Pavement Tools Consortium
Pooled Fund

Summary

The Pavement Tools Consortium (PTC) is a public-private partnership to further develop and use computer-based pavement tools. The major focus of the pavement tools is the enhancement of pavement-related training and construction. The Consortium will be funded via a Pooled Fund arrangement and managed by the Washington State Department of Transportation.

The goal of the PTC is to farther develop and provide the following HMA-oriented pavement tools, for example:

- HMA View Database
- Interactive Pavement Training CD/DVD (includes the VSL)
- Computer Simulations
- Distance Learning Content and Delivery
- Computation Software (EverFe, EverFlex, etc.)

Identification of specific pavement tools and the necessary development efforts will be coordinated through an annual Consortium meeting and electronic communication. The initial collaborative duration is five years. The number of products and versions developed depends on the total annual funding available.

Background

In May 2000, the University of Washington (UW) embarked on a project for the development of a set of pavement tools that can be used by a DOT or paving contractor to improve communication, training and design/construction for the pavement topic area. A key is the use of enabling technologies, such as the Internet and digital media (DVDs and CDs). This concept allowed for the organization of these products into a broad-based format that is easy to access, straightforward to use, and upgraded quickly. The emphasis on the digital media as a delivery system was supported by a quote from Hiebeler et al. (Hiebeler, R., Kelly, T., and Ketteman, C., 1998, “Best Practices,” Simon and Schuster, New York.): “The Internet has become to the knowledge economy what electricity was to the industrial economy.”

The funding for these products has come from a variety of sources including

- Washington State DOT (WSDOT)
- Maryland State Highway Agency (Maryland SHA)
- National Asphalt Pavement Association (NAPA)
- Transportation Northwest (TransNow)
- Federal Highway Administration

Initially, one of the goals was to develop a web-based catalog for hot-mix infrared images. The purpose of this catalog was to store and document infrared images that WSDOT and other DOTs had collected from various pavement projects, and provide search capabilities so users can locate and view the images related to specific construction conditions (ambient temperature at construction time, haul time, project location, paving equipment used, etc.).

In the course of this development, it became apparent that there is a use for, and a need to, store additional project information. In particular, the development of a complete hot mix database that documents paving projects over their entire life cycle was viewed as a feasible extension that can significantly enhance the power of the web-based tools. An initial hot mix database prototype was developed and is termed "HMA View." There has been some discussion nationally that a database such as HMA View would be appropriate for tracking the performance of Superpave projects along with specific project data (such as Quality Control (QC) and Quality Assurance (QA) information, JMF, etc.). Current work underway includes the addition of a Superpave mix design process that includes tracking of all relevant mix design attributes including stockpiles, pit information, etc., and the ability to do all needed calculations within the software application. Further, contractors can use the system to submit their mix designs to an agency. The current work on HMA View is for two state agencies: WSDOT and the Maryland SHA.

Another major initiative currently underway includes the development of an interactive Pavement Guide (currently CD based but it can be made available via the Internet). Initial versions of this type of content have been developed for NAPA, WSDOT, the Washington Asphalt Pavement Association (WAPA), and the Hawaiian Asphalt Pavement Industry (HAPI). The content is designed for a wide range of persons within the paving industry—both public and private. This allows applications for self-directed and distance learning initiatives. The NAPA version ("A Guide for Hot Mix Asphalt Pavement") has sold over 5,000 copies in the first five months it was offered. All these "pavement guide" applications make extensive use of photographs, short digital movie clips, and Flash animations. Given the initial reception to the "pavement guide" series, the demand for this type of product is very significant. Further, the WSDOT version of the Pavement Guide is now being used as the class text for pavement courses at the University of Washington.

Related self-directed and classroom training aids includes the upcoming Virtual Superpave Laboratory (VSL)—a joint collaboration between UW and the National Center for Asphalt Technology (NCAT). Since the early efforts toward implementation of Superpave in 1993, AASHTO has adopted a complete series of test methods and specifications dealing with asphalt binders, aggregates, and mixtures (some all new, some modified, some existing). The number of DOT's, local highway agencies, and contractors using these tests and specifications has steadily increased with time, and subsequently the number of construction projects in which Superpave is specified has increased. Today, a well-equipped Superpave laboratory costs on the order of $150,000 to $250,000. With the new simple performance test coming on line, the cost will rise by approximately $40,000 more. Along with the high price tag for the equipment, comes a need to have one or more

full-time technicians or research engineers to maintain the equipment and provide continuity with an additional cost of about $100,000 annually.

To address the increase in needed HMA mix training, the VSL will be developed. This will be a computer based learning tool that allows for familiarization of equipment, test procedures, materials, and data analysis associated with Superpave. While it cannot replace the experience of hands-on training, it will provide a sufficient background to understand the laboratory testing process. The potential users include universities, vo-tech institutions, contractor and agency training courses, as well as any other organization needing a familiarity with Superpave testing. The VSL will prepare those that must conduct Superpave related laboratory tests for the necessary hands-on training that is a critical part of laboratory skills development. Use of the VSL will improve their working knowledge of the procedures and shorten the required training time.

The training needs for the HMA industry are huge by any measure. Other tools such as computer-based simulations of paving equipment can further help the cause. For example, a "virtual compactor" has been developed that can be used to familiarize equipment operators and inspectors with the basics of rolling HMA. Other simulations are possible such as a complete HMA work zone that includes the simultaneous operation of an HMA plant, trucks, paver, and rollers. The types of training these simulations provide better prepare field personnel for the types of situations they will face including adverse weather conditions, nighttime construction, and difficult work zones. By use of this approach, training time is shortened, knowledge is increased, and expensive construction equipment time is reduced.

