

Taking Pavement Management into the Next Millennium

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Pavement management systems are expected to continue to be a critical component of managing and maintaining the transportation infrastructure around the world. Although these systems have been used since the 1980s, many changes have evolved in the field of pavement management, leading to the continued development and refinement of computerized capabilities and analysis tools. The changes in pavement management have evolved as the types of information required by public agencies have changed. Today's pavement managers must address their transportation needs with limited resources at the same time that legislative bodies are requiring more efficiency in highway agencies and more accountability for the expenditure of taxpayers' money. As a result, the importance of management systems to assist with effective allocation of these resources to manage infrastructure assets becomes more critical than ever. The challenge of managing and maintaining the existing infrastructure under today's environment is considered by many to be more difficult than the design and construction of the initial system, when there was less scrutiny of public expenditures.

MAJOR ACCOMPLISHMENTS

Over the years, there has been tremendous support for pavement management, which has had a significant influence on its importance to transportation agencies. This support has been enhanced by the participation of pavement management practitioners, private industry, and government in a variety of activities. Some of the major accomplishments from these participatory efforts are summarized in the following paragraphs. This list is in no way exhaustive, and the authors do not mean to ignore any of the other efforts made that are not summarized here.

National Workshop on Pavement Management

In July 1997, the National Workshop on Pavement Management was sponsored by the Federal Highway Administration (FHWA), the Joint Task Force on Pavements of the American Association of State Highway and Transportation Officials (AASHTO), the Southeastern States Regional Pavements Committee, and the Louisiana Department of Transportation. The workshop provided an opportunity for pavement management practitioners from the United States to discuss the state of the practice, set priorities for future efforts in the field, and offer suggestions for advancing the technology into the next millennium. Some of the goals for pavement management are the following:

- Research should continue in order to further improve the status of existing pavement-related technology, especially efforts to standardize data collection and analysis procedures.
- Additional training programs should be developed for both practitioners and top-level managers. Innovative approaches to training should be considered because of restrictions on travel and the ongoing nature of the need for technology transfer programs.
- Focused efforts should be made to link asset management components, which include pavements, into an integrated decision-making model that can be used by transportation agencies for all infrastructure assets.

International Conferences

The pavement management community has enjoyed a rich history of international conferences that have advanced the knowledge of pavement management concepts and promoted the use of pavement management throughout the world. These conferences, which have been held in Toronto, Canada; San Antonio, Texas; and Durban, South Africa, have served as the forum for addressing important areas such as institutional issues and their effect on implementation success and the use of pavement management concepts for the management of an agency's assets. The Fifth International Conference on Managing Pavements is currently being planned for summer 2001 in Seattle, Washington. The next conference will build on the traditions established in earlier conferences and will continue to enhance the use and understanding of pavement management systems.

AASHTO Contributions

AASHTO has had a significant role in furthering the development and use of pavement management systems through the years. Recently the Joint Task Force on Pavements sponsored the development of updated pavement management guidelines and provisional standards for automated data collection activities and the upcoming "Pavement 2000" workshop, scheduled to be held in Newport, Rhode Island.

Contributions by FHWA, TRB, and NCHRP

During the past several years, FHWA, the Transportation Research Board (TRB), and the National Cooperative Highway Research Program (NCHRP) have contributed to major technical studies that will significantly influence the way pavement management practitioners conduct business over the next decade. Through initiatives that have been sponsored by one or more of these agencies, technical advancements are being made in the development, use, and standardization of automated data collection equipment, ground-penetrating radar, and rolling wheel deflectometers. Training initiatives have also been a high priority, with new courses on pavement management, the use of multiyear prioritization, the conduct of engineering analysis using pavement management data, and preventive maintenance concepts.

