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Rejuvenated corridor

Beaten-up Florida road gets a new lease on life with HIR

State Rte. 700 in western Palm Beach County, Fla., takes a lot of abuse. The two-lane rural highway is in an agricultural area, so almost all of its traffic is heavy trucks, especially during the harvest, from October to April.

As a result of the punishing truck traffic—about 3,000 vehicles a day, at least 85% trucks—and the fact that the soil under the road is soft and prone to settling, S.R. 700 historically has needed to be resurfaced every seven years.

For the latest resurfacing, the Florida Department of Transportation (FDOT) threw the project open to life-cycle cost analysis and tossed in the option of hot in-place recycling (HIR). What rose to the top was HIR, so the state set out to perform its first HIR project. The general contractor on the project was Ranger Construction Industries Inc. The paving subcontractor was Hot in Place Paving LLC (HIP). The designer was the Corridino Group. The total project cost was $10.6 million.

The finished product won a 2010 Roads & Bridges/Asphalt Recycling and Reclaiming Association Recycling Award.

Before recycling, the pavement had a rideability number of 2.3 in some spots, on

Florida's scale of 0 to 5, where 5 is perfect. After recycling was completed in November 2010, the average ride number was 4.5, among the highest values in FDOT's District 4.

"The project got a lot of accolades in Florida and in this district because of that ride number," Scott Ryder, project administrator for C3TS, FDOT's consultant overseeing the project, told Roads & Bridges.

In Florida, HIR is a developmental specification.

"This is the first project we used the development spec on," said Ryder. "It was a big learning curve for not only the department, the consultant as well as the GC on the job.

"The job was 490 days," he continued, 24 of which were spent recycling asphalt. "During that time, we had probably over 200 visitors come down from the state, all aspects from materials, from pavement design, to see the process for the first time. There was a great amount of learning that was going on."

The project covered 28 lane-miles of S.R. 700 from Lake Okeechobee to S.R. 80.

C3TS will be preparing a report on the lessons learned for the state.

"There was a little virgin mix that was required as part of the process," Mike Schawe, senior inspector for C3TS on the project, told Roads & Bridges. "We need to define what the limits are for virgin mix use."

Another lesson: "This particular project didn't require a cross-slope correction," the transverse counterpart to the longitudinal ride number, "to make sure you get the water draining off the roadway. The process allows for improvement in that area," Schawe said. "That just needs to be defined on how they want to approach that. They can do that without adding any extra cost, based on the process we saw out in the field."

The paving train on the S.R. 700 project was some 200 ft long.

"I could see that being a problem," said Schawe, "in small areas, in downtown areas or small corridors."

The train was so long because it needed to include four heating machines preceding the paver. The first heater—a Chip Mfg. PH 300 Pre-Heater—did nothing but heat the existing asphalt. The second heater—a Chip Mfg. PH 1500 Pre-Heater—was equipped with a sheepfoot mechanism to aerate the asphalt and allowed the heat to penetrate deeper. The third heater—a Chip Mfg. PH 300A Pre-Heater with aggregate bin—added heat and put down fine aggregate to be mixed into the recycled product. The fourth heater—a Chip Mfg. RU 1500 Recycler—milled up 2 in. of material, added a liquid rejuvenator and left a windrow 2-3 ft wide and about 2 ft high.

Following the heaters was a Caterpillar AP 1000 paver equipped with a conveyor to pick up the windrowed asphalt, place it in the hopper and then place it back on the roadbed.

The mat was then compacted using a Caterpillar 534 OXW roller and a Cat PS 360B roller to a minimum density of 92%, which was the target density for

the recycled asphalt course. Air-void content was 2%-6%, in line with the target for air voids.

Over the recycled asphalt, HIP placed a 1-in. FC 9.5 friction course, a standard FDOT mix, using a Roadtec RP190 and a Roadtec SB2500 Shuttle Buggy.

"Right now the three heaters would be necessary," said Ryder. Technology is always changing, though, and improving the ability to get heat into the mat. "If the technology continues to change, I could see the train getting smaller and smaller."

After compacting the friction course with a Hypac C778B steel-wheel roller and a Hyster C530A traffic roller, HIP achieved their target density of 90% and their target air-void content of 2.3%-6%.

The recycling contractor had a mobile laboratory on-site and tested the recycled asphalt mix for air voids, asphalt cement (AC) content, AC viscosity, mix gradation, specific gravity, density, temperature and surface tolerance daily.

The friction-course mix was tested at the plant for air voids, AC content, AC viscosity, mix gradation and specific gravity. It was then tested by HIP at the jobsite for density, temperature, cross slope and surface tolerance with rolling straightedge and laser profiler.

"I would recommend this process again," Jacques Beaubun, the project manager for FDOT, told Roads & Bridges. "That was the first time I was exposed to this process, and I was very impressed with the train."

The second heater—a Chip Mfg. PH 1500 Pre-Heater—was equipped with a sheep-foot mechanism to aerate the asphalt and allowed the heat to penetrate deeper.

HIR saved FDOT more than $600,000 over conventional milling and resurfacing. It eliminated 70% of the emissions—an estimated 283 million cu ft of engine exhaust—that would have resulted from conventional milling and resurfacing. It eliminated the need to truck 24,000 tons of asphalt millings from the road to the plant and to truck the same amount of fresh asphalt from the plant to the road—about 2,600 truck round trips—as well as the need to mine new materials out of the earth. It also saved about 300,000 gal of asphalt cement.

"The state of Florida is really excited that some recognition is coming for their attempt to go green," said Ryder. "I think it is a really good step of going green, of taking what material you have there and turning it into a reusable road, for whatever duration we'll find out. It's clean. It's moving forward in road building."

The project left a couple of questions open. Ryder wondered about recycling a recycled roadway:

"When you're recycling the roadway, you're adding some aggregate. I just don't know how many times you can do the same corridor due to the aggregate breakdown. Someone that's in the business, that does it for a living, probably could answer that question."

Another open question is whether HIR will lengthen the life of S.R. 700 or whether it will have to be resurfaced in another seven years.

"We're going to have to wait and see," said Ryder. "That's the magic question. The ride number and the test results all reflect a good light on that, but we won't know until after a few harvest seasons whether it will succeed or not. As of right now, since we completed the project, we see no deterioration at all," but it has only been half of a trucking season. R&B

The fourth heater—a Chip Mfg. RU 1500 Recycler—milled up 2 in. of material, added a liquid rejuvenator and left a windrow 2-3 ft wide and about 2 ft high.