Preserving Georgia Pavements with Micromilling

DAVID M. JARED AND SHEILA HINES

Jared is Chief, Research and Development Branch, and Hines is State Bituminous Construction Engineer, Georgia Department of Transportation, Forest Park.

The Georgia Department of Transportation (DOT) has used open-graded friction course (OGFC) to maintain asphalt pavements on Interstate highways since the 1990s. This pervious friction course (PFC) is placed on the pavement surface to improve tire friction and surface drainage and to extend pavement life. In 2001, Georgia DOT introduced a different type of OGFC, known as porous European mix (PEM), now in use on most Interstate pavements.

Problem

Georgia's experience shows that PFCs provide good pavement performance for 10 to 12 years. When a PFC approaches the end of its service life, the underlying layer of dense-graded hot-mix asphalt or stone matrix asphalt (SMA) generally is still in good condition and could last for several more years.

Georgia DOT's rehabilitation practice is to mill and replace the PFC layer and the mixture beneath. This helps avoid (*a*) the poor bonding between PFC and milled surfaces and (*b*) the entrapment of water that penetrates through the PFC in the valleys created by milling. This procedure, however, is expensive; a cost-effective pavement maintenance procedure was needed, particularly as resources for pavement construction and maintenance diminish.

Solution

Georgia DOT initiated a research project to investigate micromilling for the removal of deteriorated OGFC. A team from the Georgia Institute of Technology and Auburn University conducted the research. The goal was to validate the stringent requirements that Georgia DOT had established for the surface texture and smoothness of the milled surface.

The requirements addressed the variations in surface texture and smoothness caused by the milling equipment. For surface texture, the requirements stipulated that the ridge and valley measurement of the mat surface should differ by no more than 1/16 in. (1.6 mm). The requirements also delineated the acceptance criteria and the contractor's liability if the criteria are not met. Georgia DOT specified a target smoothness index of 825 mm/km, not to exceed a correction index of 900 mm/km.

Micromilling operation.

I-75 Project

In 2007, the researchers investigated the micromilling of a deteriorated OGFC overlaid with PEM on I-75 near Macon; this was one of the first applications of PFC directly on top of a micromilled surface in the United States. Because micromilling equipment has more teeth at closer spacing than conventional milling equipment, micromilling produces a more uniform, smoother, and finer surface texture, which meets Georgia DOT's smoothness requirements for surface texture.

The placement of PEM on top of the milled surface without the addition of a new underlying layer of dense-graded mixture or of SMA has yielded significant cost savings. The researchers also investigated other technologies for surface texture quality assurance.

The study confirmed that the surface texture requirements established for the project were achievable and cost-effective with variable-depth

Variable-depth micromilled surface.

micromilling to ensure the complete removal of the PEM layer. The study also determined that the laser road profiler (LRP)—routinely used by Georgia DOT for quality acceptance of pavement smoothness—could be retrofitted with software that estimates surface texture parameters. These estimates would be suitable for use in the acceptance of surface texture quality and in the evaluation of pavement sections.

I-95 Project

In 2009, the micromilling and OGFC inlay on an I-95 project near Savannah was used to investigate the following:

- The applicability of micromilling for pavements with underlying layers different from those of the I-75 project,
- The viability of the measurements of surface texture and smoothness from the software-retrofitted LRP, and
- The stringency of the Georgia DOT surface texture requirements.

The study determined the following:

- Large cost savings can be realized by micromilling instead of conventional milling,
- The software-retrofitted LRP was capable of measuring both the surface texture and the smoothness of micromilled surfaces and therefore could be used as a tool for quality acceptance and performance measurement, and
- Variable-depth micromilling was necessary to ensure reasonable compliance with surface texture requirements, without sacrificing the milled surface texture or smoothness.

Application

The I-75 project achieved Georgia DOT's surface texture and smoothness requirements with variable-depth micromilling. The I-95 project, however, did not achieve the requirements; scabbing of the OGFC occurred—thin, weakly bonded layers remained in place—because a single milling depth had been specified. Georgia DOT approved a change order permitting variable-depth micromilling on the project and achieved the surface texture requirements. Variable-depth micromilling subsequently was used on a project on I-285 in metropolitan Atlanta.

Micromilling is a promising pavement preservation option for PFCs that have sound underlying pavement structures—that is, projects that have no load-related failures or failures associated with the underlying materials. The I-75 project area experienced and still shows reflective cracking from the underlying portland cement concrete; nonetheless, there are no indications of premature raveling or load-related failures.

Benefits

The research produced several findings that would benefit Georgia DOT and other highway agencies, including the following:

- Micromilling in conjunction with thin asphalt overlays is an effective pavement preservation treatment.
- Variable-depth micromilling provides the required surface texture without sacrificing milled surface texture and smoothness.
- The LRP can measure both surface texture and smoothness on micromilled surfaces and can serve as a tool for quality acceptance and performance measurement.

In addition, Georgia DOT has accrued cost savings from this preservation treatment. Replacing conventional milling with micromilling on the two Interstate projects saved an estimated $11 million—nearly 50 times the expenditures for the research. After 4 to 7 years in service, both projects have shown good performance.

For more information, contact Sheila Hines, State Bituminous Construction Engineer, Office of Materials and Testing, Georgia DOT, 15 Kennedy Drive, Forest Park, GA 30297; 404-608-4700; shines@dot.ga.gov.

EDITOR'S NOTE: Appreciation is expressed to Amir Hanna and G. P. Jayaprakash, Transportation Research Board, for their efforts in developing this article.

Suggestions for Research Pays Off topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, Keck 488, 500 Fifth Street, NW, Washington, DC 20001 (202-334-2956; gjayaprakash@nas.edu).