ISSUES AND CHALLENGES

There continues to be support for pavement management among transportation agencies worldwide; however, recent changes in legislation that no longer mandate the use of pavement management systems have had a detrimental impact on the support for pavement management among some representatives of top management. At the New Orleans

Pavement Management Workshop, many pavement management practitioners expressed the need to regain or maintain the support of top-level management and raised the following issues as needing to be addressed through increased training and technology transfer, citing the observations of top management in their agencies:

- Pavement management was losing, or had lost, the attention of top management personnel. Further, top management did not appear to fully understand the capabilities of pavement management systems or the importance of pavement management analyses in program development.
- Management tended to support the portions of pavement management that they best understood or with which they had some direct interaction. In some agencies, this partial support resulted in an overall detrimental impact on the program because decisions were not made in the best interest of the pavement management program as a whole. For example, management may support the collection of roughness information but not distress data. This decision can limit the ability of the pavement management system to make maintenance and rehabilitation recommendations based on any factors other than roughness.
- Some managers haphazardly override pavement management recommendations with little or no thought to the consequences on overall network conditions. This tendency frustrates pavement managers, who put a lot of time and effort into developing networkwide recommendations.

The participants in the national workshop believed that as management better understood the multidisciplinary aspects of pavement management and began running transportation agencies with more of a businesslike approach, these issues could be satisfactorily addressed.

Other challenges focus on the more technical aspects of pavement management, including more standardization in data collection procedures and more training for pavement management personnel. Broader challenges that were identified include the following:

- The need for increased standardization in the data collection processes to facilitate communication of data between states on a more consistent basis;
- Allowances for flexibility in the customization of pavement management programs so that agencies can tailor their systems to the management philosophy and resources available;
- The lack of practical pooled-fund studies to address research concerns that are common to several agencies;
- Continuous turnover in pavement management personnel, requiring the need for more training and innovative forms of training;
- The lack of standards by which transportation agencies can measure and evaluate existing pavement management capabilities and identify areas of improvement or enhancement;
- The need for a better link between network-level and project-level management decisions; and
- The increased need to sell pavement management results to the individuals responsible for making program, policy, and budget decisions.

FUTURE DIRECTIONS IN PAVEMENT MANAGEMENT

Considering the challenges that pavement management personnel are currently facing, several goals and objectives for taking pavement management into the new millennium were identified:

- The program development process, which includes pavement management system recommendations, should become more formalized within transportation agencies, with decisions made on a more objective basis.
- The use of pavement management systems should be expanded beyond large transportation agencies to include cities, counties, and airports.
- A clearinghouse for pavement management information should be developed so that agencies have immediate access to information that documents best practices and the use of new technology in pavement management.
- Processes and procedures should be developed to facilitate improved coordination between transportation agencies in pavement management through shared activities and pooled-fund studies.
- Research should continue in order to continue to improve the status of existing pavement-related technology.
- Additional training programs should be developed for both practitioners and top-level managers. Innovative approaches to training should be considered because of restrictions on travel and the ongoing nature of the need for technology transfer programs.
- Efforts should focus on linking asset management components, which include pavements, into an integrated decision-making model that can be used by transportation agencies for all infrastructure assets.

ROADMAP TO SUCCESS

The pavement management community is committed to addressing the goals discussed previously to further strengthen the link between pavement management concepts and day-to-day practices. A roadmap to further develop this link is outlined, along with a summary of the mechanisms necessary to achieve the goal and the agency or agencies that should take the lead.

Objective 1

Objective 1 seeks to provide a forum for the international exchange of information and ideas. Pavement management is increasing in use and importance. This increase will continue exponentially, especially at the international level. As a result, there continues to be a need to provide a forum to transfer technology across the world through technical presentations, discussions between practitioners, and similar types of activities.

Necessary Mechanisms

To achieve this objective, the Fifth International Conference on Managing Pavements will be held in Seattle, Washington, in summer 2001 as well as ongoing conferences on a periodic basis.

Lead Agency

The TRB Committee on Pavement Management Systems should lead this effort.

Objective 2

Objective 2 seeks to provide a national forum on a regular basis to provide the exchange of information among pavement management practitioners while also seeking a means to address the use of pavement management information in other areas of a transportation agency.

There continues to be a strong need to share and transfer pavement management technology at the national level; among state, local, and federal agencies; as well as in academia and the private sector. Now that many transportation agencies have established historical pavement condition databases, pavement management engineers will be able to perform engineering analyses that compare actual performance data with theoretical design, mix, material, or construction expectations, or all of those aspects. On a national level, this type of analysis could also be used to compare information from a state's pavement management database with the information from the Long-Term Pavement Performance (LTPP) studies database.

