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MIDWEST CONTRACTOR

Edition

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MISSOURI CITY SEEKS TOUGHER CUL-DE-SAC PAVEMENTS

Lee's Summit tries highly modified asphalt micro surfacing to counter damaging wheel loads of trash trucks

By Paul Fournier

Missouri's sixth largest city is testing a new type of micro surfacing in hopes it will better resist wheel loads of heavy trash trucks that damage pavement surfaces in the community's many cul-de-sacs.

Lee's Summit, a city of 91,000 people located in Jackson and Cass Counties in the western part of the state, approved the use of micro surfacing made with highly polymer modified asphalt emulsion for 20 cul-de-sacs in an upscale residential area abutting scenic Raintree Lake.

The city's pavement management program, financed by a ½-cent transportation tax, utilizes a number of scheduled programs to maintain or restore paved road surfaces including its annual micro surfacing contract. Vance Brothers, based in Kansas City, Mo., which has this year's micro surfacing contract, was asked if they could produce a tougher pavement treatment for the cul-de-sacs.

"The city has been looking but so far hasn't found anything to use in these cul-de-sacs," said Howie Snyder, Slurry/Micro Surfacing operations manager for Vance Brothers. Snyder said their contract includes not only cul-de-sacs but major thoroughfares and residential streets as well. He noted that conventional micro surfacing performs well on streets but not on cul-de-sacs, especially those in the Raintree Lake area, where unusually heavy truck traffic damages the pavement surface treatment.

"A number of private companies provide trash pickup for residents in this area, so on any one day, you could have 2- to 5 trucks with



Vance Brothers' Bergkamp continuous mix paver applies micro surfacing made with highly polymer modified asphalt emulsion in Lee's Summit, Mo.

40,000-pound front-axles going around the cul-de-sacs," he said.

Conventional micro surfacing has failed to withstand the tremendous pressure of turning tires that knead and smear the surface treatment. What's more, the higher than normal temperatures plaguing the Mid-West this year have exacerbated these detrimental effects.

Micro Surfacing Benefits and Limits

Micro surfacing, a pavement preservation method, is used to extend the life of existing, structurally sound asphalt pavements. It is a cold-mix material, made on site by a continuous mix paver that combines mineral aggregate (usually #4 minus), Portland cement or other type of mineral filler, and a polymer-modified asphalt emulsion. Capable of being spread in different thicknesses, micro surfacing can be used as a leveling or scratch course, to fill pavement wheel ruts, or placed as a thin wearing course, or seal, to protect the underlying pavement.

Owner: **City of Lee's Summit, Mo.**

Micro Surfacing Manufacturer/Installer: **Vance Brothers**



MISSOURI CITY

SEEKS TOUGHER CUL-DE-SAC

PAVEMENTS



Generally, traffic can be placed on the surface treatment as soon as 30 minutes after application, but the length of time between applying micro surfacing and allowing traffic on it is dictated by the agency responsible for roadways. Other circumstances, such as type and volume of traffic and ambient temperature, also help determine this waiting period.

Lee's Summit has been using micro surfacing made with conventional polymerized asphalt emulsion. The polymer proportion of the emulsion is usually about 3 percent or slightly higher, while the emulsion content of the micro surfacing mixture is normally about 13 percent by weight.

Polymer-modified micro surfacing offers a number of benefits. It seals and protects the pavement, improves resistance to aggregate raveling, adds to riding comfort and increases skid resistance. But since the treatment is thin, usually 1/4-inch to 3/8-inch thick, over time it can develop cracks that are reflected up from the underlying pavement.

Targeting Reflective Cracks

Vance Brothers has been researching ways to retard reflective cracking in the surface treatment. Its latest research involves testing the effectiveness of an advanced emulsion made from highly polymer modified asphalt binder (HiMA).

In this case, the HiMA binder contains 6 percent SBS polymer – about twice as much polymer used in conventional polymer-modified binders. While it has been demonstrated that polymer can improve the performance of asphalt binders, there is a limit to the amount of polymer that can be blended with asphalt binder, usually about three percent. Beyond this dosage, the viscosity of the binder begins to increase. Eventually, a point is reached where the benefits of adding more polymer are outweighed by the difficulty of using the highly viscous binder for practical applications, such as in manufacturing and placing hot mix asphalt pavement.

This problem was solved by Kraton Performance Polymers, a Houston-based chemical manufacturer. Kraton has developed and is manufacturing a new generation of SBS – Kraton D0243 – which produces only a modest increase in asphalt binder viscosity even in polymer concentrations exceeding 6.0-percent.

Furthermore, HiMA binder containing this advanced SBS polymer can be emulsified for other applications at lower cost than manufacturing emulsion using asphalt pre-blended with a more conventional SBS polymer. This is possible because a heavier-duty mill for shearing asphalt and significantly higher temperatures are required to emulsify asphalt pre-blended with conventional SBS polymer than required for emulsifying HiMA binder.

