

Quite a stretch of road

Kentucky prolongs life of concrete pavements

By Kristin Dispenza
Contributing Author

Pavement-management systems (PMS) place an emphasis on concrete pavement-preservation (CPP) efforts, aiding governing bodies in staving off the need for extensive—and expensive—reconstruction, while maintaining a high standard of quality within the road network.

Several techniques are part of the CPP toolbox: slab stabilization; full-depth repair; partial-depth repair; dowel bar retrofit; cross-stitching longitudinal cracks/joints; diamond grinding; and joint and crack resealing.

States began to implement PMS more than 30 years ago, and at present there are

identifiable methods of assessing a road network's needs and budgeting resources accordingly. However, these methods are not uniformly used or understood across the U.S. Kentucky serves as an example of one state that has continued to explore best practices management of CPP. The Kentucky Transportation Cabinet has made strides in determining data that can be used to trigger CPP, and its findings can serve as a model for other DOTs looking to accomplish a wider deployment of PMS.

The most common CPP technique used in Kentucky is diamond grinding. The state has been performing diamond grinding since the mid-1990s, but "at that time we were really just exploring our options—not a lot of diamond grinding was being done," said Jon Wilcoxson, director, Division of Maintenance, Kentucky Transportation Cabinet.



That changed in 2007, when the state increased its pavement-preservation activities in an effort to improve the roadway system. Between 2007 and 2012, 536 interstate lane-miles were diamond-ground statewide, primarily in the Louisville area. During this period, International Roughness Index (IRI) measurements for Kentucky's interstate concrete pavements improved from an average of 112.1 in./mile to an average of 74.5 in./mile—the longest sustained improvement in the state's IRI and its lowest recorded average IRI ever. The improvement was attributed to the 536 lane-miles of diamond grinding that had taken place. The combined cost of the diamond-grinding projects (including traffic control, patching, joint resealing, etc.) was \$101 million, or \$188,000 per lane mile. Reconstruction costs would have been an estimated \$1.5-\$2.5 million per lane

mile—meaning that CPP saved the state more than \$1 billion. The expected pavement life-extension for ground pavement is 10-15 years.

"We are getting this at the top of the curve," said Wilcoxson, "and delivering a much improved product for the driving public."

Of the state's approximately 62,000 lane-miles of roadway, about 1,800 are concrete; 820 of its 3,800 interstate lane-miles are concrete. Therefore, finding an effective way to prolong concrete pavement life while improving performance is vital. The past year has seen an increasing range of CPP techniques being used in the state: Significant partial-depth rehabilitation and slab replacement has occurred, with subsequent grinding. Joint resealing also is part of Kentucky's CPP toolbox, although dowel bar retrofit, another common CPP technique, has not been extensively performed in the state.

Which one to pick?

When assessing its road network for needed repairs, the main indicator employed in Kentucky is pavement smoothness. Inertial profilometers are used to annually measure roughness on the interstate system, and IRI values greater than 130 in./mile will generally trigger CPP.

"This number is not absolute—it is used more as a guideline," said Wilcoxson.

Undertaking CPP is contingent upon a situation in which there is moderate to low cracking and faulting. (Low faulting is defined as $\frac{1}{4}$ - $\frac{1}{2}$ in.; faulting greater than $\frac{1}{2}$ in. would generally necessitate full restoration rather than preservation.) Similarly, if $\frac{1}{3}$ or more of the slabs were in need of replacement, full restoration would typically occur. Pavements with IRI measurements lower than 130 could still trigger CPP if it appeared that cracking and faulting were about to become a major problem; conversely, if a road is expected to require major work (such as widening) within the upcoming 5-10 years, the cabinet will not recommend it for CPP.

Starting a group

Kentucky's pavement-preservation efforts are funded through the state's transportation budget, which is legislated every two years. For the year 2015 there is a \$5 million program in place that will cover all preventive maintenance to the entire roadway system. A \$5 million program also is approved for 2016. Each year, a portion of the \$5 million available will be allocated to interstate preventive maintenance, and this money must be used as strategically as possible in order to keep the overall road system in optimal condition.

Although the budget is only approved biennially, the Transportation Cabinet has developed a six-year highway plan. Project assessment is done on an annual basis for highways and on a two-year basis for other roadways. While the overall roadway system is overseen by a central office, there also are district offices, each with a section engineer who oversees maintenance and construction. Pavement-management engineers measure IRI using a van-mounted inertial profiler and also perform visual "windshield" surveys to spot cracking and faulting. Those data are used to make recommendations regarding preservation, resurfacing and reconstruction. The engineers then work with the districts on the prioritization and contracting of projects; they aim for a mix of preservation treatments across pavement types. Software is used to streamline planning, scheduling and recording.

