives experts.

Missouri S&T again recognized for value, ROI

January 4, 2011 11:32 AM | Permalink | Comments (1) | SHARE

Missouri University of Science and Technology is once again one of the nation's top public universities, according to *Kiplinger's Personal Finance*.

This marks the fourth time since July that Missouri S&T has been recognized by national publications for its value and return on investment.

The February issue of *Kiplinger's*, now available on newsstands, ranks Missouri S&T 86th for in-state students on the Kiplinger 100 list of public institutions "that deliver a stellar education at an affordable price." S&T is ranked 84th on the list for out-of-state students.

Earlier this year, Missouri S&T was recognized by PayScale Inc. for the high starting salaries of its graduates, *BusinessWeek* for offering a high return on investment (ROI) and *U.S. News and World Report* for being one of the nation's best values in public higher education.

"Despite rising tuition costs, there are still many first-rate institutions providing outstanding academics at an affordable price," says Janet Bodnar, editor of Kiplinger's. "Schools like these on the Kiplinger 100 list prove graduates can enter the workforce with a great education - and without a huge cloud of debt."

"The Kiplinger's rankings reflect the quality and value of a Missouri S&T education," says Missouri S&T Chancellor John F. Carney III. "It also reinforces our own message that investing in a Missouri S&T education will pay great dividends in the future."

This latest ranking comes on the heels of other national recognition for S&T's value and ROI.

Last July, a report by PayScale Inc. ranked Missouri S&T second among Midwestern public and private universities in terms of starting median salary for graduates. The starting median salary for Missouri S&T graduates - $56,700 - was third among all public universities in the nation. More recent salary data from Missouri S&T shows an even higher average starting salary for 2010 graduates: $57,800.

Also last July, BusinessWeek listed Missouri S&T as one of the top 25 campuses in the nation for return on investment. According to that analysis, the 30-year return on investment for Missouri S&T graduates is $1,181,000. The annualized net ROI for obtaining a Missouri S&T degree is 12.4 percent, well above the 9 percent annualized ROI for all schools.

Last fall, U.S. News and World Report put Missouri S&T as No. 6 among public universities in its ranking of Great Schools at Great Prices.