North Central Superpave Center News

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Inside this issue

Winter in the North Central region is meeting time. When the snow flies or it is just too cold to pave, industry, agencies and academics get together to share information. Budget cuts and hard times have made it harder than ever to travel to meetings, however. So, this issue of the newsletter is filled with summaries of some of the more important recent regional and national meetings. It is hoped that these summaries can help you stay up to date on the latest advances and concerns in asphalt.

Regional News

National News

On-Line Version of this Newsletter:

https://engineering.purdue.edu/NCSC/library/newsletters.htm

NCSC Vision and Mission

To be a recognized source of hot mix asphalt expertise and to provide services to advance and transfer HMA technology through training, research, technology transfer and technical support.

North Central Superpave Center

Regional, National Information Shared at Conference

by Rebecca McDaniel

In February, information about a wide variety of asphalt related issues was shared with an audience of over 130 people at the annual Hot Mix Technical Conference sponsored by the North Central Asphalt User Producer Group (NCAUPG). And this year, for the first time, much of that information is also available to everyone who could not attend in person. The presentations were recorded by the North Central Superpave Center and are available for viewing at the NCAUPG website. (See the URL at the end of the article.)

Hussain Bahia, University of Wisconsin – Madison, opened the meeting and and invited everyone to enjoy the ice! He then introduced Kevin Chesnik, Administrator of the Wisconsin DOT Division of Transportation Systems. Chesnik commented on how important it is to remain flexible and open to new ideas. He asked us to think about how climate change will affect us. Who is going to design an asphalt mix that can be placed and perform at extremes of temperature? People look to us to use technology to solve problems economically and efficiently. The investment of time to attend meetings like this one definitely pays off. "If you do not spend the time, one day you will find that you are behind the curve," he noted.

Next, John D'Angelo, Federal Highway Administration, gave an update on key issues at the national level. He noted the challenges that are facing our industry. The population and urban areas continue to grow but the road network has changed relatively little since the beginning of the interstate. We have to build faster and at night with better performance and in an environmentally sustainable way. Emerging technologies that can help us accomplish that include the Mechanistic-Empirical Pavement Design Guide (MEPDG), Asphalt Mix Performance Test (AMPT), Multi-Stress Creep and Recovery (MSCR) test and Warm Mix Asphalt (WMA), among others.

Rebecca McDaniel provided a brief update on the continuing activities at the North Central Superpave Center. The NCSC is continuing to research various aspects of recycling, tire-pavement noise, friction and more. The Center is also active in technical support, technology transfer and, to a lesser extent, training. In addition, the Center is pursuing AMRL accreditation this year. She also reported on the findings from a series of state visits conducted over the summer around the region. Those visits give a snapshot of the common issues the states are facing. (See sidebar on page 11.)

To conclude the first session, Bahia gave an overview of research efforts underway in the host state through the Wisconsin Highway Research Program (WHRP). The WHRP is now ten years old and has an impressive record of projects; 59 projects have been completed and 32 are in progress. One of the projects he highlighted found that mixing and compaction temperatures may be too high as contractors overheat mixes to help get density. Another offers a way to differentiate between areas with interlayer bonding problems (i.e., slippage) and areas with good bonding based on FWD testing and the comparative stiffnesses of the layers. Bahia also noted that Wisconsin has spent about $1 million on MEPDG-related research and expects to spend another million. Other states in the region are similarly investing in the new design procedure, offering a good place for regional collaboration.

HMA's Changing Economic Paradigm

After last season's volatile petroleum prices

Regional Conference…

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and SBS binder shortage, economic and supply issues are priorities. Jay Hansen, NAPA's Vice President for Government Affairs, observed a similarity between the current transportation situation and A Tale of Two Cities – "It was the best of times, it was the worst of times." The emphasis of the Obama team on infrastructure, which is focusing the public's attention, is the best. The deficits and threats of continued cuts are among the worst. Hansen stressed the need to contact our legislators to support the stimulus package. He also pointed out, though, that the country still needs an FY09 appropriations bill and a better concept for the Highway Trust Fund.

Mark Buncher, Director of Field Engineering for the Asphalt Institute, summarized the results of a 2005 study on the benefits of Polymer Modified Asphalt (PMA). In that study, conducted by Harold von Quintus, 84 pavement sections were compared to assess the performance of modified and unmodified mixes. Overall, the study found that PMA sections exhibited reduced rut depths, reduced transverse cracking and less fatigue cracking that unmodified sections. Buncher recommended that each state compare their life cycle costs for PMA vs. conventional mixes to determine if the improved performance justifies the added initial cost; in many cases, it will.

