

FLORIDA PUTS HIR PLUS VIRGIN OVERLAY TO WORK ON TAMAMIAMI TRAIL

By Tom Kuennen

After a hiatus of several decades, Florida DOT once again is employing hot in-place recycling (HIR) with simultaneous hot mix asphalt overlay, this on U.S 41, the Tamiami Trail, a process known as repaving.

There, late last season, about 35 miles west of Miami, four miles of the Tamiami Trail was hot in-place recycled with virgin HMA overlay, from mile posts 0.00 to 3.9, with 12-ft. driving lanes each way. In addition, two 4-ft.-wide shoulders were overlaid monolithic with the pavement. Before this work, both the existing pavement and shoulders were milled of their open-graded friction course 1-in. deep.

THERMAL 'INTERLOCK' ATTAINED

The HIR process used on Tamiami Trail was a unique, one-pass, hot-on-hot repaving process in which the existing, deteriorated pavement is heater-scarified by mobile equipment to a depth of 1 in., and mixed within the equipment with a rejuvenating agent prior to being placed as a leveling course immediately behind the repaver.

This 100 percent-recycled leveling course then is immediately topped by the repaver with 1 in. of virgin hot mix asphalt, which achieves a thermal interlock between the lifts. This HMA is received by a hopper at the front of the recycler and is conveyed the length of the machine to a screed at the very rear of the repaver. The process is exclusive to the HIR contractor, Cutler Repaving Inc., Lawrence, Kan.

"The Tamiami Trail surface was worn, but some of the material below the base is undesirable," Fowler said. "Consequently, every 10 or 12 years we have to work on it. Also, being in the Everglades, the water table is very high in the rainy season, which does not help. The roadway had light surface cracks and raveling of the surface, but the distress that got it into our resurfacing program is that its ride quality was deficient by our standards."

Florida DOT's experience with HIR dates to the late 1970s, Fowler said. "We had nothing substantive for about 25 years," he said. "In the early 2000s we did more hot-in-place recycling, to the tune of one project a year. After 10 years of this our executive leadership decided we should develop this process more and bring it into our 'toolkit'. So for the last three years we've been doing more and more HIR projects."

However, nearly all of those projects had been single-pass surface recycling jobs, and the Tamiami project was the first in memory to include a virgin HMA overlay immediately following the HIR. "The U.S. 41 was the first time we used the Cutler Repaving method in over 20 years," Fowler said.

Not that Florida DOT was a stranger to asphalt recycling, having used reclaimed asphalt pavement (RAP) in mixes for decades.

"We've been using RAP routinely since 1980," said James A. Musselman, P.E., state bituminous materials engineer. "When we were using Marshall mixes our average RAP content was in the upper 20s [percent]; today, with Superpave mixes, that number is closer to 23 to 25 percent. Occasionally we will get designs with more than 40 percent RAP, but 40 percent is the maximum

For this work Florida DOT applied a "developmental specification," which permits use of a new or unique process. Dev 325 permits "[Construction of] a repaved asphalt concrete pavement by milling and constructing a binder course layer and friction course layer using a paving machine capable of recycling the existing asphalt using the hot-in-place process and placing plant-produced virgin hot-mix asphalt simultaneously."

"This was a brand-new spec," said John S. Fowler, P.E., quality assurance engineer for Florida DOT. "During our previous era of recycling we used one spec for surface recycling, and it did not permit the repaving method used here. After seeing a couple of demonstrations we wanted to open the competition up to other processes, so we wrote a brand-new spec that permitted the HIR repaving process."



Everglades up to roadside of Tamiami Trail are beautiful, but high water table is destructive to U.S. 41's base layers.

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we've used in the Superpave era, although from the 1980s through the mid-1990s we may have seen one or two mixes with as much as 50 percent. But it was uncommon and not the norm."

The highway experienced approximately 5,500 vehicles ADT, with about 11.1 percent trucks. "That's on the lower-end of our structural pavement design," Fowler said. "We basically go from traffic levels A to E, and this is level B, just a little lower than the midpoint. When we were looking at candidates for this HIR process, we only looked at levels A or B because we wanted to verify that it would work at the lower structural design before we started with more intense structural values."

DIFFERENT CROSS SLOPES

Typically the repaving process rarely includes a shoulder overlay monolithic with the driving lane recycling and overlay. But on Tamiami Trail, the virgin HMA went down with a 2 percent cross slope on the driving lane, and 6 percent cross slope on the shoulder. Both driving lanes and shoulder were placed at the same time.

Getting two separate cross slopes placed in one pass required some adjustments to Cutler Repaving's unique HIR equipment.

"In Florida we have never had had the challenge of recycling and paving the travel lane at a 2 percent cross slope, while paving the shoulder at a 6 percent cross slope, all in one pass," said Bob Hall, Cutler area manager. "We had to manufac-

ture a special screed extension that we attached to our machine's screed, to enable us to achieve the 2 and 6 percent cross slopes simultaneously."

The result, a "crownable" bolt-on extension, was not unusual for the industry at-large, but atypical for Cutler.

