



Recycling's day in the sun

Ariz. thoroughfare brought back to life using innovative hot in-place recycling technique

By Jeff Zagoudis
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Arizona would sound like the perfect place to do a hot in-place recycling of asphalt rubber such as the one undertaken along 99th Avenue in Sun City, Ariz., last spring.

The Maricopa County Department of Transportation (MCDOT) wanted to fix up the 7-mile portion of the roadway between Olive Avenue and Beardsley Road and opted for hot in-place recycling (HIR). Cutler Repaving Inc. was tapped for the job, and their approach with an innovative, homegrown recycling method garnered a 2013 ROADS & BRIDGES/Asphalt Recycling and Reclaiming Association Recycling Award.

The selection of HIR for the road repair was an easy one to make, according to Bob Erdman, P.E., area sales representative for Cutler Repaving Inc., as HIR of asphalt rubber was still a relatively untested idea in Arizona. "Maybe little test sections had been recycled

in the past, but asphalt rubber has worked so well here in Arizona that not a lot of people have found a need to recycle it yet," he said. "But now, a lot of stuff's getting to be 15, 20 years old or more, and the big challenge was how well was it going to recycle."

99th Avenue definitely fell into that category, and Erdman should know—he was the one to place the existing overlay as an MCDOT employee approximately 17 years prior.

New recycling

Over its 45-plus years in operation, Cutler has developed its own brand of HIR, which it calls Single Machine Repaving (SMR), that does the work of two passes in one. For the 99th Avenue job, prime contractor Sunland Asphalt went in first and cold milled off the top inch of existing asphalt in preparation.

From that point, Cutler brought in its own paver. Going one lane at a time, the machine heated, scarified and recycled the top layer, refreshing it with new asphalt emulsion. While the recycled layer is still hot (at least 200°F), an



The paver can be augmented to any width needed via a series of pre-made, 1-ft extensions for the heating hood, scarifying teeth and the recycling auger. This adaptability allowed Cutler to set a new Arizona record with one pass of 18 ft.

additional inch of fresh material is placed on top, improving the durability of the rejuvenated roadway. With the addition of the extra inch on top, the final grade of the new surface is usually an inch higher than the original pavement. Once a lane is completed, the paver backs up and moves onto the next lane.

"So it's all compacted hot to where there's no bond break layer, there's no tack coats, there's no flat slippage plane between

the two mixes," Erdman said. "They're all compacted together, so it's like a monolithic, 2-in. mat that you're getting."

Making the grade

The asphalt mix—courtesy of Southwest Asphalt—was a 1/2-in., open-graded asphalt rubber mix common in Arizona, utilizing a binder of PG 64-16 asphalt cement and ground crumb rubber; the optimum binder content was 8.2% by weight of the

total mix. The mineral admixture was Type N hydrated lime.

Erdman wanted to see how their recycled asphalt rubber material stacked up against existing samples from the county, so he sent it to the Arizona office of AMEC Environment and Infrastructure Inc. for testing. In particular, he wanted to compare the gradation, binder content, viscosity and dynamic modulus. The results were compared with a series of curves established from new asphalt rubber samples that the Maricopa County DOT and John Shi, P.E., Ph.D, materials engineer for MCDOT, had been testing at Arizona State University over the previous few years. The recycled content ultimately displayed similar characteristics to the new asphalt rubber mixes.

"It was slightly softer, but we showed ourselves and everybody that we can essentially restore this material to—I hate to just say we can restore it to 100% new, that's almost impossible, but from the dynamic modulus and the other tests we did, it sure comes pretty close," Erdman said.

One foot at a time

One of the biggest construction challenges noted by Erdman made itself apparent right from the start: The four-lane 99th Avenue sports a wide concrete drainage channel separating the north- and southbound lanes for a long portion of the roadway. As a result, lane widths vary from section to section.

"We'll make a pass run all day one width, then we'll come back and often have to do a different width on the second pass,"



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said Erdman. "Very seldom do we get to make two equal passes on the roadway."

Luckily, Cutler's paving equipment is uniquely suited for just such a task. While the paver itself is standard width, it can be augmented to any width needed via a series of pre-made, 1-ft extensions for the heating hood, scarifying teeth and the recycling auger. Pieces are added or removed overnight to prepare for the next day's work.

This adaptability allowed Cutler to set a new Arizona record with one pass of 18 ft, breaking its own previous high mark of 17 ft set on another job for the Arizona DOT back in the mid-2000s. According to Erdman, the new record-setting pass was a large part of the reason Cutler was able to complete the job in just 16.5 days—about one-third the expected length of the project.

It also helped them slightly correct the grade of the roadway.

At the outset of the project, MCDOT had implemented a smoothness specification, with a bonus available for successful compliance—and an associated penalty. Normally such specifications are made on interstates and state routes that are mostly long, straight stretches with little to no curbs and gutters. 99th Avenue, in the middle of a high-traffic residential area, was a different story.

"These roads did have curb and gutter, and they weren't really in the greatest shape," Erdman admitted, "so you didn't really have a straight line you could follow . . . It could be that the material would be below the gutter lip and then 2 in. above the gutter lip."

Cutler was concerned that by following the curb line it might fall into a ride penalty, as the surface would be above the gutter in spots and below the gutter in others. Therefore, Maricopa County chose to eliminate the smoothness spec altogether. Smoothness numbers on the finished paving, obtained by the county for information only, were spot-on in the normal expected range.

The SMR pavement recycling method allowed Cutler to always keep one lane of traffic open, keeping disruptions to a minimum—an especially important consideration thanks to the large number of retirees in Sun City.

"To my knowledge we didn't get any complaints, but we did get some calls in for praise and gratitude," Erdman said. **R&B**



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