One option to help reduce energy consumption and costs is to combine warm mix technologies with use of Reclaimed Asphalt Pavement (RAP). Everett Crews, Technical Development Manager for MeadWestvaco, reported on the progress of field trials utilizing this combination. Crews cited work that showed the variability of RAP can be controlled and that RAP binder can blend with virgin binders in hot mix. But, what happens when you add RAP to Warm Mix? Will the RAP binder blend when mixed at lower temperatures? Some lab work suggests that blending can occur in warm mix. Field trials in Missouri (20, 28 and 35% RAP), New York (40% RAP) and Illinois (15% RAP) will help to evaluate the field behavior of WMA RAP mixes. Larger projects are needed to fully evaluate the economics, fumes and other factors.

During last year's SBS shortage, many states, especially those that require specific types of modifiers, were interested in alternate modification techniques. John D'Angelo returned to the podium to report on one technique that some are particularly concerned about – modification with polyphosphoric acid (PPA). Research at FHWA shows that acid does affect different binders differently, but can be effective. (See article on the PPA Workshop on page 6 for details.)

Mihai Marasteanu, University of Minnesota, discussed an on-going pooled fund project looking at the performance of PMA mixes at low temperatures. Both lab and field produced mixes are being studied in this project funded by ten states and the FHWA. The study also compared the performance of mixes with different aggregate types, granite and limestone. The project is continuing with a second phase to further investigate low temperature cracking and expand the work on field samples. One goal of the second phase is to develop a low temperature mixture specification. Marasteanu also commented on the need to do a better job of educating the general public about asphalt and its advantages.

A panel discussion was next on the agenda. Industry representatives gave their perspectives on alternate binder modifiers. First up, Marty Burrow, Vance Brothers, reviewed some alternatives to SBS, including Elvaloy, Entira Bond, PPA, and PPA with polymers. Rick Senger, Seneca Petroleum, reported on the use of terminal blended ground tire rubber (GTR). Gerry Huber, Heritage Research Group, took a step back and looked at asphalt chemistry from a civil engineer's point of view. Lastly, Gerry Reinke, Mathy Technology, talked about ways to evaluate how these alternative modification techniques affect binder and mix properties.

The session closed with a presentation by Ron Corun, Manager of Technical Services for NuStar Asphalt Refining, LLC. Corun discussed the outlook for asphalt and polymer supplies in the next construction season. He indicated that the asphalt binder supplies appeared to be adequate. Last year's SBS and SB shortage was due to a shortage of butadiene, which is a by-product of ethylene production. He does not expect shortages of SBS and SB in 2009.

Nonetheless, there are alternatives to SBS, including the following modifiers:

- SBR, available despite the butadiene shortage;
- Non-butadiene based polymers such as Elvaloy and EVA;
- PPA, which can be used alone or to reduce the amount of SBR needed;
- GTR, either added at the plant (wet process) or terminal blend; and
- Hybrid polymers, such as blends of SBS and GTR.

Environmental and Sustainable Technologies

The second day of the conference was focused on environmentally sustainable technologies and recycling. Joe Schroer, Missouri DOT, reported on a current National Cooperative Highway Research Program synthesis study on in-place recycling techniques. This project, being conducted by the California Center for Pavement Preservation, will provide guidelines and best practices for hot and cold in-place recycling as well as full depth reclamation. Schroer and McDaniel are both on the panel and will ensure that the results are disseminated to the region when they become available towards the end of 2009.

Schroer also noted that MoDOT is preparing to do about 200 miles of cold in-place recycling (CIR) using stimulus money. MoDOT has over 20,000 miles of roadways with less than 1000 vehicles per day, which are well-suited to CIR. With the increasing need to do more miles with less money, CIR is an attractive option for lower volume roadways.

A three person team then addressed the subject of shingles. Roger Olson summarized Mn/DOT's specifications, which allow up to 5% shingles. For projects that allow up to 30% RAP, mixes may incorporate 25% RAP and 5% shingles. A recent specification change requires that 70% of the binder be virgin. Most of the shingles recycled in Minnesota are from manufacturer waste, though they are evaluating the use of tear offs on MnROAD and other demonstration projects.

