RESEARCH
PROJECT CAPSULE [12-4PF]
October 2012
TECHNOLOGY TRANSFER PROGRAM

Synthesis of Research Results: Regional Implementation of Warm Mix Asphalt

JUST THE FACTS:

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POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used
Implementation Potential

PROBLEM

Warm mix asphalt (WMA) is the generic name for any of the several technologies currently used to reduce the mixing and placement temperatures of hot mix asphalt by 50° -100°F. The number of states piloting and evaluating WMA projects grows each year and WMA technology is becoming more prevalent in routine roadway construction across the country. Research has shown that the addition of additives to increase workability may also increase in-place density. Increases in density have been shown to improve pavement performance. Additionally, lowering the mixing temperatures should cause the binder to undergo less oxidative hardening, which should produce a more durable pavement and could possibly extend the life of the pavement. However, the reduction of stiffness in the material, although good for fatigue life, could increase the material's susceptibility to rutting.

There are three groups of technologies currently being used to achieve these lower temperatures: chemical additive, organic additive (wax), and water additive (foamed). These technologies are different, yet all function on the same basic concept. Each decreases the viscosity of the liquid binder, thus allowing the binder to more easily coat the aggregate at cooler temperatures. One concern this synthesis will address is the disparity of chosen technologies. Foamed warm mix is the overwhelming choice of warm mix producers, despite having performance results similar to those of warm mix produced with chemical or organic additives. While the three technologies are very similar in how they function, there are significant differences in their financial impact. Foamed warm mix requires an investment upfront to modify the asphalt plant so that it can produce foamed asphalt. Once the plant is modified, the only costs incurred by the contractor are for water (which is negligible) and equipment maintenance. In contrast, the organic and chemical additives require little-to-no equipment modification; some asphalt binder terminals can provide the binder with the additive already incorporated into the binder. However, with these additives there is a "per ton" cost associated with producing warm mix. For each ton of WMA produced, the material costs will be $1 to $2 higher due to the wax or chemical additive.

It is possible that some contractors are choosing which warm mix technology to use without being fully aware of the information available. For some technologies, once the initial decision has been made and a technology has been chosen, the sunk cost makes switching to a different technology cost-prohibitive. By presenting unbiased information about each type of warm mix technology, this synthesis will serve as a tool to help the user reach the most informed decision possible.

Another concern within the industry is establishing acceptance criteria for warm mix asphalt using the tests that have been established for hot mix. Laboratory tests

have consistently indicated an increased potential for rutting, which is particularly evident in Hamburg Wheel Tracking and Flow Number testing. However, there has been a noted discrepancy between laboratory and field performance. Tests have indicated an increased susceptibility to rutting and stripping, yet these have not been an issue in field trials. Binder and mixture testing seems to indicate a significant stiffening of the mixture in the field.

OBJECTIVE

The objective of this research is to inform research agencies of the work that is ongoing, as well as the work that has already been done. In doing so, this study will enable researchers to more effectively spend research dollars on areas of WMA research that have been underfunded and to provide a document that can be used to educate and inform contractors from an unbiased perspective of the costs and benefits associated with the different types of warm mix asphalt. This document will assist in educating the industry, further enabling contractors to make fully informed decisions based on the full body of knowledge, and to assist government agencies in establishing acceptance criteria for warm mix asphalt, thus allowing it as a suitable replacement for hot mix asphalt. Some states already have warm mix specifications in place, and by quantifying the effectiveness of these specifications, this document will provide valuable assistance to government agencies.

METHODOLOGY

Given the size and scope of this study, each objective should be achieved all in one phase of research. The tasks to be completed within this phase are:

Task 1: To perform an exhaustive literature review collecting research scopes, methodologies, results, and publications from existing research contained within the Southeast Transportation Consortium (STC) project database, NCHRP, TRB's Transportation Research Information Services Database, and libraries of additional research agencies.

Task 2: To collect information from research that is ongoing.

Task 3: To construct and administer surveys to deliver to each state's Department of Transportation.

Task 4: To evaluate the results from Tasks 1-3.

Task 5: To synthesize all of the data into a final report.

IMPLEMENTATION POTENTIAL

The results of this project will be applicable to researchers, agencies, and contractors alike. The proposed synthesis will offer a centralized location of warm mix asphalt results to be summarized and synthesized, therefore reducing confusion across the industry. The results would provide an unbiased, straightforward description of the technology, as well as resources that will enable the reader to make informed decisions regarding warm mix and its application. Be it a contractor that has yet to produce his first ton of warm mix, or a government employee trying to revise his state's warm mix specification, this synthesis will be a tool that can be used to shed an unbiased light on the decisions at hand.