

City Streets Improve with Hot In-Place **RECYCLING**

Saving 30 percent compared to mill and fill claimed

You could say that Chandler, Ariz., is celebrating its tenth anniversary with hot in place Recycling (HIR) this year. Since 2001, the city has repaved nearly 1.3 million square yards of asphalt roadways, or 30 centerline miles, with the HIR process. The majority of those roads are four- and six-lane urban arterials that carry heavy traffic volumes.

"The arterial roads for which we use HIR are structurally sound," says Rex Hartmann, street superintendent in Chandler's Transportation and Development Department. "But on our HIR candidate roads we see longitudinal and transverse cracking, some minor alligator cracking, some surface raveling and some showing." On a scale of 0 to 100, with 100 being perfect, Hartmann says roads run in the range of 49 or so prior to getting the HIR treatment.

Hartmann says the city has learned that HIR is not a cure-all. Some roads still need milling and filling. But the HIR process costs in the range of 30-percent less than a 2-inch mill-and-fill, Hartmann estimates. Based on a 2011 project, the cost of HIR runs \$12.70 per square yard. That includes everything – edge milling, the virgin hot-mix overlay, utility adjustments, striping, and street light replacements.

"Our city council and senior management have always been supportive of cost-effective and the newer green-technology

Photos courtesy of the city of Chandler



Kansas-based Cutler Repaving's hot recycling train is led by a pavement preheater. The mobile recycling unit comes next, and it is fed hot mix asphalt for the overlay. The recycling unit heats, scarifies, adds a recycling agent, remixes the material, spreads it and lays the overlay on top.



The heater is the center piece in the Cutler HIR recycling unit.

recycling projects," says Hartmann. "And the HIR is a very fast-moving, single process that limits the time contractors spend on the road." Traffic can return to an HIR road within a half-hour to forty minutes of being compacted. Plus, the HIR process permits the contractor to adjust the crown on a roadway.

Chandler's HIR work has all been performed by Cutler Repaving Inc., Lawrence, Kansas. Cutler has been doing HIR continuously since 1965. "They have always won the low-bid contract with us," says Hartmann.

One-pass process

Cutler's process begins with a preheating unit that softens the asphalt. That is followed by a mobile repaving unit that continues to heat the pavement, taking it up to 350 to 375 degrees F. The same machine scarifies the pavement to a depth of 1 inch, adds a recycling agent, remixes the scarified asphalt in-place, and redistributes the material, with a screed, as a 1-inch leveling course. While that material remains at a minimum temperature of 225 F, the same repaving unit places a virgin hot-mix asphalt overlay over the leveling course. Compaction completes the process.

Road users benefit from the Cutler process because there is no time delay between the time the pavement is recycled and the time the overlay is placed. The result is a safer – one-pass – work zone for workers and for user traffic. And because the hot virgin mix is placed over the heated, recycled leveling course, the process achieves an interlocking bond between the two layers.

"From an engineering point of view, there is no delamination between the recycled layer and the new overlay," says John Rathbun, vice president of sales for Cutler Repaving. "That's very important in predicting life cycle performance. The same heat that is used to take the road apart is used to put it back together, and the two layers are effectively compacted into one lift."

The amount of recycling agent needed is determined by lab tests on the existing asphalt. Rathbun says the recycling agent is mostly composed of a high-float medium-set emulsion with a polymer modifier. It replaces both the asphaltenes and the maltenes in the existing asphalt. The benefit of heat, says Rathbun, is that you don't break the existing aggregates up, so you don't change their gradation from the original design.

In 2010, Cutler performed HIR on nearly 112,000 square yards of Chandler's streets – or 4 centerline miles. This year, Cutler is doing HIR on a 4.8-mile project that covers nearly 182,000 square yards.

"We have found that the HIR process works best on arterial roads or streets, or collectors with a thicker

cross-section," says Hartmann. "What works best for us is a cross section of around 3 inches or thicker.

"We have also found that it doesn't pay to go too thin on that final lift," Hartmann continues. "On our first year with HIR, we did a 1-inch overlay, and we had just a bit of an issue with that. Ever since then, we have been going to a minimum of 1.5 inches. We will do 1.5 to 2 inches and that really seems to cure the problem. We have not seen the delamination that we saw before."

That the overlay thickness is flexible is an advantage, says Rathbun. "We can lay it as thin as one inch," he says. "It depends on the pavement and the traffic load. If you have a high traffic load, which they have in Chandler, and you want to lay it a little thicker, our machine is capable of doing that. The paving screed has electronic grade and slope control, just like you have on any paver."

Hartmann estimates that HIR will extend a Chandler arterial's life by 20 years or more – with additional regular maintenance. By maintenance he refers to slurry seals, microsurfacing and the like. And now Chandler has begun to use Tire Rubber Modified Slurry Seals (see related story on Page 31).

While Chandler's Street Division has used rubberized asphalt on overlays and HIR projects, Hartmann says he has not seen overwhelming improvements in roadway life cycles or in noise reductions – not sufficient to regularly justify the increased costs, especially during challenging economic periods. He says the decibel levels of traffic noise are not perceptibly different between regular asphalt and rubberized asphalt for inner city applications. And for city streets, he says rubberized asphalt has its place, but may not be the most cost-effective globally-exercised application.

Hartmann stresses that a road agency should not force the HIR process onto a road that really needs a more aggressive treatment. "I think we got a little excited on a couple of our first roads and thought this was a cure-all," he says. "And we were in a learning curve and have certainly come to better understand its limits. And HIR has them. But it has turned out to be a great product and a great application for us." ❖



CUTLER Repaving, Inc.
921 E. 27th Street Lawrence, KS 66046
(p) 785-843-1524 (f) 785-843-3942
www.cutlerrepaving.com