The Road to Innovation

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Our wide range of polymer-based solutions not only deliver improved durability and resistance to rutting and cracking, but also offer flexibility to overcome the most challenging sources of bitumen.

For all your paving needs, Kraton Polymers is your single source for highly innovative solutions, service and support.

Delivering solutions to your toughest challenges is what we do best.
The performance of thin-lift hot asphalt overlay recently placed on U.S. Route 202 in Rochester, NH as one of a series of field demonstrations is being closely monitored by the New Hampshire Department of Transportation (NHDOT) as it looks for promising products designed to extend pavement service life.

Continental Paving Inc. of Londonderry, NH, supplied the hot mix asphalt and installed the one-inch asphalt overlay on a 2.4-mile section of highway under a demonstration provision included in the contractor’s $1.72-million contract for paving various roads in NHDOT’s Maintenance District 6. The thin-lift asphalt overlay incorporated highly polymer-modified liquid asphalt binder (HiMA) and was integral to a project initiated by the Northeast Pavement Preservation Partnership (NEPPP), a regional DOT group dedicated to advancing pavement preservation practices through education, research and outreach.

NEPPP’s demonstration project was hosted by the National Center for Pavement Preservation housed at Michigan State University, which is under contract to develop and administer the Transportation System Preservation Technical Services Program (TSP • 2). This is a national program funded by AASHTO that provides current information on pavement and bridge preservation measures.

As a member agency of the regional partnership, NHDOT wanted to participate in the NEPPP/ American Association of State Highway and Transportation Officials (AASHTO) / TSP • 2 project to further the agency’s continuing search for longer-life pavement treatments, according to Eric Thibodeau, Pavement Management Chief of NHDOT’s Bureau of Materials and Research.

“Each year NHDOT tries to look at new products and processes that will produce longer service life pavements,” Thibodeau said. “We’re really trying to expand our toolbox and have as many tools available as we can. We want to look at the use of polymer-modified asphalt to achieve a longer service life, lower life cycle cost and keep good roads in good condition. This project fit with our overall strategy and our goals.”
New regional specifications

For the 2011 thin-lift overlay demonstration on U.S. Route 202 in Rochester, a highway that experiences an average daily count of 4,600 vehicles, Continental Paving produced and placed about 1,500 tons of the HiMA-modified hot mix. This was installed adjacent to a section of highway they overlaid with 500 tons of conventional hot mix asphalt for comparison purposes.

The HiMA-modified mix adhered to regional specifications developed by NEPPP. Called “Superpave 9.5mm Highly Polymer-Modified Thin Overlay Specifications,” (PMTOL) the mix is designed as a pavement preservation strategy to extend a pavement’s service life without improving its structural capacity. It is intended to be placed on pavements in good condition that do not require structural rehabilitation.

Specifications allowed the use of up to 25 percent recycled asphalt pavement (RAP) in the mix.

“We selected this roadway because it represents a typical road that we would overlay in our district resurfacing program,” said Thibodeau. “The road has relatively high traffic volume and truck traffic, so we get a good cross section of traffic on it. We are generally a thin lift state. Our workhorse overlay treatments are 3/4-inch overlays, but we don’t usually use polymer-modified liquids here in New Hampshire. We are starting to evaluate polymers as a way to extend the service life of our overlays, increase performance and lower life cycle cost.”

Boosting polymers but not viscosity

The HiMA binder contained 7.5-percent SBS (styrene-butadiene-styrene) polymer—more than twice as much used in conventional polymer-modified binders. While it’s common industry knowledge that modification of liquid asphalt binders with polymers improves resistance to rutting and raveling of asphalt mixes, there is a practical limit to polymer concentration. Usually, as polymer concentration exceeds three percent, the viscosity of the binder increases such that the mix becomes more difficult to produce in the plant and less workable for the paving crew.

However, the polymer used in the demonstration was Kraton™ D0243, a new SBS product manufactured by Kraton Performance Polymers Inc., which meets the requirements of the new regional specifications without increasing viscosity.

NuStar Energy blended the D0243 polymer with a performance-graded asphalt binder at its New Jersey specialty asphalt product plant to produce the HiMA binder for the Rochester demonstration. Frank Fee has been the principal NuStar Energy manager for the AASHTO TSP•2 HiMA production in the Northeast. NuStar will also produce the HiMA binder for a demonstration by the Vermont Agency of Transportation and for a demonstration tentatively planned by the Massachusetts DOT in 2012.

All told, Continental Paving installed about 20,000 tons of hot mix for the District 6 contract, with most of this produced by the company’s Litchfield CMI plant. The Londonderry drum mix plant produced the 1500 tons of HiMA mix for the demonstration section on U.S. Route 202.

