THE UNIVERSITY OF TEXAS AT AUSTIN ✦ COLLEGE OF ENGINEERING
TxDOT
TEXAS PAVEMENT PRESERVATION CENTER
Newsletter
ISSUE 2 / SPRING 2006

Spring 2006 / Issue 2

Inside This Issue:

Our Mission

The mission of TPPC, in joint collaboration with the Center for Transportation Research (CTR) of the University of Texas at Austin and the Texas Transportation Institute (TTI) of Texas A&M University is to promote the use of pavement preservation strategies to provide the highest level of service to the traveling public at the lowest cost.

Contact Us

Director: Dr. Yetkin Yildirim, P.E.
E-mail: yetkin@mail.utexas.edu
Website: www.utexas.edu/research/tppc

Mailing Address:
Texas Pavement Preservation Center
Center for Transportation Research
The University of Texas at Austin
3208 Red River, CTR 318
Austin, TX 78705

Tel: (512) 232-3083
Fax: (512) 232-3070

Issue Highlights

TRB 85th Annual Meeting

The TRB 85th Annual Meeting attracted more than 9,500 transportation professionals from around the world to Washington, DC January 22-26, 2006. The meeting covered all transportation models, with approximately 2,600 papers and presentations in 500 sessions addressing topics of interest to attendees. Summaries of selected papers related to pavement preservation are included in this issue. The Transportation Research Board is a division of the National Research Council, which serves as an independent adviser to the federal government and others on scientific and technical questions of national importance. TRB's mission is to promote innovation and progress in transportation through research.

2006 Navigating Costs Symposium

The CTR Navigating Costs Symposium was held April 4 at The University of Texas at Austin with keynote speaker Dr. William Buechner, Vice President of Economics and Research for the American Road & Transportation Builders Association (ARTBA).

2006 TxAPA Seal Coat Conference

The Texas Asphalt Pavement Association (TxAPA) held their Seal Coat Conference on April 26-27, 2006 in Waco, Texas with approximately 300 attendees.

Mark Your Calendar:
2006 Pavement Preservation Seminar

The Pavement Preservation Seminar will be held October 3, 2006 in Austin, Texas. Visit www.utexas.edu/research/tppc for continuing updates.

TRB 85th Annual Meeting
Selected Pavement Preservation Papers

Cooling Rates in Hot-Poured Bituminous Sealants by Peter Collins, J-F. Masson, and Imad L. al-Qadi

Collins et al. stated that the performance of bituminous sealants applied to cracks and joints is partly governed by installation. The rate of cooling after pouring hot sealants impacts rerouting traffic, adhesion of sealant / hot mix asphalt interface, and the sealant microstructure. To determine the extent of the rate of cooling, the change in temperature of three sealants was measured in field and lab tests. Tests showed that sealant bulk temperature was more than 50°C lower than the standard application temperature (180°C) almost immediately after pouring. The bulk temperature reached 40°C or lower within 15 minutes. These results indicated that traffic need only be rerouted for 15 minutes, as opposed to the common 30 minutes, because deformation is not a concern. While the cooling rate of bituminous hot poured sealants remained undetermined, it can be inferred that the time for a sealant to wet and bond to the HMA surface is extremely short. Thus sealant wetting propensity is crucial for a sealant to adhere strongly to pavement.

Probabilistic Life-Cycle Cost Optimization for Pavement Management at the Project-Level by Dima Jawad and Kaan Ozbay

Jawad and Ozbay stated that optimizing the life-cycle cost of transportation infrastructure is a strategic approach for achieving sustainability of infrastructure systems. They present a life-cycle cost optimization model (LCCOM), developed for analysis at the project-level for pavement management. In order to identify a life-cycle strategy that can bring about an optimum gain to society, the life-cycle cost optimization must look at every feasible life-cycle strategy and consider every possible impact that may be caused by placing the system into operation. The research presented creates the opportunity for further exploration of project-level probabilistic cost optimization in real-world decision making. The main goal of life-cycle cost optimization is to ensure that infrastructure facilities are managed (planned, constructed, operated, maintained, and rehabilitated) in a manner that brings about the best gains to present and future generations. Life-cycle cost optimization is a broad concept that can be applied at different levels of evaluation and to different categories of infrastructure systems. A thorough research in this area has resulted in noticeable advancement as it is steadily being integrated into practice and the decision making process.