In addition, new instrumentation is being developed and the capabilities of this equipment should be shared with practitioners. These developments include enhancements to automated pavement condition data collection equipment, ground-penetrating radar, and the rolling wheel deflectometer. Developments in software analysis programs could also be included in this forum.

Necessary Mechanisms

The Pavements 2000 national workshop will bring together individuals working in design, research, materials, and pavement management to explore the interaction with pavement management.

Lead Agency or Agencies

The AASHTO Joint Task Force on Pavements and FHWA should be leaders in this area.

Objective 3

Objective 3 seeks to develop and continually update a how-to guide on pavement management for practitioners that can be used to enhance existing systems, standardize procedures, and consider technical advancements. In the past, there has been an abundant collection of papers, research reports, and studies that are housed in separate locations. Although such a guide is currently being developed, it must be recognized that for it to remain relevant, a well-structured effort must be in place to provide updates in a timely fashion.

Necessary Mechanisms

AASHTO's *Guidelines on Pavement Management* is an integral part of achieving this goal.

Lead Agency or Agencies

The AASHTO Joint Task Force on Pavements and NCHRP should serve as leaders.

Objective 4

Although many recognize that highway agencies design and customize their own pavement management system to suit their particular needs, there is a fundamental need to standardize basic measurement procedures for pavement condition data. During the last five years, more and more agencies have been moving toward the use of automated data collection equipment for pavement condition information. Because of the nature of the automated data collection process, this equipment simplifies the standardization process and allows high-quality data to be collected at a lower cost to the agency. AASHTO and FHWA jointly developed provisional standards for the basic measurement of roughness, rutting, and faulting. The future challenge lies in the adoption of the provisional standards as AASHTO Standards and the voluntary effort of highway agencies using automated equipment to adopt the standards to improve the consistency of data across states.

Necessary Mechanisms

The AASHTO Provisional Standards are necessary to achieve this goal.

Lead Agency or Agencies

The AASHTO Joint Task Force on Pavements and state highway agencies should take the lead.

Objective 5

Objective 5 provides for updates to the training classes necessary to provide the ongoing training for pavement management personnel. There is a need to provide training to both college students and working practitioners. Several years ago, FHWA developed materials for a college-level course on pavement management through a contractor. The course materials need to be updated and redistributed to the many colleges and universities that offer a course in pavement management either now or in the future.

Necessary Mechanisms

To achieve this goal, development of new course materials and commitment to updating current course materials on a regular basis are necessary.

Lead Agency or Agencies

Leaders should be FHWA, the National Highway Institute, universities, and Technology Transfer Centers.

Objective 6

A means of using the concepts of pavement management within the framework of asset management should be developed.

Necessary Mechanisms

Goals and objectives should be developed through AASHTO's National Initiative and Strategic Plan.

Lead Agency or Agencies

AASHTO and the member states should lead, as well as the AASHTO Task Force on Asset Management.

SUMMARY

In order to achieve these goals, it is important that continuous efforts be focused in a few key areas, both technical and nontechnical in nature. Although researchers are familiar with a focus on the technical aspects of pavement management and pavement engineering, the goals of pavement management now require a broader focus that illustrates successes, promotes the business aspects of pavement (and asset) management, and facilitates the exchange and use of this information worldwide. This broader research effort requires the recognition of pavement management as a multidisciplinary practice that requires much more than civil engineering expertise. It requires the knowledge and input of systems analysts, computer engineers, electronics experts, business leaders, finance experts, economists, and others to develop a truly successful system approach. With a new focus on pavement management as one component of a system of assets, the pavement management field will be able to benefit from the expertise of larger organizations that are currently practicing the systematic management of assets. This exposure to agencies practicing asset management will introduce civil engineers and other pavement management practitioners to some new ideas based on the input of a multidisciplinary team that can be applied to existing pavement management practices. It is this new focus that will successfully take pavement management into the new millennium.