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**JIM MOULTHROP
1939-2025**

**LAST CHANCE FOR
RECYCLING SUMMIT**

**HOT IN-PLACE
RECYCLING**

**URBAN PAVEMENT
PRESERVATION**

Hot In-Place Recycling Keeps Good Roads Good in Winnebago County

In central Iowa just south of the Minnesota border, a rural county is finding hot in-place recycling (HIR) is the right choice for keeping a good road good.

On R20 south of Rake, Iowa, a hot in-place recycling project was preserving the two-lane blacktop, restoring ride and providing another two decades of service to taxpayers.

According to FP² Inc., HIR is a continuous process with self-contained train of equipment that heats the distressed surface to 250 to 300 deg F, mills or scarifies a depth of ¾ to 2 in., mixes it with new, rejuvenating asphalt emulsion or binder, places the recycled mix with a paver, and compacts the mat in readiness for potential new surfacing as dictated by the traffic and road conditions.

HIR should be used on structurally sound pavements with good drainage, but with distressed surfaces. HIR has been successfully done on all types of roads, from city streets to rural roads to interstate highways. Before HIR, the reasons for the distresses should be analyzed so they can be corrected by the HIR process. Usually an investigation by civil engineers will specify a process or mix design based on cores.

HIR levels deformations, removes surface cracking, re-establishes crowns, maintains clearances and curb heights and reuses existing materials. The construction is quick, with immediate traffic return. However, the road base must be strong enough to support the equipment. If the distresses go deeper than the recycling, they may reappear.

This \$2.0 million, 249,476-sq. yd. HIR project was undertaken by FP² supporting member Dustrol, Inc., Towanda, Kan.

R20 IN WINNEBAGO COUNTY

The R20 project was one of several pavement preservation projects in the area that were in progress.



Freshly placed recycled pavement awaits breakdown compaction



Rejuvenating emulsion added from tanks into final windrow

“R20 has been cold-milled to the state line, and that’s part of the overall scope of this project,” said Winnebago County Engineer Scott Meinders, P.E. “We have several different locations, each with its own project number.”

Milling on R20 was accomplished by a Dustrol subcontractor, Ulland Brothers, Inc., of Albert Lea, Minn., using a 12-ft drum in one pass at profile grade. “The plans call for an inch to be removed, but when we ran at 2 percent cross slope,

sometimes we were milling inch and a half down to nothing in some points." A total of 111,888 sq. yd. was milled.

If the essence of pavement preservation is keeping good roads good, R20 fit that theme. "The road was last paved in

2005, and here we are in 2025, some 20 years later, but still in good condition," Meinders said. "It had some cracking, and wear over time, but the ride was pretty good. Usually in our county, after 20 years, a road really needs to

have some major resurfacing or recycling done, but this one was in better shape than most."

With an ADT of 590-740 vpd, R20 gets both semi truck loads and heavy agricultural loads, especially during harvest time. "I'd say the majority of truck traffic, aside from agricultural traffic, serves hog confinements," Meinders said. "We have a feed mill here, not far away, so we get quite a bit of feed traffic and other ag commodities, for example, cattle feed and byproducts from ethanol plants. And this particular road leads to the only grain elevator nearby."

Winnebago County does not employ an asset management system to track road conditions. Instead it relies on its county five-year program, plus an additional tweak.

"We have a couple of different programs," Meinders said. "Our more formal system is our county five-year program, which every Iowa county must have, in which you program all of your major construction projects. But we also have a lot of maintenance projects that don't make it into that. Instead we keep them off to the side in a five-year plan spreadsheet that evolves as our budget allows.

"We try not to make it too complicated," he added. "We have 150 miles of road and it's split into 35 segments at most. So we don't need an asset management system for just 35 sets of data. We keep that in a spreadsheet, including the history of the pavement and maintenance, and we line that up with proper timing of pavement preservation and resurfacing, all the way down to complete recycling and full-depth reclamation."

HIR IMPORTANT TO COUNTY

Hot in-place recycling is a big part of the county's pavement preservation effort, and has become a very popular practice in the county's program.

"Dustrol's been a really good contractor to work with, and they've helped us through the development and scoping of projects," Meinders said. "We're experimenting with different surfacing types after they leave, including no overlay at all. We have a couple of projects this year which we're going to leave uncovered, that is, HIR with no overlay on top."



Windrow elevator places hot-recycled mix with rejuvenator into paver



At end of recycling train, finish roller operates in static mode



Intermediate heater continues to gently bring hot recycled mix up to optimal temperature



Milling drum lifts softened asphalt mix off pavement and combines with material milled earlier in train



Windrow of hot recycled asphalt is maintained through the recycle train



Mixer following heater is an opportunity to add rejuvenating emulsion stored in black tanks

A few years ago Winnebago used Dustrol for about 14 miles of HIR, and micro surfaced all but 1,000 ft. of it. “We thought we would monitor how that pavement aged in comparison to the micro surface part,” he said. “And this year we put [asphalt rejuvenator] *Reclamite* on one lane of it, so we did a little test section there. To me, HIR is the best value for the money, so it has a unique spot in our treatment list.”

