Civil Matters

Kansas State University Department of Civil Engineering April 2013, Volume 11, Issue 1

Steel bridge team member constructs "Steel Willie VIII" —story on page 7

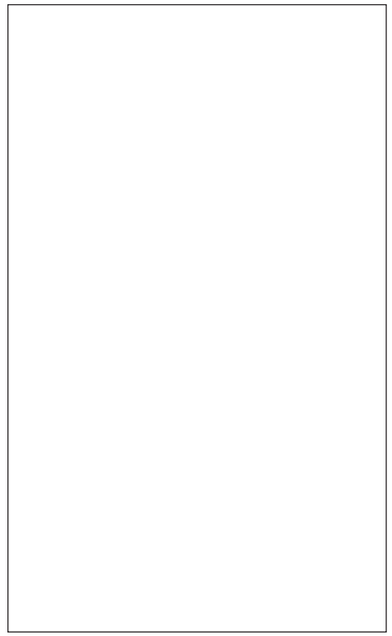
KANSAS STATE UNIVERSITY | College of Engineering

Biofuel co-product helps in stabilization of unpaved roads

Although unpaved roads often serve as the only transportation lifelines for many rural communities in Kansas, U.S. and worldwide, they remain plagued by wash-boarding, raveling, rutting, pot-holing and dust generation. This results in frequent maintenance operations, which are costly and disruptive to traffic.

Associate Professor Dunja Perić has been investigating use of calcium lignosulfonate (CaL), a biofuel co-product resulting from the binding properties of CaL-water mixes, for stabilization of unpaved roads. CaL is derived from lignin, the second most abundant terrestrial organic polymer found in cell walls of most plants. Consequently, combining CaL with soil, the most abundant material on Earth, to build the rural transportation lifelines appears to be a very sustainable concept. To this end, two former graduate students, Paul Bartley and Wilson Smith, have recently been awarded M.S. degrees for their investigations of shear strength of masonry sand-CaL-water mixes. Both early age and strengths after air drying show promising results.

This research was featured in a 2012 article in Prism, a magazine of the American Society of Civil Engineering Education. It was supported by the University Transportation Center. Borregaard LignoTech, Rothschild, Wisc., and Midwest Concrete Materials, Manhattan, Kan., donated the materials.



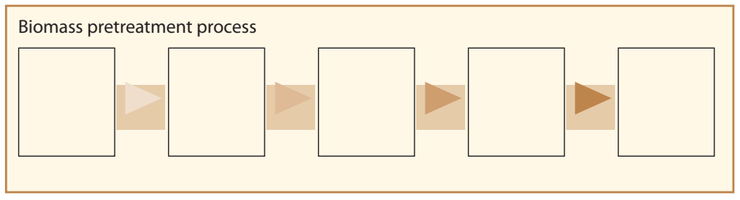
Wilson Smith and CE Associate Professor Dunja Perić review samples testing sustainability of masonry sand-CaL-water mixes.

Research yields biomass pretreatment for concrete

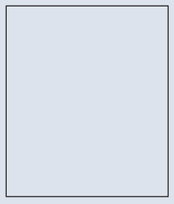
Concrete, the most used material after water, is made out of three major components: portland cement, water and aggregate. Because some greenhouse gases are released during the manufacture of portland cement and it is used in such large quantities worldwide, the cement industry is responsible for about 5% of global man-made carbon dioxide emissions.

Research at K-State is being performed under NSF grant CMMI-103093 to develop a new generation of supplementary cementitious materials (SCMs) to replace some of the portland cement used in concrete that is highly reactive and widely available at low cost. To accomplish this goal, biofuel pretreatment processes such as dilute acid and steam explosion treatments are being applied to the production of a new class of highly reactivity SCMs made from biomass.

From this research, it was found that these material pretreatments can greatly improve concrete strength by removing alkalis out of the biomass and breaking down the cellulosic structure of straw and stover before ashing. This greatly increases the ash reactivity in concrete, making it a more valuable agricultural co-product which can improve concrete strength and durability.



Publication announcement



Hani Melhem

Hani Melhem, professor of civil engineering, and his former graduate student, Asfandyar Inayat, announce the recent publication of their book, Critical Success Factors for Organizations in Construction Projects: A Quanti□cation and Analysis of Engineering Judgment through Analytical Hierarchy Process and Statistical Approaches, Lambert Academic Publishing.

Concrete institute honors college activities with "Excellent University" award

Kansas State University's College of Engineering was named an American Concrete Institute (ACI) "Excellent University" for its accomplishments in 2012. The university is one of just 16 to receive ACI's Award for University Student Activities. The honor recognizes universities that participate in institute-related activities.

Contributions from the departments of civil engineering and architectural engineering and construction science helped the college earn the honor. K-State has 69 students who are ACI members. In 2012, these students competed in two institute competitions.

