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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.

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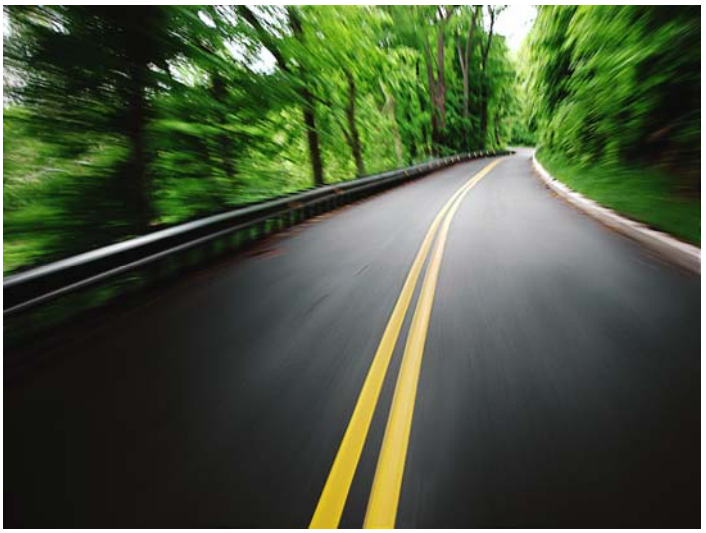

Issue Highlights

Transportation Systems Preservation (TSP) Research & Implementation Roadmap Workshop

The FHWA has assembled a technical panel of experts in pavements and pavement and bridge preservation, which will ensure that the direction of the project is responsive to the diverse interests and needs of FHWA and state and local highway agencies. Two workshops on pavement preservation, held February 5 – 7 in Phoenix, AZ and February 26 – 28, 2007 in Orlando, FL, invited approximately 100 persons knowledgeable in pavements and pavement preservation, representing highway agencies, FHWA, TRB, industry, and academia to discuss, evaluate, and rank potential research problem statements that would compromise the Pavement Preservation Roadmap. Workshop sponsors included FHWA with AASHTO Highway Subcommittee on Maintenance, FP^2, TRB Committee on Bridge Management, and ESCINC. This issue summarizes the TSP Workshop presentations.

Mark Your Calendar: 2007 Pavement Preservation Seminar

The 2007 Pavement Preservation Seminar will be held October 8-9 at the Austin Convention Center in conjunction with the 24th Annual Association of General Contractors of Texas Trade & Equipment Show. Sponsors for the Seminar are the Asphalt Emulsion Manufacturers Association (AEMA), the Associated General Contractors of Texas (AGC), the Foundation for Pavement Preservation (FP^2), the Texas Pavement Preservation Center (TPPC), and the UT Center for Lifelong Engineering Education (CLEE).
For more information, visit
http://www.utexas.edu/research/tppc/conf/pps/index.html

Asset Management and Preservation by John O'Doherty and Larry Galehouse

Transportation agencies have traditionally focused on physical road conditions, rather than on economics and cost-effectiveness. As road agencies begin the transition to proper asset management, they are discovering the difficulties involved with adapting private enterprise models to the public sector.

Agency officials face difficult budgetary constraints and, therefore, often make the safe political move of fixing the worst facilities until funds run out. Typically, officials have a tendency to concentrate on the present and deal with their networks at the project level. Modern management theory shows that highly complex operations, such as highway systems, can be successfully managed at the network level by using a horizon of multiple time periods. O'Doherty and Galehouse present two project-level management dilemmas that agencies now face: when to undertake physical improvements, based on physical or engineering criteria, and what thresholds to use, based on public views of the acceptable level of service. In other words, what exactly constitutes a good road?

Challenges exist at both the highway project and network levels. A major obstacle involves convincing agency management that many existing management systems, along with other management tools, have strong advantages and should be utilized. Also, agencies must ensure that the right data needed to conduct engineering and economic analyses is collected accurately. Fortunately, these two challenges can be solved without any further research. However, economic benefits and cost-effectiveness of individual preservation techniques need to be further assessed. With many factors affecting these figures, such as materials, design, workmanship, traffic, and climate, road agencies need to collect adequate data for use with modern Pavement Management Systems (PMS's).