Joe Schroer returned to the podium to discuss MoDOT's use of shingles. Since there is only one shingle manufacturer in Missouri and its waste is mainly used locally, most of the shingles they use are tear offs. In 2008, 39 of 360 approved mixes in the state contained shingles, accounting for some 24,000 tons of mix. Schroer referred the audience to a best practices guide available at www.shinglerecycling.org. MoDOT uses shingles at no more than 7% with PG64-22. No binder change is necessary if 70% or more of the binder is virgin. If less than 70% of the binder is virgin, the binder grade is dropped to a PG58-28.

A contractor's viewpoint on shingle recycling was provided by John Bartoszek, from Payne and Dolan in Wisconsin. His company has used both manufacturing waste and tear offs and have had more challenges with tear offs. Early on they had issues with removing tar paper, metals and deleterious materials, but those have largely been resolved by making the supplier responsible for the cleanliness and homogeneity of the product, plus any equipment replacement or downtime caused by deleterious material. They have had some trace hits on asbestos but none have exceeded the EPA limit of 1%. He noted that finer is not necessarily better with shingles; some drums cannot handle material that is too fine. WisDOT changed their specifications in 2008 to allow shingles.

Matt Corrigan, FHWA, addressed a different aspect of sustainable technologies; he reported on

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the huge growth in the use of Warm Mix Asphalt (WMA) technologies since the European scan tour in 2002. In the initial US research in 2004-05, there were three WMA technologies – now there are at least 14. Only about 13 states have not tried WMA. FHWA supports a WMA Expert Task Group, and NAPA has a best practices guide (QIP 125) available for guidance. Corrigan cautioned to watch for proper combustion in the burner at low temperature to avoid fuel contamination of the mix. More information is available at www.warmmixasphalt.com.

Asphalt Recycling

The next session was concentrated on asphalt recycling. Steven Gillen, Materials Manager for the Illinois Tollway, reported on the Tollway's asphalt research initiatives. Their work with fractionated RAP (FRAP) dates back to 2007; additional work in 2008 included comparing different binder grades with high RAP mixes. (Other projects looked at GTR in 2006 and at WMA SMA's in 2008.) The 2007 study show the performance of the FRAP mixes should be comparable to all virgin mix. Specification changes to allow use of GTR and FRAP resulted in an estimated savings of over $10 million on a $200 million reconstruction project. The Illinois DOT is also opening their specifications somewhat in consideration of fractioning the RAP.

Jay Behnke continued the discussion of the Tollway recycling work from the point of view of the materials consultant, STATE Testing. Steel slag has been a reliable aggregate for the Tollway for years, but they are concerned that with the economic downturn and reduced steel production, there may someday be a shortage of steel slag. Recycling allows them to reuse these good materials. They are also evaluating alternate coarse aggregates, such as crushed gravel and trap rock.

Greg Renegar, Chief Engineer for Astec, Inc., described how foamed asphalt can be used with RAP to provide energy savings at the plant. He described the growth of WMA as a "green tsunami" and estimates that within three to five years, the vast majority of mixes will be warm mix. He mentioned that a new plant in New Jersey could only get permits if it agreed to go with 100% WMA. Astec has installed about 130 units that have produced around 1.5 million tons of warm mix.

State approaches to accepting recycled materials were illustrated by Roger Olson, Mn/DOT, and Tom Brokaw, WisDOT. Mn/DOT was the first state to really get into hot mix recycling back in 1976. Their initial permissive specifications allowed very high RAP contents (up to 70%) in the days before fractionating was feasible. These RAP contents may have been too high for the existing plant technology and led to some problems with variability and control. Their current specifications are lower and control is better. Mn/DOT is also experimenting with other recycled materials, like taconite tailings. MnROAD has test sections with WMA, RAP and porous pavements.

Tom Brokaw outlined WisDOT's approach, which basically calls for testing as close to the final product as possible, with few restrictions on individual components. Mixes with recycled materials must meet the same quality standards as virgin mixes. There also has to be an engineering usage for the material before its use is even considered. WisDOT's newly revised specs allow FRAP, RAP and both manufactured asphalt shingle scrap (MASS) and tear off shingle scrap (TOSS) and more as contractors' options.

Will Stalcup, MoDOT, and Judie Ryan, WisDOT, ended the conference by asking the audience to provide suggestions for topics and discussions for next year's meeting. What new ideas should we explore as a region? The dates and location for the 2010 meeting will be announced and posted on the NCAUPG website at http://cobweb.ecn.purdue.edu/~spave/NCAUPG/Index.html.