Vance Brothers decided to try using HiMA emulsion in micro surfacing applications to see if the product would help retard reflective cracking. If it turned out to be effective, the company would be in a unique position to market it, according to Mark Smith, vice president of operations.

“We can make highly polymer modified asphalt binder, we can emulsify it, and we can place micro surfacing containing the emulsion,” said Smith, referring to the wide-ranging capabilities of the Kansas City, Mo.-based company. Vance Brothers manufactures and distributes many liquid asphalt products, including emulsions, cutbacks, polymerized emulsions, slurry seal emulsions and micro surfacing emulsions, among other products. The company also manufactures hot mix asphalts and has paving crews who install pavements as well as surface treatments such as micro surfacing, chip seals and slurry seals.

Overcoming Manufacturing Challenges

Vance Brothers was able to manufacture HiMA by blending base asphalt with 6 percent Kraton D0243, and emulsify it to meet the city's micro surfacing specifications. But this was not quick and easy, according to Bryan Midgett, Vance Brothers Manager of Operations.

“We were dealing with two separate manufacturing processes,” Midgett said. “First, we had to modify the base asphalt with polymer to produce HiMA, and second, we had to emulsify HiMA to produce a true CSS1-h emulsion for the micro surfacing specs.

“During research and development of the manufacturing processes, sometimes we produced really good quality emulsion, and sometimes it wasn't acceptable,” he said. “The stability of the emulsion was the issue. That had to do with how we mechanically handled the base asphalt, and how we cross-linked the polymer system. We have learned more and more about the processes and still have a lot more to learn,” Midgett said.

Bergkamp paver installs micro surfacing containing HiMA emulsion at the rate of 24- to 25 pounds per square yard, producing a 3/8-inch seal for the road pavement.



A Freightliner “nurse” truck delivers raw materials to micro surfacing machine.

Eventually, after much trial-and-error, they were able to produce a consistent quality emulsion for some application demonstrations.

Taking on Cul-De-Sacs

“We did roadway and parking lot demonstrations using HiMA micro surfacing and are now watching to see if it retards reflective cracking,” said Vice President Smith.

“In the meantime, based on the demonstrations, the city approved our trying the product to solve the problem they’re having with micro surfacing in the cul-de-sacs,” he said.

“The city has been doing a lot of micro surfacing on their streets because of budget restraints, and there are many cul-de-sacs in Lee’s Summit. It’s been extremely warm in the Kansas City area this summer and micro surfacing in the cul-de-sacs is not holding up. But they don’t want to mill off pavement and fill in with hot mix asphalt because it’s expensive. Micro surfacing is really thin, so they’re not building up a thick pavement and they avoid the need to build wheelchair ramps and make other improvements to comply with the federal Americans With Disability Act,” Smith concluded.

Applying Micro Surfacing

Snyder supervised the cul-de-sac operations, which employed a Bergkamp continuous mix paver for micro surfacing. Trucks carrying necessary raw materials, including emulsified HiMA binder, aggregate and water, provided a steady supply of these ingredients to the Bergkamp machine to make sure it maintained uniform speed. Portland cement for the process was stored in bags on the Bergkamp machine.



Augers blend ingredients before material exits the micro surfacing machine.

According to Snyder, the Bergkamp applied micro surfacing at the rate of 24- to 25 pounds per square yard, producing a 3/8-inch seal for the pavement. The machine was equipped with a plate mounted behind the screed that produced a textured micro surface.

Snyder said they didn’t notice any difference between the application of HiMA micro surfacing on the cul-de-sacs and the previous application of the non-HiMA micro surfacing. Both applications had an emulsion content of 13 percent, he said, but the polymer content was different – about 6 percent for HiMA and 3 percent for the non-HiMA treatment. In addition, the aggregate gradation – a #4 minus – was the same for both but HiMA micro surfacing used limestone, and the non-HiMA treatment used granite. The different stone was simply the result of available supplies, he added.



A plate mounted behind the screed produces a textured micro surface (at left).

Crews kept the cul-de-sacs closed to traffic for at least 4 hours after the treatment.

“We didn’t want one of those heavy trucks getting on the HiMA micro surfacing for at least that length of time. In fact, whenever possible we micro surfaced a cul-de-sac in the early morning, to get a full 8 hours or so before we had to open the cul-de-sac by 5 p.m. as ordered by the city,” he said.



Howie Snyder, Slurry/Micro Surfacing operations manager for Vance Brothers, observes job progress with Chris Lubbers, Kraton Polymers technical sales manager.

A Spring Judgment

“The city is going to wait until spring to judge whether their cul-de-sac problem has been solved,” Snyder said. “We think it will be, because we believe this HiMA micro surfacing is tougher and more durable than the usual 3-percent treatment,” he concluded. 🍌