According to O'Doherty and Galehouse, more research is needed in the area of Remaining Service Life (RSL) and other asset condition indicators. Accuracy in the calculation of these indicators is imperative; decisions involving allocation of vast resources will depend heavily on accurate research. It is also necessary to have the ability to link the asset physical condition to economic replacement thresholds and cost-effectiveness levels. Future research work could attempt to establish multi-regional baselines through economic analysis that will assist agencies in their asset management programs. Research in the area of budget allocation, such as investigating adjustments that encourage preservation, would be helpful, as well.

Design of Pavement Preservation Activities/Projects by Dr. R Gary Hicks, P.E. and Dr. Shakir Shatnawi, P.E.

Project design considerations constitute an essential element of pavement preservation programs. Placing the right treatment on the right road at the right time is crucial. For instance, pavement preservation should be performed only on pavements in good condition or with minor distress. Guidelines such as this must be adhered to for a program to function correctly.

According to Hicks and Shatnawi, it is necessary to have a selection process for choosing the appropriate treatment methods for any given project. This selection process must consist of the following steps: the assessment of existing roadway conditions, such as surface distress, traffic issues, and drainage and climatic conditions, the determination of feasible options by addressing functional issues, such as the surface condition of the pavement, and the analysis and comparison of every feasible option. The analysis of possible treatments should be based on the predicted life extension of the existing pavement resulting from the PP treatment, along with the results of LCCA or other economic evaluation tools. Road agencies need to conduct research and gather accurate data on determining optimal timing for PP treatments.

Although the work reported in NCHRP Report 523 provided a framework for optimal timing, this framework must now be field evaluated.

The design element issues of pavement preservation must be addressed before PP can advance throughout the industry. There are a variety of issues involved here, such as the need for road agencies to have a process for the selection of proper PP strategies for all pavement types that includes economic analyses of each feasible strategy. In order to resolve some of the PP design element issues, certain measures need to be taken. Better documentation on costs benefits and improvements, without the usual reliance on anecdotal information, would be helpful, for instance. Other vital issues include the optimal timing of treatments, the most effective number of treatment applications, and the need for valid justification for delaying pavement rehabilitation, reconstruction, and replacement.

Yet, the most important issue remains whether PP treatments are cost-effective compared to pavement rehabilitation. Further documentation of expected life extension from the application of preservation treatments is necessary in order to show whether PP programs are beneficial overall. For instance, the reasons for the variable performance of treatments applied must be explained. In addition, different analysis periods (for economic analysis) may be needed in order to study the difference in cost between preservation and rehabilitation programs.

Future research needs and topics for potential research projects related to this topic could include determining which pavement attributes would best assist agencies in the selection of PP activities, determining threshold limits or trigger values, or integrating preventive maintenance and pavement management.

Materials for Pavement Preservation Activities/Projects by John B. Johnston and Larry Galehouse

In this study, Johnston and Galehouse formulate a framework for the development of research problem statements that accurately address the effect of materials selection on the performance of preventive maintenance treatments. The quality of the materials used significantly impacts the life span and long-term performance of the construction project. Pavement preservation treatments are usually relatively thin but must withstand large amounts of stress, such as adverse environmental conditions and heavy traffic.
Recent reviews of the literature show that little research has been conducted on materials selection, mix design, and materials testing. Most of the available research has centered on evaluating the performance of crack and joint sealing and filling products, and to a lesser extent, the investigation of improved mix design methods. Nationally conducted surveys have determined that, among pavement practitioners, a high level of interest exists about the study of crack and joint sealant material performance and the methods used to select sealant products.

The on-going reviews of traffic agencies have revealed a tendency towards using local aggregate sources. Those in charge of materials selection generally focus on the low cost and high availability of such products, rather than their quality and long-term performance capabilities. This often occurs because many practitioners simply do not fully understand the impact of aggregate quality on treatment life and performance. Because they are not supplied the proper quantitative data needed to judge whether using local materials or importing high-quality aggregate would be the most cost-effective, most practitioners choose the less costly of the two by default. Furthermore, many decision-makers are unsure how to judge if a material is sufficient or substandard for a given treatment. Without these necessary tools to justify spending more on imported, higher quality aggregate, selecting cheaper and inferior materials seems to be the only sensible choice. This problem is further heightened by the general lack of availability of high-quality aggregate in some areas.