R20 itself was to get a 2-in. hot mix asphalt overlay after recycling this fall, and that will be applied to other HIR segments around Rake as well. R16, a project near adjacent Buffalo Center, Iowa, also will be hot in-place recycled, but that one will not be overlaid this year, Meinders said.

“Two other sections that they’ll be doing after that will also not be covered,” he said, “and we’ll be evaluating some surface treatments or rejuvenators or sealers next year or the year after that, depending on available funding.”

PERFORMS WITHOUT OVERLAY

Even without an overlay the HIR pavement will handle the heavy agricultural loads and local traffic of the area, the county has found. “The product we’re left with is nearly perfect in finish as new hot mix asphalt,” Meinders said. “The only question is how does it age, not how does it perform in the moment, but how does it oxidize and age over time? And that’ll be highly impacted by how we treat it after the fact with surface treatments or other preservation efforts.”

Approximately 6,100 tons of asphalt were milled off the R20 eight-mile project, some of which will go back into the 2-in. overlay. Ultimately some 12,000 tons of pavement were hot in-place recycled.

Dustrol’s *Mobile Asphalt Recycling System*, or MARS®, constitutes its newest method of rejuvenating asphalts of up to 2 inches or more.

This HIR process typically uses eight units, one after the other, slowly moving forward and gently heating the existing asphalt pavement to the optimum level without prematurely aging or oxidizing the material, caused by loss of lighter components of the residual asphalt due to high temperatures.

The process begins with two or more custom-made, propane-fueled preheaters. The next heater in the train is equipped



HIR process typically uses eight units, one after the other, slowly moving forward and gently heating the existing asphalt pavement to the optimum level



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with grade-controlled milling drums which windrow the top 1 in. of material. The milling heads are capable of milling 15 ft. wide and 1 in. deep.

Tunnel heaters heat the underlying pavement while maintaining the temperature of the windrow. The surface is then milled and heated by up to three more milling heaters followed by tunnel heaters depending on material and depth.

The last milling heater in the process has a metering system that injects and mixes a rejuvenating agent or asphalt emulsion into the milled asphalt and aggregate. No pug mill is used.

After adding and mixing the rejuvenating agent, the windrow is picked up with a conventional elevator. The paving process is performed with a conventional electronic grade control, electric screed paver. The material is compacted using conventional rollers in vibratory and static modes. The road can be opened to traffic after a cool-off period similar to an HMA paving operation, typically within an hour after the process is complete.

“Four units are preheaters, and four are heater/mills, and they’re alternated in the train,” said Donn Johnson, engineering consultant for Dustrol. “The first preheater unit heats the aged asphalt down to a half-inch and leaves it in place,” Johnson said. “The next heater comes and heats that same surface, but at the back it has milling heads, and it mills the material again to about a half inch. At the end it has guardrails that create a windrow in the center of the pavement.”

Heating the recycled material in stages precludes premature oxidation, providing relatively gentle heat, in one stage after the other, instead of an intense, single burst of heat. “We don’t want to burn off any

residual asphalt that's in the pavement," Johnson said. "The customer has already paid for that oil and aggregates, so we re-use 100 percent of it." The paver places the resulting mix at a depth of two inches.

The rejuvenating emulsion used was an ARA2P product made by Flint Hills Resources of Stevens Point, Wis. It serves as a fresh binder for the hot recycle mix and adds black color, which is preferred by highway users. The pavement is not sealed or overlaid immediately as the seal will inhibit curing of the emulsion as water is released.

The process is not rushed and the contractor generally can recycle between two and three lane miles per day.

PRESERVATION WILL CONTINUE

Under Meinders' direction, in the last few years Winnebago County has embraced pavement preservation. "We have had a dramatic shift in the last five years from paving every 20 years to using a complete pavement preservation toolbox in our hands, all the way down to full-depth reclamation," he said. "I'm excited to see how we can extend the performance of our road system at the lowest cost possible. We're in the early stages to see how well that can be proven, but I'm confident that in five or 10 years we'll be able to tell a really good story.

"There were decades in which there was almost zero pavement preservation done in Winnebago County, outside of crack sealing," he continued. "I have really taken pavement preservation on as an interest, done some training and a lot of informed experimentation."

Meinders has two lists he uses to guide preservation work. "One is the list of preservation treatments, and one is the equivalent annual uniform cost of that treatment," he said. "And when possible, we try to use the treatment with the lowest equivalent annual cost, and we keep working up in value until we get the treatment that is correct for the road, maximizing the value of the treatment. Every treatment has an ideal road that it would be used on."

And that's the essence of pavement preservation mantra, *the right treatment for the right road at the right time.* 

Edited by Pavement Preservation Journal from material contributed by Dustrol, Inc.



Tunnel heaters heat the underlying pavement while maintaining the temperature of the windrow



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