Pace's plant had minimal problems producing warm-mix asphalt for the paving project.

By Chuck MacDonald

Warm Mix Cures Bump Problem

Tractor-trailer trucks crawled along an open traffic lane on Hall Street in an industrial section of St. Louis while the paving crew from Pace Construction paved the turn lane during a night paving project. The Pace team was using a traditional Superpave mix and pavers and rollers that had served them well in other jobs. But the paving team was clearly frustrated as they could see numerous bumps as the mat cooled. Engineers from Missouri DOT were on hand and stopped the job half-way through work on the north-bound lane.

Roger Brown, vice president and special projects coordinator at Pace, does not give up easily, even on a road that takes a beating day in and day out from heavy truck traffic. Brown and his paving team led by Randy Besand, construction manager, and Andy Ernst, construction operations manager, returned to the office to try to solve the bump problems.

The first step was to identify what caused the bumps. When they examined several large cross section pieces cut out of the asphalt pavement, they learned that the heat from the fresh lift of asphalt created steam in open joints and under areas where joint sealer material was placed in the old asphalt pavement. The steam

The warm-mix asphalt did not create steam as the traditional hot-mix mat had done on an earlier project.

created in the joint, and in other areas under the crack sealer, was the real culprit in causing bumps. The crack sealer only made things worse. Cracked areas where there was no crack sealer also had bumps.

An equally pressing problem was that the road runs over a reclaimed swamp. The road was originally concrete with an asphalt overlay before Pace added an additional 1.75 inches of asphalt. The water table lies close to the road's surface, causing frequent flooding. Pace's original attempt to pave the road with hot mix turned the low-lying water into steam that expanded rapidly upward at the joints and exacerbated the bump problem in the new surface.

Brown and Ernst had learned about warm mix at a meeting sponsored by the North Central Asphalt

Roger Brown (left) of Pace examines a core sample.

Warm Mix Cures *continued*

User/Producer Group in St. Louis some months earlier. So they proposed using warm-mix asphalt as a potential solution. They theorized that the cooler temperatures of the warm mix would not create the steam as the traditional hot-mix asphalt application had. The team decided to add another level of difficulty by using three different warm-mix technologies to see how each performed.

Engineers from the Missouri DOT embraced the plan. They were interested to see how the different warm-mix technologies would perform under these circumstances and to see how warm mix would fare in solving the bump problem.

Six months after the initial paving efforts on Hall Street in St. Louis, the Pace team geared up for a night paving run on May 16. Over

The Pace paving team produced 2,400 tons of asphalt with Evotherm, 2,400 tons of asphalt with Sasobit, and 1,200 tons of asphalt with Aspha-min.

the next 10 days, interrupted by rain, the paving team paved 3.5 miles of the road, first using a traditional Superpave mix. The team then paved for two nights using Sasobit, two nights using Evotherm, and one night using Aspha-min, then closed the project by paving a final lane with traditional Superpave for comparison purposes. The team at Pace used the mixes on both milled and unmilled surfaces and used approximately 2,400 tons of asphalt with Sasobit, 2,400 tons with Evotherm, and 1,200 tons with Aspha-min. Warm-mix representatives commented that this was the first time in the country that all three technologies were tested in a side-by-side comparison.

The mix design was a 12.5 mm Superpave with limestone/porphyry aggregates. The mix also contained 10 percent RAP and polymer binders. A major concern for the Pace team was whether they would be able to achieve density specs with the warm-mix additives in the mix.

The team experienced a few glitches with the first night of warm-mix paving. "We had some problems getting the temperature right at first with the Sasobit," said Besand. "But after some adjustments we had it coming out from the paver at about 230 degrees."

The bottom line for Besand and Brown was the production of steam did not affect the mat nearly as much as when the hot mix was used. "We did have a few bumps along the road, but nothing like what we had before," Besand said. "All bumps

were eliminated when the temperature behind the paver was below 240 degrees. Density results were better than the regular mix with the same roller pattern."

Brown also counted the project a success, but was unsure of how the economics of warm mix would work out. "I was pleasantly surprised at how well the warm mix worked," he said. "It saved us about $0.33 in fuel costs per ton of asphalt produced. But the warm mix additives would be much more expensive than that for a normal project." The manufacturers of Sasobit, Evotherm and Aspha-min donated the ingredients for this project and there were no additional costs to MoDOT.

Brown was pleased that the warm mix seemed to fix the bump problem. "A standard approach with hot mix would be to mill out all the joint sealer material, then pave. Or do two lifts over the unmilled surface. But the warm mix covered the bumps in just one lift.

"We still need to get moisture susceptibility test results, and we will be looking for any evidence of rutting over the next few months."

Graham Hurley, research engineer with the National Center for Asphalt Technology, tested the various mixes as they came out of the plant. "The great thing about this project was that conditions were constant for all the warm-mix technologies. They each used the same aggregate, were produced for the same job, and came out of the same plant." He observed both Evotherm and Sasobit being produced at the plant at about 230 degrees. Both technologies performed well on the QC tests he conducted. Because of time constraints, Hurley was unable to stay to test the Aspha-min, which was used later in the project.

Dale Williams, field materials engineer with MoDOT, observed the warm-mix paving project. "I was very enthusiastic about how well the project went. It was almost like a test project, yet set up under real-world conditions."

Williams said that all three warm-mix technologies performed well under the tests. "It also served as a good solution to the bump problem."

He would like to see if the mixes prove rut resistant and if any binder issues emerge. "We would be interested to see other contractors try warm mix in other applications. This has been a very successful project." *HMAT*