Practitioners must develop a better understanding of the cost-benefits associated with selecting one material component over another, especially when screening and selecting aggregate sources. Due to insufficient data, informed decisions about when to use local or imported aggregate materials are rare. Practitioners need to have an understanding of the material parameters that impact performance and utilize reliable methods of measuring those parameters, in order to make proper aggregate selection choices.

Concrete Pavement Preservation by John Roberts and Larry A. Scofield, P.E.

Pavement preservation (PP) goals can be divided into three main desired outcomes: pavement life extension, improved safety, and consumer satisfaction. As defined by FHWA, PP employs a long-term strategy aimed at enhancing pavement performance by using cost-effective practices that extend pavement life, improve safety, and meet consumer demand. When defining pavement extension, the FHWA differentiates between treatment life extension and pavement life extension. PP life estimates are commonly referred to in terms of treatment life, such as 3-5 years. If the treatment does not extend the life of the existing pavement, however, it is no longer cost-effective and its service life is, therefore, insignificant. This concept is crucial, especially when tight budgets make the worst-first strategy attractive. Ideas about safety and customer satisfaction must also be reexamined in order to enact successful pavement preservation.

In emphasizing the preservation concept, PP programs often claim that a high initial cost can lower costs down the road. This theory is linked to the belief that investments made during the preservation process are much more cost-effective than those made during the resurfacing or reconstruction process. However, this is an oversimplification of matters, which can often lead to decisions based on hearsay rather than engineering data.

Concrete pavement has previously been utilized in predominately urban areas with high traffic volumes. The term concrete pavement preservation (CP^2) describes a series of engineered techniques developed over the past 40 years to manage the rate of pavement deterioration in concrete streets, highways, and airports. CP^2 is a non-overlay option used to repair concrete pavement without changing its grade. This preventive procedure restores pavement to a condition similar to or better than the original and reduces the need for costly repairs later on.

CP^2 comes with a variety of benefits. Firstly, it is less expensive and more effective than overlay treatment techniques because it actually prevents further pavement deterioration by addressing the causes of the distress and not just the symptoms, as an overlay would. Not only is this type of treatment less costly than others, it also lasts longer and causes less traffic disruption. Because it does not affect the grade of the pavement, CP^2 is an unusually quick treatment. Roadway features like gutters and curbs do not need to be adjusted, and it can be used to repair only the areas that need improvement, both of which speed up the entire construction process considerably. Finally, CP^2 can even be used to repair concrete that was previously overlaid with asphalt.

Because of concrete pavement's reputation for having a long service life, when the budget is tight, concrete pavement preservation is typically overlooked. Agencies often fix the worst pavements first during times of financial stress. Since concrete pavements can sometimes last longer than their design lives, CP^2 is often ignored, and preservation funds are expended elsewhere. This will commonly lead to many concrete pavements experiencing little or no preservation.

For PP to be truly effective it is not sufficient to merely analyze the differences in performance levels and utilize CP^2 to mitigate their impact; the features that cause these differences must be identified at the beginning of the design process. For example, one of the most debated design considerations is whether or not to seal joints. Even though joint sealing has been utilized for almost sixty years, experts continue to disagree over the benefits of this practice. Agencies often do not have sufficient data to determine an activity to be necessary that represents 3-5% of the initial cost and is an expensive CP^2 treatment.

The potential for research projects on CP^2 abounds. Researchers could conduct studies that establish actual concrete performance curves and CP^2 strategy effectiveness, for example. Determining the most effective intervention cycles for CP^2 strategies based on actual Life Cycle Cost (LCC) principles would also be extremely useful to the development of this type of treatment. Data that would improve network level investment decisions by determining optimum design life strategy selection and CP^2 intervention interval selection could improve matters greatly, as well.

Quality Construction of Pavement Preservation Activities/Projects by Dean M. Testa, P.E., Dennis C. Jackson, and Colin Franco

Testa et al.'s paper emphasizes the importance of maintenance projects. When these projects are being administered, constructed, and inspected, they are

often referred to as “just maintenance projects.” While maintenance operations are expected to benefit existing pavement, the general consensus is that such projects are relatively unimportant. However, addressing these projects as “fill in work” or ”just maintenance,” leads to an incorrect representation of their value, as “simple” maintenance operations are essential to adequate pavement conditions.