Performing the demonstration

The contractor dedicated its plant in Londonderry to the demonstration project for the day. Since the demonstration site in Rochester is 55 miles, or about an hour’s drive, from the plant, the mix was produced at approximately 340-degrees Fahrenheit to compensate for cooling in transit.

By the time the mix reached the job site, the temperature had dropped to between 290- and 300-degrees. A tack coat of RS-1 asphalt emulsion was applied ahead of the paver. Immediately behind the paver, a smooth drum roller in non-vibratory mode did the breakdown rolling. This was followed by a pneumatic intermediate roller. Another compactor, also running in non-vibratory mode, performed finish rolling.

Denis Boisvert, NHDOT Chief of Materials Technology was on site to observe the demonstration. “You couldn’t tell the difference in appearance and handling between the conventional mix and the highly polymer-modified mix as they were installed,” Boisvert said. “Simply stated, both were hot, black and smooth. Our biggest problem with pavements up here in New Hampshire is cracking due to our cold temperatures. Regular asphalt binder gets brittle and cracks.

Field demonstration observers (L-R): Dennis Boisvert, NHDOT chief of Materials Technology; Gregory Harder, Asphalt Institute Regional Engineer; Edward Welch Jr., NCPP Bridge preservation engineer and Kevin Prince, NHDOT.
and then water gets in and we have frost heaves. We'll watch the test section and see if any cracks develop over time.”

**Testing protocols by UMass lab**
The NEPPP regional specifications governing the Rochester demonstration were developed by eleven participating transportation agencies of the regional partnership and Dr. Walaa Mogawer, P.E., professor and director of the Highway Sustainability Research Center housed by the University of Massachusetts/Dartmouth. Professor Mogawer also developed testing protocols for the specifications.

As part of his contractual functions, Professor Mogawer tested samples of raw materials that were to be used in producing the demonstration, then gathered samples of plant-produced mix after the demonstration for testing against performance specifications.

In addition to NHDOT, Vermont’s Agency of Transportation, also a NEPPP member, has scheduled a thin-lift asphalt overlay demonstration in the near future. Professor Mogawer is to provide his lab’s services for this demonstration as well.

**Other trials, other processes**
Outside the Northeast, several AASHTO TSP•2 member transportation agencies have indicated interest in participating in thin-lift overlay demonstrations. One of them, the Minnesota DOT, recently conducted such a demonstration under the auspices of a sister regional group, the Midwestern Pavement Preservation Partnership. While Minnesota did not adhere to the NEPPP regional specifications for the asphalt mix design, they did use testing protocols devised by the Northeast participants.

According to NHDOT’s Thibodeau, the New Hampshire agency has tried other paving products in recent history.

“For example, in 2010, NHDOT had 2,500 tons of conventional SBS polymer-modified asphalt overlay placed on New Hampshire Route 106 in Concord and Pembroke,” Thibodeau said. “In addition, 3,100 tons of conventional asphalt overlay was placed on an adjacent section. Both sections received a ¾-inch overlay.”

And early in 2011, NHDOT tried another pavement technology.

“We had a 1-1/2-inch-thick overlay containing rubberized asphalt binder installed on Route 38 in Pelham earlier this year,” Thibodeau said. “The binder contains very fine particles of recycled rubber from scrap tires. About 5,600 tons of the asphalt rubber gap-graded mix was applied to a three-mile section of the highway.”

All new products are closely monitored and compared to traditional paving methods.

“Within three to five years we will be able to draw conclusions about the performance of these alternate products,” Thibodeau added.

**Not business as usual**
Thibodeau explained that NHDOT’s goal in trying these new technologies is to find more cost-effective ways to extend the service life of pavements and reduce life-cycle costs.

“NHDOT has suffered a major reduction in its paving budget recently,” he said. “Usually we get about $18 million each year in state funds for the district resurfacing program. This year the program was funded at $12 million. This means each of our six districts went from $3 million-per-year budgets to $2 million.

“We have to find and evaluate newer technologies. We might have to pay 20-percent more initially, but then realize 50-percent longer pavement service life. This means longer intervals between having to get out on the road to make repairs and disrupt business and the motoring public, and ultimately, saving significant amounts of tax-payers’ dollars by reducing life-cycle costs.

“It can’t be ‘business as usual’ anymore. Given the current condition of the road, if I got 10 years out of the polymer-modified overlay, I think that would be considered a success. With our typical ¾-inch overlay, would it get 10 years? No. It would probably get six to eight. My goal is to get an additional two to four years out of this polymer-modified application.”

Paul Fournier is a freelance writer based in New England.

Brian Clark (left) is the Asphalt Institute Marketing and Membership Director.