The state is currently developing a process whereby the central office pavement-management staff will work with district personnel to evaluate and provide direction for the entire pavement-preservation program. This group will be responsible for reviewing and updating the project-selection process, ensuring proper training of inspection staff, writing specifications and evaluating potential new treatments. According to Wilcoxson, this more comprehensive process can improve alignment among participants. Kentucky is modeling its changes on similar systems in other parts of the

Midwest, particularly on practices shared at a meeting of the Midwestern Pavement Preservation Partnership (MPPP) by MnDOT, a leader in CPP. (The MPPP is an American Association of State Highway & Transportation Officials [AASHTO] regional forum dedicated to sharing information on pavement preservation.)

Further advancements taking place in Kentucky include the adoption of a laser crack management system (LCMS) for distress data collection and the development of automated predictive models for use in the PMS (part of a research program with the University of Louisville).

Preservation profiler

For new construction, there are two categories of ride quality addressed by the specifications. Category A is the most stringent and is intended for interstate surfaces. These specifications call for 100% contractor pay if an IRI of 60-80 is achieved. For an IRI below 60, there is a positive pay adjustment that can be used to offset any disincentives, but not as a direct incentive. Negative pay adjustment

or disincentives accrue for IRI measurements above 80. Those adjustments can be used to offset one another over the scope of a single paving job. Category B specifications are intended for urban or city streets, where manholes or other surface irregularities may affect IRI measurements.

Kentucky measures IRI on new pavements using a Mark IV profiler with a wide-footprint laser. "This works better than a single-point laser on concrete pavement with tining," said Wilcoxson.

For preservation projects, "we prefer to evaluate existing pavements using a profiler prior to advertising the contract," said Wilcoxson. Time permitting, crews will conduct profile measurements for all lanes within the project limits prior to repair work. ProVAL engineering software is then used to determine whether or not to pursue a single or double pass of diamond grinding. A target IRI is established for every 1/10 of a mile. After all grinding has been completed, another profile analysis is conducted, and measurements are compared to those taken at the outset of the project.

Makes sense

With so many effective repair methods available, it makes sense to develop a strategy to optimize their implementation, minimizing the overall scope of work that needs to be done and eliminating unnecessary costs. This is best accomplished by scheduling repairs based upon actual and projected road conditions, as determined by collected data, so as to catch problem areas early and address them before conditions worsen. Kentucky, having successfully balanced lessons learned from other states with the independent development of CPP solutions that fit its individual requirements, is clearly well on its way to realizing the benefits and savings resulting from the use of an effective pavement-management system. **R&B**

Dispenza is an AEC editorial specialist with Constructive Communication Inc.

For more information about this topic, check out the Concrete Channel at www.roadbridges.com.

INCREDIBLE ATTACHMENTS

TO HANDLE THE LIFTING REQUIREMENTS FOUND ON EVERY JOB SITE

KENCO

'America's Largest Attachment Provider'

www.kenco.com

Don't struggle with potentially dangerous, inefficient, make-shift rigging of chains, cables, or hooks. Kenco has the widest selection of lifting attachments in the industry.

"This is much faster and safer than our old method of using hooks."
Grays Supply Corp, Randolph, NJ



Made in USA

- shown:
- Multilift for picking up concrete slabs
 - Slab Crab® removes bridge decks cleanly
 - Barrier Lift for handling jersey wall
 - Pipe Lift™ is the easiest way to move pipe
 - Pipe Hook works on any shape of pipe



Call Today: **1-800-653-6069** or email us at: sales@kenco.com

Write in 768



Between 2007 and 2012, following the diamond grinding of 536 lane-miles statewide, Kentucky's overall IRI dropped from an average of 112.1 in./mile to 74.5 in./mile, its lowest IRI average ever.







connected excellence
in all we do



amec
foster
wheeler

Delivering on our promises

Amec Foster Wheeler offers an integrated team of seasoned professionals with in-depth knowledge of the roadway, bridge, rail, port and airport markets. From strong local market positions with access to a wide network of specialized expertise, we deliver solutions that reflect an understanding of the bigger picture of your vision and mission.

-  twitter.com/amec_fw
-  linkedin.com/company/amecfw
-  youtube.com/user/amecfw
-  facebook.com/amecfw