



U.S. Department  
of Transportation

Federal Highway  
Administration

# Spotlight on Pavement Uniformity: Minnesota Department of Transportation

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## Using the Paver-Mounted Thermal Profiler (PMTTP) For Asphalt Uniformity

FHWA-HIF-22-060

For more information on PMTPs and related technology, contact Stephen Cooper, Pavements & Materials Engineer, FHWA Resource Center, [stephen.j.cooper@dot.gov](mailto:stephen.j.cooper@dot.gov)

This equipment and more are available for loan by the MATC. <https://www.fhwa.dot.gov/pavement/asphalt/matc/equipment-loan-program.cfm>

The PMTP series shares information on pavement testing programs. To access the full series, visit <https://www.fhwa.dot.gov/pavement/asphalt/matc/technical-documents.cfm>

### Background

The Minnesota Department of Transportation (MnDOT) fully implemented Paver-Mounted Thermal Profilers (PMTTPs) into its quality assurance procedures in 2018, after finding the tool practical to use and effective in catching asphalt nonuniformity. The agency began piloting PMTPs in 2010 and phased in the tool over a four-year period between 2014 and 2018.

PMTTPs use temperature sensors to continuously read surface temperatures of the newly placed asphalt mat immediately behind the trailing edge of the paver screed during placement operations. These readings can indicate temperature differentials, usually referred to as thermal segregation. Data are converted to visual representations of the surface temperatures along a paver's path, often in the form of maps or charts.

MnDOT saw advantages in the tool's data for showing areas or patterns of nonuniformity while projects were in progress and that data allowed real-time adjustments to improve temperature uniformity as the paving continued.

The thermal data also have encouraged better construction practices in the local paving industry. "We know that paving asphalt uniformly will improve the life of our roads," says Rebecca Embacher, MnDOT Advanced Materials and Technology Engineer. "Being able to look at the [thermal] information is extremely helpful for identifying issues and mitigating them."

### Observations from PMTP Use

MnDOT documented thermal data collected from more than 450 projects from 2010 to 2021. Since 2016, the agency issued "report cards" after the paving season that showed project thermal segregation "scores." Paving managers could see these scores and know what was attainable, Embacher says.

MnDOT describes these benefits from collecting PMTP data and sharing findings with agency construction staff and paving operators:

- More information on the new asphalt mat.
- Real-time feedback on ongoing projects.
- Ability to troubleshoot workmanship, materials, or equipment that may have contributed to thermal segregation on past projects.
- More attention to optimizing paver speeds and timing of the fleet operations to avoid paver stops, where segregation frequently occurs. Paving managers monitor the flow rates of the trucks, how many are in transit, and how many arrive at the project site.
- Better construction practices in general. "Things that you know about, but sometimes forget to take care of—or take the time to take care of," Embacher says. "Making sure that hopper doesn't run dry, making sure that you're not folding the paver wings between loads. In thermal profiling, we're able to see this."

### Example Projects

MnDOT found the PMTP beneficial, for instance, in a case when the crew continued in rainy conditions rather than electing to suspend paving, resulting in nonuniform sections in the compaction. Thermal data from the PMTP helped MnDOT verify the segregation and exact areas where material should be removed and replaced based on requirements in the contract.

Another time, a loading operator inadvertently switched from providing dry aggregate to more saturated material drawn from a different location of the stockpile at the plant. Thermal data enabled MnDOT and the paving managers to help detect and pinpoint the change in aggregate moisture.

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Above: A PMTP in use on a paver in Minnesota. Photo: MnDOT.  
Below: Sample of a thermal map. Image provided by FHWA.