Agencies must examine their current practices and improve any areas that are inhibiting good PP practices. Old ways of thinking about maintenance must be thrown out, and PP activities must be considered at least as vital to an agency’s success as rehabilitation. Adequate funding for preservation must be set aside. Agencies should work with contractors in order to streamline the process. All possible outcomes of any change, such as requiring contracts to have warranties, should be considered.

Agencies must also try to improve their public image through educating roadway users about PP. Public highway surveys have revealed that motorists do not want to be inconvenienced by construction or reconstruction projects. In addition, motorists demand that projects be finished more quickly and have longer-lasting results. The traveling public needs to realize that pavement does not last forever and that they cannot always visually see potential surface distress failure. Agencies must educate consumers so they can fully understand why agencies work on good roads, while other roads, some in failing condition, are ignored. Educating the general public would allow agencies and contractors to focus on producing quality work rather than taking time out to handle complaints. Also, providing users with real-time traffic information can also be helpful in alleviating the tension between customer wants and necessary inconveniences.

Contractors and agencies must work together to improve the entire system. Contractors can take steps such as utilizing trained crews and performing their own quality control activities.

Testa et al. recommend a few potential studies related to this topic. Some research could be conducted to develop and/or certify ‘specialized’ contractors or individual crew members for PP projects. Further research should investigate the benefits of agencies and private contractors jointly developing new products and processes, how warranties can be utilized to improve quality of construction and effective pavement life, methods of communicating to the traveling public the reasons why agencies work on good roads, while others are allowed to deteriorate, and effective methods for getting real-time traffic information to the highway user when preventative maintenance is currently underway.

Methods of Maintenance Contracting by David Peshkin, P.E. and James Carney, P.E.

When an agency chooses to hire a private firm to perform a pavement preservation activity, a maintenance contract is used. Usually the agency will select one of the four main types of maintenance contracts described in this study. The maintenance contracts discussed by Peshkin and Carney are method-based, performance-related, and performance-based contracts, along with contracts that include warranties.

Method-based contracts are the most common type of contract used for pavement maintenance work performed by a private contractor. In a method-based contract, the agency specifies how the work is to be carried out in detail, and the contractor must adhere to these specifications to receive payment. Although method-based contracts may be considered “safe,” they place most of the responsibility for the success of the performance of the treatment with the owner agency, rather than with the contractor, and inhibit innovative techniques and materials.

Performance-related contracts use measures of the final product’s properties to judge the contractor’s work. The agency specifies certain properties that the finished pavement should exhibit, and if all of the specifications are met, the job is considered satisfactory. This type of contract allows the contractor to use more innovation and invention than the method-based contract but requires the agency to have a thorough understanding of the performance measures specified in the contract.

Performance-based contracts are similar to performance-related contracts, though they give even more control to the contractor. They are not currently used for pavement preservation projects but for other maintenance jobs. With performance-based contracts, the owner agency can be less specific as to the required results but also must be willing to accept any method and materials the contractor chooses to use to meet the project requirements.

Contracts that include warranties focus on the long-term performance of a pavement treatment. Agencies are attracted to warranty contracts because payment can be deferred for a specified period of time in order to judge the maintenance construction's durability. However, warranty contracts come with several problems, including higher cost and a need for more careful project selection.

Agencies must acquire the data necessary to determine when each type of contract should be used. Currently, several studies, such as the Arizona DOT's, are underway to produce guidelines for contract selection.

Pavement Preservation Treatment Performance by Dr. Yetkin Yildirim, P.E. and Joe W. Button, P.E.

For a pavement preservation program, pavement performance is a key element. Agencies must have an effective method of evaluating pavement performance. Understanding how preventive maintenance treatments affect pavement performance is especially essential for PP. Currently, this relationship is unclear, as thorough research on the subject has not been conducted.

Yildirim and Button discuss the concept of pavement performance, factors that affect performance, the development of performance specifications, the importance of training and policy for improving pavement performance, and the issues involved in applying performance measures in pavement preservation programs. Finally, future projects related to pavement performance are suggested.

