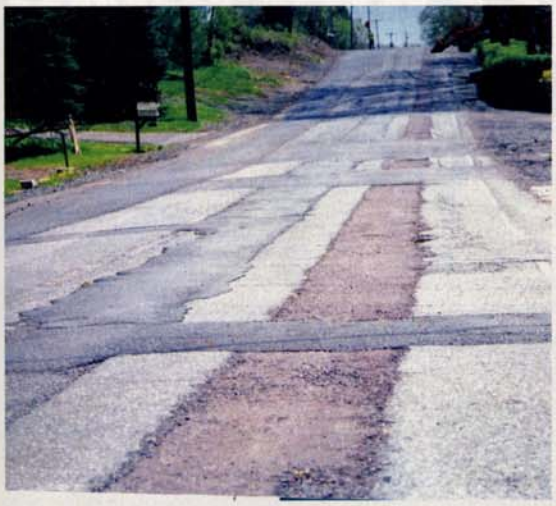
by Mike Polak

# Township Opts for Fast, Long-Lasting Reconstruction

Growing traffic volumes, aging pavement, and a patchwork quilt of utility patches made Farmington Avenue a perfect candidate for cold-in-place recycling.

Farmington Avenue is an important township road that slices through Pennsylvania's Upper Pottsgrove Township about 40 miles northwest of downtown Philadelphia. It crosses a major commuter highway, State Route 100, and that proximity has encouraged the development of new homes along its path. With the development has come traffic loads in the 6,000- to 8,000-ADT range.



**At the start of the project, Farmington Avenue is a maze of utility patches, some in various stages of failure. The original asphalt pavement is cracked and oxidized in many places, and parts of the road lack cross slope.**

In 2006, township officials knew they had to do something about the road. In addition to aging pavement and increased traffic, it had become a patchwork quilt of utility cuts and patches. The permanent patches left from the installation of new gas and water lines were bad enough, but the road was also marred by temporary patches, put in place in cold weather as a sewer project ran into the cold months of late 2006.

Those temporary patches performed badly as the winter wore on. Some of the trench patches settled, causing parts of the roadway to sink as much as 10 inches in depth. The irregular surface meant stormwater did not drain properly to catch basins, and when snow and ice covered the pavement, it was very difficult for crews to plow and salt the road effectively. Along with traction problems, humps and depressions in the pavement caused smaller vehicles to bottom out.

Farmington Road could only be driven at a slow speed during the winter. It had become a treacherous but vital highway for area motorists.

Even before the road became so difficult to use, the Township and its engineering firm, LTL Consulting Engineers of Oley, Pennsylvania, had planned to reconstruct the three largest trenches. They would remove up to 6 inches of material, then place 6 inches of 25mm Superpave asphalt in each trench. Other damage to the pavement caused by construction machinery in the utility projects would be repaired by the contractors responsible for it. Then the entire roadway would be overlaid with 1.5 inches of 9.5mm Superpave asphalt.

As they studied the plan, engineers and township officials became concerned about some of its shortcomings. While the end result would be a useable

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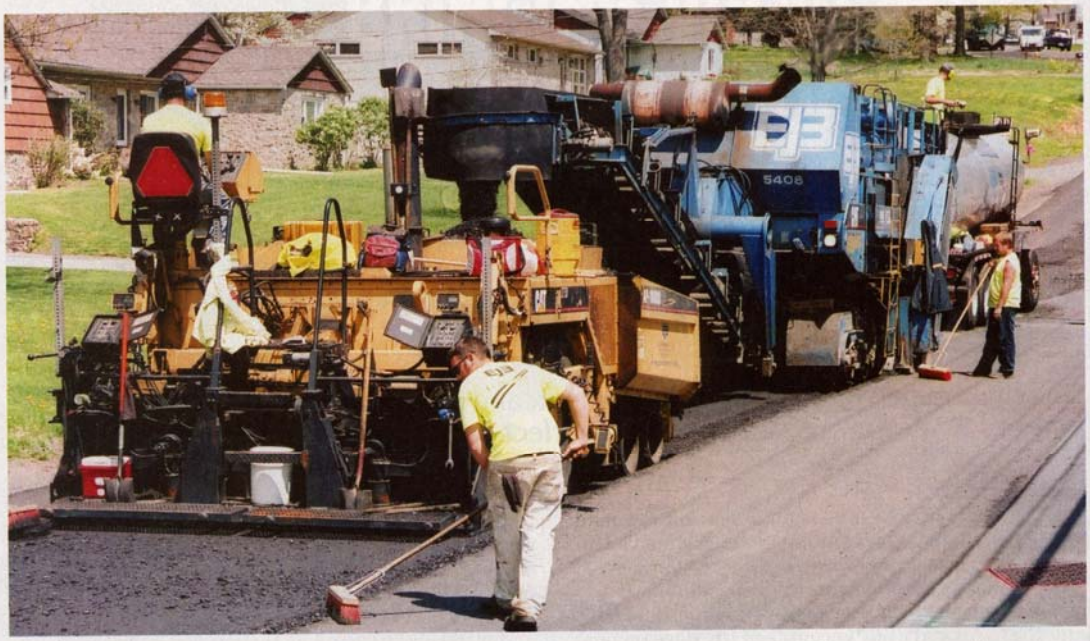