Effects of Winter Weather and Maintenance Treatments on Highway Safety by Liping Fu, Max S. Perchanok, Luis Fernando Miranda Moreno, and Quadar Ali Shah

Fu et al. attempted to quantify the effects of winter weather and maintenance treatments on the safety of highways. This research is integral for a cost-benefit analysis of alternative maintenance strategies and methods as well as effective communication of the impacts of these strategies and methods to the decision makers and public. Statistical analysis was performed on data collected from two highway routes in Ontario, Canada. The obtained data included daily accident occurrences, weather conditions, and winter maintenance operations. Researchers attempted to answer many questions in this comprehensive study, including 'How much improvement can be expected from technology-enhanced maintenance systems and operations?' The extent to which maintenance operations should be applied and the effects of application conditions were also studied. Anti-icing operations were confirmed to be more effective than the combined operations of plowing and pre-wet salting. Variation within these operations may be small despite the differences in weather conditions; therefore, crash frequency, as the object of study, becomes less quantifiable. Also, there is significant variation in local snow conditions due to drifting and shading, resulting in a large variation of snow cover and, therefore, safety. The project initiated the task of quantifying impacts of winter weather and maintenance operation on safety, but it has only focused on its effects on crash frequency. Future research should examine the impact of these factors on crash consequences. Past studies have found that the consequences of a crash are usually lower in winter seasons due to reduced travel speeds, but the effects of maintenance operations on crash frequency has yet to be quantified.

Optimum Dynamic Probabilistic Management Model for Long-Term Pavement Restoration Program by Khaled A. Abeza and Maher M. Murad

Abeza and Murad presented sample results indicating the usefulness of the developed optimum dynamic probabilistic management model (ODPMM) in yielding potential long-term pavement restoration programs. Although future conditions cannot be estimated with certainty, this probabilistic model is a simple approach with minimal data requirements (initial state probabilities and transition probabilities). The derived state probability functions can then be used to develop a dynamic optimum decision policy for pavement system conditions. The optimum solution can be efficiently obtained using available linear programming software packages.

Considerations for Establishing a Pavement Preservation Program by Teresa M. Adams and Myungook Kang

Adams and Kang established that a pavement preservation program cannot work effectively without a programmatic framework. Such an organization enables optimization and defensible pavement preservation decisions by providing the information needed to analyze and justify budget trade-off decisions. Adams and Kang discussed the essential characteristics of a pavement preservation program, obtained from the analysis of eight state transportation departments. The study noted that each dollar spent now on preventive maintenance saves up to six dollars in the future, and case studies show that pavement preservation programs can be established with relatively low investments and can lead to significant cost savings. Though agencies have been implementing pavement preservation techniques for a long time, agencies must create an organized program to realize the full benefits of such strategies. Ten features of a successful program were identified. For one, the motivation for establishing the program should be clear. Such motivations may include savings through pavement life extension, improved ride quality, and fewer rehabilitation projects. Also, preservation projects and strategies must be selected using consistent guidelines and databases. Agencies must also develop procedures for anticipating maintenance needs and provide a dedicated budget with federal support. Employees should be educated on benefits and concepts of pavement preservation, and ongoing program evaluations directly impact continued improvement and performance.

Degradation of Bituminous Sealants Due to Extended Heating before Installation: A Case Study by J-F. Masson, Peter Collins, Sladana Bundalo-Pere, John R. Woods, and Imad L. al-Qadi

Masson et al. tested bituminous sealants that are applied to cracks and joints in pavements, bridges, and other civil engineering structures. The objective of their testing was to better understand the effects of installation on sealant properties. Crack sealing treatments are generally applied at 180°C, a temperature at which the sealant can degrade. By measuring the molecular size, type of bond (sealant to crack wall), and the temperature at which the sealing material becomes ash and gas, they found that the material was most degraded early in the morning as a result of long pre-installation heating times at 150°C. This non-oxidative degradation led to sealant stiffening, a result of changes in polymer structure and loss of bitumen and polymer contents. This loss of organic material resulted in an increase in filler content. Control of sealant preparation conditions prior to installation is crucial for optimized sealant performance. This control includes the time and temperature of the sealing material prior to and during installation.

Infrastructure Asset Management Education: Active Learning and Engagement-Based Practices by Omar Smadi and Akili Waddah

Several transportation asset management courses are being taught as part of university curricula as the asset management of civil infrastructure facilities and systems becomes increasingly important. A few institutions have implemented well defined programs related to infrastructure asset management. Smadi and Waddah outlined a class offered at Iowa State University to civil engineering and transportation planning graduate students. Underlying the curriculum at Iowa State is the concept of ‘active learning’, broadly defined as any instructional method that engages students in the learning process. Cooperative and problem-based learning techniques are also used to enhance the role of group work and problem solving in engineering. Smadi and Waddah outlined the class syllabus, the active learning techniques utilized, and a sample class project. As asset management system development becomes more important, more demand will be placed on academic institutions to provide proper training. Thus efforts need to be made to standardize the training process, and education in this area can operate to further improve an engineer’s critical thinking and managerial skills.