Performance can be defined as the durability and longevity of a pavement or the amount of maintenance required to maintain an acceptable level of service during the design life of a pavement. Performance is mainly determined by which treatments, materials, and treatment strategies are used and when. Agencies must rethink the way in which performance is evaluated, as the improvement of pavement performance should be a main concern for every PP program. By developing performance specifications for PP treatments and addressing the design and construction of preventive maintenance treatments in training, agencies could vastly improve their PP programs.

Future studies on this topic will broaden the existing knowledge of PP and help advance effective preservation strategies. Yildirim and Button suggest that researchers investigate the effects of PP treatments on pavement performance, study the impact of treatment on functional performance, determine the optimal timing for treatments, define treatment failure, examine construction and performance of PP in the field, research performance specifications and materials, and investigate possible training tools.

Surface Characteristics by Dr. Mark Snyder, P.E. and Larry Scofield, P.E.

Pavement surface texture affects the interaction between tires and the pavement in many ways, such as friction during wet-weather, amount of splash and spray that occurs when the pavement is wet, noise, rolling resistance, and tire wear. Surface texture is a composite of different combinations of texture depth, which is also known as amplitude, and feature length, with each combination affecting tire-surface interaction differently. This paper focuses on the four categories of pavement surface characteristics proposed by the Permanent International Association of Road Congresses (PIARC) in 1987: microtexture, macrotexture, megatexture, and unevenness, or roughness. Each category is described, and the effect of each on tire-pavement interaction is detailed.

Microtexture is usually all that is needed to provide adequate friction for dry roads with normal vehicle speeds and for wet pavements if the vehicle speeds are less than 50 mph. Microtexture generally does not contribute to pavement noise or splash and spray. Macrotexture allows for good friction levels on wet weather roads, even for roads with higher-speed traffic. This surface characteristic has the highest impact on pavement noise and splash and spray. Megatexture is typically caused by poor construction practices, surface deterioration, or local settlements. It can produce in-vehicle and external noise and adversely affects pavement ride quality. Megatexture can even cause premature wear of vehicle suspension parts. Finally, unevenness impacts ride quality, vehicle dynamics, and surface drainage, though it has no significant effect on pavement noise.

In order to study pavement surface texture and the influence it has on tire-pavement interaction, the

surface texture, roadway friction, roadway noise, and roadway profile must all be measured accurately. Snyder and Scofield describe the ways in which each measurement is taken and the current practices that are used the most by state road agencies.

Many potential research projects related to this topic exist, including developing procedures that allow the prediction of noise and friction levels from texture measurements, developing a better noise annoyance metric, and studying high-speed 3-D texture measurement equipment.

A Literature Review of Recent Pavement Preservation Research: Preservation Research Roadmap prepared for The Foundation for Pavement Preservation by The National Center for Pavement Preservation

This study is a literature review intended to establish general topic areas for future research and development. The literature review is the first phase of the Transportation Preservation Strategic Research and Development Road Map project sponsored by the FHWA. By analyzing a number of typical recent research endeavors, the areas in which research is lacking may be identified.

The authors classified each pavement preservation-related research project according to one or more of eight categories: treatment performance, treatment timing, treatment selection, life-extending benefits, cost effectiveness, construction techniques/best practices, materials selection, and specifications and warranties. Most prior research focused on treatment performance; the second most researched topic was treatment selection.

The benefits and effectiveness of warranty programs has not been thoroughly assessed, and little has been done to measure the effectiveness of programs' current specifications.

Materials selection and mix design have not been researched sufficiently, as they are more often addressed in qualitative rather than quantitative terms. Materials selection has proven to be a very difficult topic to research.

Some topics, like best practices, have been written about extensively in literature reviews but not in literature based on scientific research. That is, most of the research does not use experimentation to justify the conclusions but rather refers to other publications. Much of the literature on pavement preservation draws from experience and not from quantitative findings.

Finally, the review found that most of the existing literature is concerned with flexible pavements. Research on rigid pavement preservation is scant.

Where sufficient information on a particular topic is lacking, there lies a need for research. This study has identified seven topics that need to be covered in future investigations: materials, design, construction, treatment performance, contracting methods, asset management, and policies, training, and public relations. Each of these research topics is discussed fully, divided into further, smaller research topics, and weighted, based on the findings of Peshkin and Hoerner's 2005 study. The literature review provides a comprehensive guide to identifying research needs.
