FACT SHEET

Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology

RESEARCH PROJECT TITLE

Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology

STUDY TIMELINE

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MORE INFORMATION

To view the full final report on the NETC website, click here.

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The NETC is hosted by the University of Vermont Transportation Research Center

Introduction: What was the Problem?

A major concern with the use of Warm Mix Asphalt (WMA) technologies has been their impact on the moisture susceptibility of asphalt paving mixtures. This is due to the lower production temperatures associated with mixtures incorporating these technologies which could lead to inadequate drying of aggregates. The moisture susceptibility concern may be compounded if high amounts of Reclaimed Asphalt Pavement (RAP) are added to the mixture. RAP is mixed with the heated aggregates in an attempt to avoid further stiffening of the binder present in the RAP. Therefore, if the aggregates in a mixture are heated at lower temperatures than the conventional temperatures due to WMA, the RAP will be exposed to less heat which might lead to residual moisture in the RAP being present in the mixture. Residual moisture may lead to adhesive and/or cohesive failures. The purpose of this study was to better understand the influence of moisture on the performance of plant produced high RAP content mixtures incorporating WMA technologies fabricated at reduced mixing temperatures.

Methodology: What was done?

Nine 12.5-mm Superpave mixtures were produced in two drum plants using three WMA technologies and three RAP contents. The three WMA technologies were wax-based SonneWarmix™, chemical-based Evotherm®, and the Stansteel ACCU-SHEAR™ foaming process. The ,moisture content of the mixtures were examined. All mixtures were evaluated in terms of moisture susceptibility and resistance to low temperature cracking.

Conclusion: What are the next steps?

A major concern with using a WMA technology and RAP is the potential for residual moisture from the RAP to be present in the mixture after production due to the reduced production temperatures associated with WMA and also any residual moisture if a WMA foaming process is used. The residual moisture contents of the mixtures in this study after plant production were negligible, which means that moisture had no effect on mixture performance. The results indicate that moisture can be dried out of these types of mixtures by a drum plant. The moisture contents of the RAP stockpiles ranged from 1.6 to 4.1%. Field trials or full-scale pavement accelerated tests with rigorous pavement monitoring are needed to confirm the findings of this study.

What are potential impacts?

The results may allow DOTs to permit the production of high RAP content WMA mixtures. However, a requirement to check the moisture content of such mixtures may be required.