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14. Supplementary Notes

15. Abstract


**Purpose and Need**

State Departments of Transportation began to implement or are considering to adopt warm mix asphalt (WMA) for various reasons. One common benefit anticipated from the use of WMA is reduced risk associated with cool weather paving and compaction of stiff asphalt mixes. This potential benefit means, among others, an extended paving season for North Dakota, as indicated in the recent questionnaire survey given to the asphalt paving contractors working in the state (Gullickson 2011).

From the literature review, it is observed that the previous research efforts were focused on laboratory evaluation of particular performance characteristics of WMA. Although there were field testing and observations of WMA indicating that specified density was achieved with less compactive efforts, field temperatures of WMA and their relation to the resulting density have not been investigated sufficiently. To make an informed decision on implementing the use of relatively new WMA into highway paving practice, a better understanding is needed of the material's field temperature-density relation.

**Objective**

The objective of the research reported here was to make field observations of WMA temperatures and HMA temperatures during paving operations and make a comparison of their temperatures in relation to compacted density. To achieve this objective, thermal images of WMA and HMA during paving were acquired using an infrared camera, from three asphalt pavement construction projects in North Dakota, over a nine-month period from September 2011 to May 2012. These paving projects were among the five WMA pilot projects that NDDOT planned for the 2011 paving season, and due to the investigators' equipment problems, temperature recording was performed only on the three projects

**Summary**

Field temperatures of three different types of WMA additives or processes were compared to HMA temperatures: Advera, Evotherm, and foamed asphalt. Based on the observations from ND 3 and ND 15 paving that pointed to the consistent directions, it can be concluded that WMA was laid down at lower temperatures by 25 to 30 °F than HMA and that WMA temperatures were less variable for a given day of paving. WMA appeared to cool more slowly than HMA, but the amount of WMA temperature drop varied depending on the paving cycle time.

The findings from this investigation provide support for reduced rate of cooling of WMA temperatures. Future research is suggested to examine the potential of WMA for extending paving seasons. Specific efforts in support of the research objective may be focused on assessing through computer simulation WMA's relative advantages of lowering the risks associated with cool weather paving.


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