"From our point of view, the most unusual thing about this project was that we had to overlay a shoulder at the same time we were recycling a travel lane," said John Miles, Cutler vice president-operations. "For this we built a special extension for our screed that was 4 ft. wide, with a separate cross slope. It's not so difficult using a standard paver, but the fixed-width screed at the rear of our repaver is not hydraulically extendable, needing bolt-on extensions."

Because the travel lanes and shoulders were cold-milled 1-in. prior to HIR, the cold milling cut the pavement to its required slope. "The intent was that they would mill 2 percent slope at 1-in. to remove the existing open graded friction course [OGFC]," Hall said. "The shoulder was milled 1-in. at a 6 percent slope as well."

The milling was required by the Florida DOT. "The roadway has an open-graded friction surface, and we don't allow that surface to be recycled," Fowler said. "So we milled 1-in. to get to the grade where we could perform the recycling operation, and then Cutler came through, recycling 1 in. of the travel lanes only, and immediately paved a new 1-in. friction course over the new travel lane and paved shoulder."

Contractor Cutler Repaving Inc. built bolt-on screed extension to permit virgin HMA paving of 4-ft. shoulder with 6 percent cross slope in conjunction with virgin paving of 12-ft. driving lane with 2 percent cross slope immediately on top of hot in-place recycled lane.



Testing of the existing pavement preceded the work. “We took up to 15 cores per lane over the four miles of the job,” said Cutler’s Hall. “We did pretesting in order to determine what our mix design would be for the recycled section. The state was very impressed with the equipment that we used and the professionalism of our crew, and how we were able to approach any problems that came up,” Hall said.

REPAVING AN HIR PROCESS

The Cutler Repaving process takes place in one pass, in one continuous train, eliminating continuous lane closures and construction traffic. In residential areas drivers may leave home in the morning on a decayed pavement and return from work on an entirely new pavement.

With repaving, the existing pavement is heated to 300 deg F. Once it reaches a softened, pliant condition, the pavement is scarified to a depth of 1 in., and in the mobile repaving unit, a recycling agent that restores the viscosity of the aged asphalt is mixed into the scarified, reclaimed asphalt.

This reclaimed material is reapplied and distributed with a recycling screed as a 1-inch leveling course. While that material remains at a minimum 225 deg F, the main paving screed immediately lays a virgin hot mix asphalt over the recycled leveling course.

Cutler’s repaving machine scarifies, applies recycling agent, places the leveling course, and applies the new overlay simultaneously in one pass. That benefits road users because there is no delay between the time the pavement is recycled and the time a riding or friction course is placed, resulting in a safer work zone for road users and for contractor personnel.




To place a final friction or driving course, other hot in-place processes use a separate paver following the heater/scarification process. But Cutler uses a screed at the rear of the repaver and thus is able to eliminate an entire machine.

“From an engineering point of view, the thermal interlock between layers means there is no delamination between the recycled layer and the new overlay,” said Cutler vice president John Rathbun. “The recycled and virgin courses bond to become a monolithic overlay. The same heat that’s used to take the road apart is used to put it back together, and the two layers are effectively compacted into one lift.”

A core of the new pavement would not reveal an inch of virgin mix on top of reclaimed material, Rathbun said. Instead you would see a consistent, 2-in.-thick layer of HMA. This thermal or hot-on-hot paving adds to the durability of the



At eastern boundary of Big Cypress National Preserve in far south Florida, Repaver begins recycling/repaving of 12-ft. driving lane and 4-ft. repaving of shoulder without recycling.



On U.S. 41 Tamiami Trail, hot in-place repaving train includes, from left, mobile preheater, truck delivering hot mix asphalt into mobile recycling unit, and compactors at rear.

driving surface and improves the smoothness of the highway. And because it's done in one pass it saves owner and user delay costs, without the additional traffic control and delays to the public.

The process also does not use a tack coat, which can be tracked by tires and shoe soles into parking lots, businesses, vehicles and homes.

In addition to the benefits of recycled material, hot in-place recycling as executed by Cutler provides a smaller energy consumption and emissions profile cumulatively than nearly every other surface reconstruction method.

USED ELSEWHERE IN FLORIDA

Although this was Florida DOT's first repaving project in memory, the process has been used routinely in Hillsborough, Orange and Escambia counties in Florida, Hall said.

The cross slopes and working in a remote part of the Everglades wilderness were only part of the challenge faced by the contractor. "That, and fending off alligators, panthers and released pythons," Hall joked. "We did see a lot of alligators as we worked just west of the Miccosukee Indian Reservation."

"This was a great place to use this particular method," Fowler said. "This road was old, in the Everglades and not built necessarily on the greatest of embankment materials. So it's a road that we have to resurface every 10 to 12 years, regardless of what we do. This is in a state where we are used to getting 15 to 20-plus years of performance from our pavements. It was an opportunity for us to realize some initial cost savings on the front end, and not worry so much about whether we'd get a full life cycle performance, because we know that the life cycle for this particular road will be 12 years regardless of what we do to it."

And there will be more of this work on the horizon. "Our executive leadership is committed to doing hot in-place recycling work," Fowler said. "In the 2013 calendar year we had 10 projects to let with the option to use HIR, with some of them the option for repaving. It's more than any year previously, and who knows what 2014 holds? The future of hot in-place recycling looks bright, and a lot of that has to do with our executive leadership."



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