Risk Cost Model for Analysis of Performance Specified Pavement Maintenance Contracts by Ivan Damnjanovic and Zhanmin Zhang

Many transportation agencies are implementing outsourced performance-based pavement maintenance contracts that are intended to shift performance-related risks from public agencies to private contractors while allowing contractors greater flexibility in planning and executing maintenance activities. However, how to quantify the risk cost remains a concern, preventing some agencies from moving more aggressively toward the implementation of such contracts. Damnjanovic and Zhang presented a general and flexible framework for quantifying the risk cost of outsourced performance-based pavement maintenance contracts in order to provide transportation agencies with the information they need to make better cost-efficient decisions. The developed framework included the reliability-based pavement performance model, the preventive maintenance and rehabilitation models, and the risk cost model. The general methodological framework was illustrated with an example where the limit state function of the reliability model is formulated using the current AASHTO design methods for flexible pavements.

Performance Evaluation of Bituminous Surface Treatment Using Third-Scale Model Mobile Loading Simulator by Jusang Lee, Y. Richard Kim, and Emily O. McGraw

Lee et al. presented a new test protocol for performance evaluation of bituminous surface treatments (BST) based on the evaluation of aggregate retention, bleeding, skid resistance, aggregate embedment depth, cracking, and rutting. The third-scale Model Mobile Loading Simulator (MMLS3) examined the effects of mix parameters such as aggregate emulsion and application rates, fine content, and aggregate gradation on aggregate bleeding. Results indicate that the developed method supports the current BST design. Experimental work presented with the MMLS3 indicates that the amount of aggregate loss decreases as the application rate decreases, the emulsion application rate increases, the fine content decreases, and the gradation becomes more uniform. While the repeatability of this method requires more investigation, the MMLS3 method showed potential for evaluating the BST under realistic loading conditions.

Optimum Decision Making and Uncertainty Analysis at Programming Level of Pavement Management Systems by Ashim Shivakoti and Hamid R. Soleymani

Shivakoti and Soleymani based their study on the idea that decisions made at the programming level of Pavement Management Systems (PMS) have the highest economic impact and determine the effectiveness of decisions taken at the project selection and project levels. Pavement performance depends on many parameters, including construction quality, materials, environment, drainage, traffic, and the interaction of these parameters. Shivakoti and Soleymani presented a methodology to address the issue of optimum decision-making and uncertainty analysis. Goals of the proposed methodology included enabling the decision-maker to optimize budget allocation and providing the decision-maker with multiple optimal solutions in order to balance the objective function and the impact of uncertainty on the optimal solution.

For more information on these or other TRB papers visit www.trb.org.

Past Events

Texas Asphalt Pavement Association Seal Coat Conference – April 26-27, 2006 – Waco, Texas

The Texas Asphalt Pavement Association (TxAPA) held their Seal Coat Conference on April 26-27, 2006 at the Waco Convention Center. The conference attracted approximately 300 attendees. The Association serves the needs of hot mix asphalt producers, contractors, liquid asphalt suppliers, and firms interested in improving and growing the hot mix asphalt industry. TxAPA consistently provides services and information to keep the industry on the competitive edge. A major goal of the organization is to provide training for design, testing, and management of hot mix asphalt materials.

For more information visit www.txhotmix.org.

Center for Transportation Research "Navigating Costs" Symposium – April 4, 2006 – Austin, Texas

CTR hosted its annual symposium, "Navigating Costs," on April 4, 2006 at The University of Texas at Austin. CTR researchers addressed a variety of timely topics. Presentations were followed by a tour of the UT Microelectronics Lab. Keynote speaker Dr. William Buechner, Vice President of Economics and Research for the American Road & Transportation Builders Association (ARTBA) in Washington, D.C., discussed recent developments and the future outlook of highway construction costs. In addition to presentations, exhibitions of current research projects were displayed. The Texas Pavement Preservation Center (TPPC) gave a video presentation on the definition and economic benefits of pavement preservation as well as pavement preservation treatment types and procedures.

For more information visit www.utexas.edu/research/ctr.

Upcoming Events

Pavement Preservation Seminar
October 3, 2006 – Austin, Texas

The Pavement Preservation Seminar, scheduled for October 3, 2006 in Austin, Texas, will present a thorough overview of the latest concepts, techniques, and materials related to pavement preservation. Seminar topics will include Asphalt Overlays, Scrub and Fog Seals, Crack Sealing Techniques and Materials, Chip Seal Best Practices, TxDOT Questions and Answers, Hot-in-Place Recycling, Micro-Surfacing and Slurry Seals, and Pavement Management Systems. In recognition of the need for education and training related to pavement preservation, AGC, AEMA, FP^2, and the Texas Pavement Preservation Center will collaborate in conducting the 2006 Pavement Preservation Seminar. The 2006 Seminar will be presented in conjunction with the 23rd Annual AGC of Texas Trade and Equipment Show.

For updates visit the Texas Pavement Preservation Center (TPPC) website: www.utexas.edu/research/tppc.

Loop 360 in Austin, Texas