Stalcup also announced that Ron Walker, Indiana DOT, will be taking over as the state co-chair of the NCAUPG. Scot Schwandt from the Wisconsin Asphalt Pavement Association, is the industry co-chair.

Copies of the slides from the presentations are available at the NCAUPG website. In addition, the recordings of the speakers and their slide shows are also online. To view these, go to http://cobweb.ecn.purdue.edu/~spave/NCAUPG/Index.html and click on NCAUPG Conferences and Activities. Then click on Meeting Information and select the 2009 meeting in Madison. Under Presentations, you have the option of opening a PDF version of the slides or the recording of the presentations within each session. This is the first time the group have used this technology, so there are admittedly some glitches, but if you were unable to attend or you want to verify something you heard, it is helpful.

"Big Ten" Common Issues in the North Central Region

Just as the Big Ten actually includes 11 universities in the North Central Region, a list of the top concerns expressed by the state DOT's during site visits by the NCSC staff in 2008 includes 11 topics that were named by at least three states. This list gives a snapshot of the region's top asphalt-related concerns. The issues, in alphabetical order, include:

1. Cold In-Place Recycling
2. Longitudinal Joints
3. MEPDG and Dynamic Modulus Testing
4. Overlays over specialty surfaces (SMA, PFC/OGFC, surface treatments, etc.)
5. Pavement Preservation
6. Polyphoshoric Acid
7. Porous Pavements, including mix design
8. RAP
9. Surface Characterization
10. Tear-Off Shingles
11. Warm Mix

States may already have trials or research going on in these areas or may simply have the topic on their radar screens. The NCSC will work with its Steering Committee to determine how best to coordinate work or share information in these areas on a regional level.

North Central Superpave Center
1205 Montgomery Street
P.O. Box 2382
West Lafayette, Indiana 47996-2382

Non-Profit Organization
U.S. Postage
PAID
Purdue University

North Central Superpave Center
1205 Montgomery Street
P.O. Box 2382
West Lafayette, IN 47906

Jan Olek — (765) 463-2317
Director — ext. 225
olek@purdue.edu — Campus (765) 494-5015

Rebecca McDaniel — (765) 463-2317
Technical Director — ext. 226
rsmcdani@purdue.edu

Ayesha Shah — (765) 463-2317
Research Engineer — ext. 227
bano@purdue.edu

Jody Leddy — (765) 463-2317
Marketing and Business Specialist — ext. 224
jody@purdue.edu

Fax: (765) 497-2402

Website: http://bridge.ecn.purdue.edu/~spave/

The National Superpave Newsletters are coordinated by the North Central Superpave Center. The NCSC was originally established as one of five regional Superpave Centers to assist states with implementation of the Superpave system and now focuses on all hot mix asphalt issues. The Center is currently conducting research on tire pavement noise control, frictional characteristics of surfaces, recycling, regional test standardization and more. The NCSC is a joint effort of Purdue University, the Indiana Department of Transportation and the Federal Highway Administration. It is administered by the Joint Transportation Research Program (JTRP) at Purdue University.

Calendar of Events

2009

June 8-10	NAPA Warm Mix Asphalt and Recycling Symposium Sacramento, CA http://www.hotmix.org
June 16-25	NCAT Professor Training Course Auburn, AL Contact: Randy West Phone: (334) 844-6244 Email: westran@auburn.edu
June 29-July 2	8th International Conference on the Bearing Capacity of Roads, Railways and Airfields Champaign, IL http://www.BCR2A.org
July 13-15	The Petersen Asphalt Research Conference Washakie Center, University of Wyoming Laramie, WY http://www.petersenasphaltconference.org
July 15-17	The Pavement Performance Prediction Symposium Washakie Center, University of Wyoming Laramie, WY http://www.petersenasphaltconference.org
July 27-28	National Asphalt Pavement Association (NAPA) Midyear Meeting Hilton Head, SC http://www.hotmix.org/index.php
August 25-27	2009 M-TRAC Annual Meeting Fargo, ND http://rebar.ecn.purdue.edu/Superpave/M-TRAC/index.htm
Sept. 30-Oct. 2	International Conference on Perpetual Pavements Columbus, OH http://www.ohio.edu/icpp/
Nov. 5-6	4th Asphalt Shingle Recycling Forum, Implementation: Beyond the Barriers Chicago, IL http://www.shinglerecycling.org/content/home