The award was also based on student and faculty attendance at ACI conventions and service on institute technical committees. Ahmed Abd El Fattah, CE doctoral graduate, served on the ACI 440 committee—fiber-reinforced polymer reinforcement—and its 441 committee—columns. CE faculty members Hayder Rasheed, Kyle Riding and Asad Esmaeily were all actively involved with the institute.

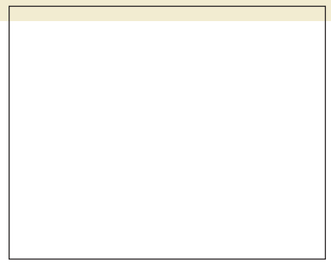
"This honor is a great accomplishment for me, my colleagues, our students and Kansas State University," Rasheed said. "It represents our commitment to professional service activities in our fields of expertise."

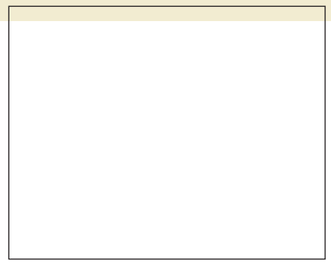
The award was presented at the American Concrete Institute's 2013 spring convention, in Minneapolis, Minn.

Team studies aquifer impact on agriculture production

Groundwater is important for Kansas and Kansans. The Ogalalla Aquifer provides a reliable source of water for irrigated corn production, which in turn is used to support production of five to six million head of cattle on feed every year. And yet, pumping rates in Western Kansas exceed the rate of natural recharge, resulting in a steadily declining storage of water.

At future times, wells will begin to go dry. CE Professor David Steward and his team are researching how groundwater is being used to grow corn and cattle. A variety of scenarios are being evaluated to learn how changes in policy and management practices might impact this system. Team members are looking at hydrologic pathways and the potential to enhance recharge rates, as well as how declines in groundwater pumping will impact crop production and the availability of corn to support the regional cattle industry.





Russell selected for national award, committee chair

Eugene Russell, professor emeritus of civil engineering, was recently selected to receive the 2012 Wilbur S. Smith Award from the American Society of Civil Engineering for his contributions to enhance the role of civil engineers in highway engineering. He was also recently appointed chair of the Roundabout Committee of the Transportation Research Board, a division of the National Research Council.

Graduating seniors practice civil engineering in "real-life" project

Every semester, the graduating class works on a senior design project that is either ongoing in the city of Manhattan, or is expected to be implemented in the near future. This capstone course is required in the CE curriculum and is taken by all students in the semester in which they graduate. It is intended to provide an experience that integrates various design areas in a comprehensive, open-ended project. This typically involves designing elements from the various areas of transportation, water resources environmental, geotechnical and structural engineering. The design involves incorporating appropriate engineering standards, economic considerations and multiple realistic constraints while considering criteria such as impact on the natural environment, sustainability, constructability, ethics, public health and safety, social impact, esthetics and political context. In the class, design problems of current interest in the Manhattan area involving actual local sites are selected to emphasize the real-world character of the work expected of the students.

Capstone-course team members preform a site visit in Manhattan to develop project plans.

The class is divided into design teams of four to six members. Teams are organized so that members complement their design experience in various civil engineering sub-areas. During the semester, each student serves as chief engineer of the design team for a particular design task. As chief engineer, he or she is responsible for preparing weekly/biweekly written and oral progress reports, as well as presenting oral and written task reports at the end of a major task. Chief engineers also assign work to the members of their teams and submit written evaluations of each of the design team members at the end of the task. Design team members, in turn, evaluate the work of the chief engineer and the oral task reports. All members of the design team collaborate in preparation of a final written project task report.

The course also includes a seminar series that leads to a general understanding and appreciation of the professional, social and ethical responsibilities of the practice of civil engineering. Reading assignments are selected every week and discussed during a portion of the weekly class meetings. Individual students are assigned on a rotational basis to lead the discussion. Outside engineering professionals are also invited once or twice a semester to present topics related to professional development and the various aspects of engineering practice.

The professor-in-charge organizes and conducts the course. Other faculty members serve as primary consultants for each of the various design tasks. Quite often and almost every semester, practitioners from industry and consulting firms get involved in the course, providing input and advice to the students. All departmental faculty, practitioner advisors and graduate students are invited to the oral presentations, and evaluate and critique the presentations. The students seek input from other consultants, both on and off campus, as needed during the semester, and outside speakers with knowledge and experience relating to the assigned project are occasionally invited to facilitate interactions with the project teams.

The spring 2013 semester has 35 graduating seniors. The project is about modifying the city lot at 3131 Anderson Avenue in Manhattan from a fire and rescue station to a utilities operation facility. It will need to house the service and maintenance vehicles, and serve as the base for the maintenance crews and their equipment. The class activity starts with a site visit to explore the site conditions and existing topography and land use.