**E.J. Breneman's compact cold-in-place recycling train reconstructs Farmington Avenue. At the front of the train, a tanker feeds emulsified asphalt to Breneman's proprietary CIR machine, which mills and sizes the old asphalt and mixes it with the emulsion, then conveys the cold mix to a paver for placing.**

driving surface, the trench repairs would be labor-intensive and expensive. In addition, only about 30% of the aging roadway would be reconstructed — just the parts requiring patch restorations.

After exploring other alternatives, the planners decided to reconstruct the entire road using cold-in-place recycling technology.

## Cold recycling

In this reconstruction technique, a recycling train moves along the surface, milling the old pavement to a prescribed depth, crushing and screening the milled asphalt to a prescribed specification, adding a rejuvenating agent, and placing and compacting the recycled cold mix — all in a single pass.

The cold-recycled pavement is opened to traffic while it cures, then topped with a friction course of hot-mix asphalt or a chip seal.

In opting for CIR, LTL Consulting Engineers and the Township officials saw a chance to save money and build a longer-lasting road.

To re-hab just the patches, spot repair damaged base, and place a 1.5-inch Superpave wearing course would have cost $326,000. In addition, the life expectancy of the overlay was likely to be compromised by the fact that a lot of the underlying pavement was damaged and oxidized. Bottom-up cracking in a few years was likely.

In contrast, the cost of cold-recycling the entire road to a depth of 5 inches was nearly 50% cheaper. The E.J. Breneman bid included spot repairs of soft and yielding patches (poorly compacted patches would have led to premature failure of the reconstructed pavement), and the same 1.5-inch Superpave overlay in the original plan — all at a cost of just $219,000. Along with saving more than $100,000, the new road would be stronger, the life-expectancy of the overlay would be years longer, and the entire process would be faster and less intrusive than the repatching-and-overlay approach.

## Project notes

Farmington Avenue presented several challenges to the rehabilitation crews. It is a hilly, undulating road and the width of the roadway varies from 40-feet wide in some places to just 22-feet wide in others. The road's severe drainage problems were due, in part, to inadequate cross slope, and the road needed to be widened at the entrance to a new development.

Crews had to work around 35 utilities, manholes, gas valves, and catch basins.

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**A steel-drum roller compacts the cold-recycled asphalt around a manhole cover. Crews use compact equipment to mill around such structures before the recycling train makes its pass.**

To restore the road's cross slope, project specifications called for 0.25-inch per foot or 2% cross slope for the majority of the project, transitioning to a 3% cross slope on steep hills where the extra slope was needed to keep stormwater in the roadside swales and drainage areas. Breneman crews accomplished this variable change in the road profile using both the down-cutting milling machine at the front of the CIR train and the screed that placed the cold mix at the end of the train.

To deal with the utilities in the roadway, crews first marked each one in a painted rectangle, and then used a utility mill with a 24-inch cutting head to clean out all the material around the utility and within the painted rectangle to a 5-inch depth. They cleaned up the fines using a skid-steer loader or small grader.

When the CIR train reaches the utility, its large mill *walks over* the utility. The paving part of the train then places the newly recycled cold mix in and around the steel monument, and the material is compacted along with the rest of the recycled pavement.


**Breneman's CIR crew uses a compact mill or a milling attachment on a skid-steer loader to clean out rectangular areas around utility structures like this manhole. There were 32 such structures on the Farmington Road project.**

The CIR train moved at about 25 feet per minute except when dealing with utilities. Its down-cutting mill head produced right-sized material, which was blended with CSS-1 h emulsified asphalt, which acts as a binder for the new base.

Compaction was performed by a vibratory tandem-steel-wheel roller and a 25 to 30-ton pneumatic roller.

Since the entire project was done with one lane always open, there was little disruption to traffic and no need for detour. In addition, vehicles had continuous access to residential and commercial driveways, so there was no interruption to commercial or commuter vehicles.

The entire CIR rehabilitation project was completed within a few days and opened to traffic. The CIR pavement supported Farmington Avenue traffic for three weeks, at which time the final Superpave lift was applied. The entire road now has 6.5 inches of asphalt. The project not only saved the Township more than $100,000, it also contributed to clean air and fuel conservation initiatives since the milled asphalt never had to be transported and stored, the recycled cold mix did not require any new aggregate, and only required a small amount of asphalt cement for a binder. And, thanks to the strength of the cold-in-place recycled base, only a thin layer of new asphalt pavement was needed to create an excellent road. **BR**

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