Final Report

Materials Management Section Project
Project 0092-22-52
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Superpave Gyratory Compactor Rapid Angle Measurement (RAM) Kit

Research Objectives

- Improve precision of gyratory compaction test machine calibration.
- Improve correlation between laboratory compaction testing of hot mix asphalt (HMA) and field results.
- Decrease interlaboratory variability.

Research Benefits

- The outcome of this research enables the department to

  decrease the possibility of no comparison issues between the department and contractors.

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Background

Gyratory compactors used by WisDOT construction materials laboratories must be capable of kneading asphalt mixtures at an internal angle of 1.16 degrees to reduce interlaboratory variability and accurately predict the field performance of the mixtures. The interlaboratory variabilities caused by the malfunction of gyratory compactors can result in non-comparison issues between the department and contractor laboratories which initiates a dispute resolution process.

To ensure high compaction quality and accuracy, lab technicians must measure/calibrate the internal angle on a regular basis. When the angle of gyration of Superpave gyratory compactors is calibrated using high precisions devices such as RAM, there would be less likelihood of having non-comparison issues that are related to the malfunction of the compactors.

Methodology

With the research funding, WisDOT's central laboratory was equipped with two rapid angle measurement (RAM) devices. Figure 1 shows one of the devices. One of these RAMs was used for the measurement of internal angles for the gyratory compactors at the central lab. The other RAM will be loaned to WisDOT regional office labs. This way, WisDOT labs across the state can verify the internal angle of their gyratory compactors more frequently.

Figure 1. The RAM device used by Bureau of Technical Services' (BTS's) Central Laboratory.

"Procurement of the new RAMs helped improve the precision of WisDOT testing."
–Ali Arabzadeh, WisDOT

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It is widely accepted within the research community that RAMs are accurate devices for the calibration of gyratory compactors. Tran et al. (2006) were among the researchers who conducted a comprehensive investigation and proved the efficacy of RAMs. Such high level of accuracy decreases the interlaboratory variability and results in simulating compaction levels that occur in the field using steel drum and pneumatic rollers.

Results

With the use of the RAMs, WisDOT could ensure the accuracy of the gyratory compactors and perform the calibrations in a timely manner. The result obtained from the RAM is a measured angle that should be within an acceptable range. The number on RAM liquid-crystal display (LCD) (see Figure 1) is the angle measured by this device.

Recommendations for implementation

To maintain the accuracy of the gyratory compactors, monthly RAM measurements are recommended.

References

Tran, N., K. Hall, and T. Easley. "Evaluation of the Rapid Angle Measurement (RAM) device for calibration of the superpave gyratory compactor internal angle." In 10TH INTERNATIONAL CONFERENCE ON ASPHALT PAVEMENTS-AUGUST 12 TO 17, 2006, QUEBEC CITY, CANADA. 2006.