The subject lot must be redeveloped in conformance with local ordinances and engineering standards. A site layout is to be developed to use the available space efficiently. The transportation engineering aspects include site access and internal circulation, service vehicle parking, public/visitor and employee parking, and public/employee access to buildings. Pavement will need to be designed as well as adequate drainage of storm water. This also includes developing a utility plan to provide additional water and sewer service to a wash rack for the utilities vehicles.

Structural and foundations aspects include constructing an additional structure needed as a garage/shop for the utilities vehicles. The required area will be a partially enclosed floor space, directly accessible from the driveway or parking lot. Structural aspects include determination of the design loads and the material(s) of choice for construction, and the design of different structural components that will be used in the structural system. Foundation aspects include identification of soil properties, selection of type of foundations and design of those foundations, as well as any earth-retaining walls that might be necessary. Detailed cost estimates are required.

Distance education master's degree courses

The civil engineering department offers graduate-level courses leading to a master of science degree in civil engineering to off-campus students—no matter where they live. All courses needed for the degree will be offered online or by other multimedia delivery methods. Students only need to travel to K-State once, at the end of their program, for an oral examination conducted by their graduate committee. A master's degree can also be counted as a year of credit toward earning a professional engineering license. For information on earning this license, go to the Kansas Board of Technical Professions online at http://www.kansas.gov/ksbtp/.

Summer 2013

CE 703	Responsibility in Engineering: Codes and Professionalism
CE 704	Responsibility in Engineering: Leadership and Diversity
CE 790	Prb/Engineering Ethics Case Studies

Fall 2013

CE 654	Design of Groundwater Flow Systems
CE 690	Top/Basics of Engineering Ethics
CE 704	Responsibility in Engineering: Leadership and Diversity
CE 732	Advanced Structural Analysis I
CE 742	Advanced Steel Design
CE 745	Structural Dynamics
CE 752	Advanced Hydrology
CE 766	Wastewater Engineering/Biological Processes
CE 775	Traffic Engineering
CE 777	Portland Cement Concrete Pavements
CE 786	Land Development for Civil Engineers and Planners
CE 790	Prb/Sustainability and Green Engineering
CE 816	Topics/Modern Roundabout Analysis and Design
CE 816	Topics/ABAQUS Applications in Geosystems

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Phone: 1.877.528.6105
www.dce.ksu.edu/engineering/degrees/civil/

Undergraduate scholarship recipients

Cale Armstrong (Shawnee, Kan.) Francis D. Wagner Memorial Scholarship, S. H. Brockway Memorial Scholarship, William R. and Mila Kimel Engineering Scholarship

Andrew Bernica (Topeka, Kan.) Bartlett & West Inc. Civil Engineering Scholarship, Francis D. Wagner Memorial Scholarship, Kenneth and Maria Rector Scholarship, Shelby K. Willis Civil Engineering Scholarship

Antoine Borden (Colorado Springs, Colo.) NACME Scholarship

Andrew Brunner (Silver Lake, Kan.) Engineering Scholarship, Karl J. Svaty Memorial Engineering Scholarship

Joseph Burgett (Carbondale, Kan.) Alan and Sharon Sylvester Civil Engineering Scholar, Carl R. Ice Dean's Excellence Fund, Engineering Scholarship, 'Red' Web Sproul Memorial Scholarship

Gregory Canales (Emporia, Kan.) Bruce E. Roberts Scholarship, Charles A. Stryker Memorial Engineering Scholarship

Caleb Childs (Wichita, Kan.) Warren and Mary Lynn Staley Engineering Excellence Scholarship

Dillon Cowing (Clay Center, Kan.) Brungardt Honomichl & Company, PA Civil Engineering Scholarship, Walter A. Buchheim Memorial Scholarship

Brady Crites (Overland Park, Kan.) Bartlett & West Inc. Civil Engineering Scholarship, Coonrod Memorial Civil Engineering Scholarship, Jeanne M. and Edward J. Mulcahy Scholarship, Walter M. and Alice K. Bellairs Scholarship

Joshua Dlabal (Wilson, Kan.) Walter M. and Alice K. Bellairs Scholarship

David Ecklund (Overland Park, Kan.) Chas Turnipseed Memorial Fund Engineering Scholarship, The Wildcat Construction Company, Inc. Scholarship

Adam Emerson (Tomball, Texas) Walter M. and Alice K. Bellairs Scholarship

Eric Fletcher (Topeka, Kan.) Jim and Pat Guthrie Civil Engineering Scholarship, Roger W. Coulter Scholarship in the College of Engineering, The Claude and Lucellustine Wilson Minority Engineering Scholarship, The Edward L. Wilson Civil Engineering Scholarship, Walter M. and Alice K. Bellairs Scholarship