The Need for a Consortium

The current development effort on these types of tools at the University of Washington through March 2003 has been supported via a variety of funding agencies and mechanisms. All funding has had various requirements including local content—as should be expected. In order to accelerate the development and implementation of these types of tools, a consortium of supporting members is needed to provide consistent, continuing funds and interaction. A major, additional benefit of membership is implementation opportunities for the tools and identification of future "tools" needs.

Consortium Focus Areas

The primary focus for the pooled fund consortium includes five related areas. The degree of research and development accomplished for each depends on the amount of funding that is available and the agreed upon priorities. These areas currently are:

- HMA View Database
- Interactive Pavement Training CD/DVD Products (includes the VSL)
- Computer Simulations
- Distance Learning Content and Delivery

- Computation Software (EverFe, EverFlex, etc.)

The Consortium members will be provided all the pavement tools shown above and others as they are produced including new versions. Each Consortium member is expected to implement these tools as they see fit. UW will provide support in the form of documentation, troubleshooting, etc.. The figure on the following page suggests that the individual tools can be viewed as an integrated whole—the separate pieces can be made to compliment the others (analogous to Microsoft Office XP which has separate but complimentary tools such as Word, Excel, Front Page, etc.). As currently envisioned, the pavement tools are sorted by the following categories:

HMA View: HMA View would be made available to each Consortium member. The software would not be directly adopted for each agency or contractor but modified to maximize the benefit for all Consortium members. The data that is entered and viewed is currently customizable by the user. Near term updates will include an extensive mapping capability that allows for GPS location of specific field tests.

Interactive Pavement Guide: The interactive pavement guide would continue to be expanded and improved. A straightforward process would be created that would allow local content to be added by the Consortium members. This Guide, or versions of it, can be produced in languages other than English. A need for more training in Spanish has been expressed by DOTs in Maryland and Texas.

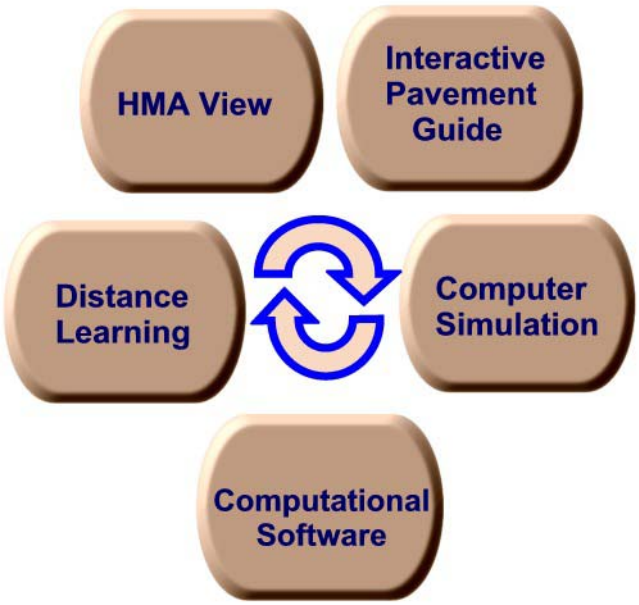
Computer Simulations: The currently available "virtual roller" would be made available to all Consortium members. This will be improved over time. The Consortium members will suggest additional tools, like the roller, that would best serve their training needs. Another planned computer simulation is the VSL.

Distance Learning Content and Delivery: Distance Learning (DL) is a rapidly evolving education delivery approach and the other Pavement Tools will significantly aid this process. The UW team will deliver pavement-related content for the members or aid the Consortium members in conducting their own. Such training is intended to supplement existing training venues already available. DL is an exciting and evolving training delivery approach.

Computation Software: Software such as EverFe (finite element analysis tool for plain jointed concrete pavements) and EverFlex (finite element analysis tool for flexible pavement) will be provided to Consortium members for their use. Documentation and training will be provided. If related computational tools are developed via the Consortium, those too will be distributed to members. EverFlex, for example, can accommodate non-uniform tire contact pressures.

Consortium Benchmarks

The PTC is to be action oriented with the primary focus being the development and implementation of tools that enhance training and construction venues. It is important to provide adequate documentation of all the developed tools including conference and refereed publications. As such, papers will be prepared as appropriate and submitted to organizations such as the TRB of review, presentation, and publication. Presumably, the Consortium members will co-author these papers.



Pavement Tools Integration

Current Commitments and Estimated Funding Requirements

Category	Year 1	Year 2	Year 3	Year 4	Year 5
Current Commitments					
FHWA	$25k				
Maryland SHA	$20k	$20k	$20k	$20k	$20k
Washington State DOT	$20k	$20k	$20k	$20k	$20k
Additional Funding					
FHWA		TBD	TBD	TBD	TBD
State DOT (3 States at $20k/each)		$60k	$60k	$60k	$60k
Private Industry		TBD	TBD	TBD	TBD
TOTAL	$65k	$100k	$100k	$100k	$100k

TBD – To be determined.

Verbal commitments have been made for year 1 funding. Washington State DOT, as the pooled fund lead, with the support of Maryland SHA plan to solicit the support of 3 to 6 additional State agencies to support the effort. Year 2 through 5 budgets of $100 thousand represents minimum funding requirement. Additional State contributions would accelerate product development and potentially expand scope. It is anticipated that the total funding for the project would not exceed $250 thousand per year or $1.65 million over the five years.