Allison Franken (Kansas City, Mo.) Glenn L. and Doris A. Ellithorpe Scholarship, Herb and Mary Sue Whitney Scholarship

Claudia Gonzalez (Wichita, Kan.) Successful Engineers Scholarship, The Claude and Lucellustine Wilson Minority Engineering Scholarship, Warren and Mary Lynn Staley Engineering Excellence Scholarship

Ashley Green (Rose Hill, Kan.) Walter M. and Alice K. Bellairs Scholarship

Brandon Heavener (Emporia, Kan.) Ralph and Dora Rogers Memorial Scholarship

Trevor Kaufman (Newton, Kan.) Chas Turnipseed Memorial Fund, Mick and Nancy McAuliffe Civil Engineering Scholarship, R. D. and Mary C. Andersen Scholarship

Corey Kingsland (Wichita, Kan.) Charles Freund Memorial Scholarship, Dwight Raymond Lee Memorial Scholarship, The Paulson Civil Engineering Student Excellence Scholarship

Weston Koehn (Montezuma, Kan.) Orville "Butch" and Doris Spray Family Civil Engineering Scholarship

Dominic LaRocca (Kansas City, Mo.) Ralph and Dora Rogers Memorial Scholarship

Sara Mann (Hutchinson, Kan.) Orville "Butch" and Doris Spray Family Civil Engineering Scholarship

Keithen Meyer (Bern, Kan.) Ralph and Dora Rogers Memorial Scholarship

Matthew Oesterreich (Colby, Kan.) Ralph and Dora Rogers Memorial Scholarship

Xuchu Pang (Taizhai City, China) Ralph and Dora Rogers Memorial Scholarship

Jacob Paperi (Overland Park, Kan.) Ralph and Dora Rogers Memorial Scholarship

Ethan Peck (Russell, Kan.) Bruce E. Roberts Scholarship

Carl Peterson (Overland Park, Kan.) Beavers Heavy Construction Scholarship, E. C. Lindly Scholarship for Engineering Students, Engineering Scholarship

Dustin Phommanivong (Olathe, Kan.) Edmond E. Young Scholarship, Engineering Scholarship, Joseph C. and Elsie May Fickel Endowment

Yadira Porras (Newton, Kan.) Successful Engineers Scholarship

Donald Powers (Manhattan, Kan.) Engineering Scholarship, Kevin and Dianne Honomichl Civil Engineering Scholarship, Robert Callen King Award in Engineering

Robert Reilly (Overland Park, Kan.) Civil Engineering Excellence Scholarship, Engineering Scholarship, Walter M. and Alice K. Bellairs Scholarship

James Scott (Manhattan, Kan.) Ralph and Dora Rogers Memorial Scholarship

Garrett Sharpe (Lindsborg, Kan.) Albert Niu Lin Scholarship in Civil Engineering, Engineering Scholarship

Lisa Shofstall (Mission, Kan.) Everett J. and Marilyn J. Cupps Civil Engineering, Herman V. Fleming Memorial Scholarship, Serpan Family Engineering Scholarship, Vicki Scharnhorst Civil Engineering Scholarship

Vincent Studer (Frankfort, Kan.) Engineering Scholarship, Greg A. Tucker Leadership Scholarship, Paul Bartak Family Scholarship

Jenny Swabb (Basehor, Kan.) Engineering Scholarship, Loyal and Jill Huddleston Civil Engineering Scholarship

Daniel Vogt (Sedgwick, Kan.) Edwin F. and Eunice F. Wambsganss Engineering Scholarship

Brett Voth (Walton, Kan.) Ralph and Dora Rogers Memorial Scholarship

Brandon Wagner (Augusta, Kan.) Warren and Mary Lynn Staley Engineering Excellence Scholarship

Aaron Wasko (Winfield, Kan.) Ralph and Dora Rogers Memorial Scholarship

Kyle Weldon (Des Peres, Mo.) Ralph and Dora Rogers Memorial Scholarship

Thomas Barret Wellemeyer (Derby, Kan.) Engineering Scholarship, Max E. Foote Scholarship

Andrew Wiederholt (Hartford, Kan.) Ralph and Dora Rogers Memorial Scholarship

Adam Wilkerson (Columbia, Mo.) John Brooks and Ida Bernice Slaughter Engineering

Kurt Yoder (Welda, Kan.) Ralph and Dora Rogers Memorial Scholarship

Xinchi Zhang (Wuhan, China) Alfred Walton Johnson Memorial Scholarship, Engineering Scholarship

Competitors line up for the coed sprint concrete canoe heat. Mohammed Ali, Saudi Arabia; Brianna Krysztof, Baldwin, Kan.; Nathan Pohl, Hutchinson, Kan.; and Jenny Swabb, Basehor, Kan., second hull from top, race for K-State.

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