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Regional Implementation of Warm Mix Asphalt

INTRODUCTION

Asphalt is used in over 94 percent of all paved roadways in the United States. The ability to reduce its cost and emissions while improving its performance has benefits that could potentially change the direction the asphalt industry moves in the future. Warm-mix asphalt (WMA) technology is becoming more prevalent in routine roadway construction across the country. It provides many benefits over conventional hot-mix asphalt (HMA). Some of these benefits are a decrease in mixing and placement temperatures, a decrease in fuel consumption, reduced emissions, a safer work environment, and higher densities with lower compactive effort.

There are three groups of technologies currently being used to achieve these lower temperatures: chemical additive, organic additive (wax), and water additive (foamed). Each of these technologies is different, yet they all function on the same basic concept. They each decrease the viscosity of the liquid binder, thus allowing the binder to more easily coat the aggregate at a cooler temperature. This decrease in temperature results in lower energy costs for the producer, as well as a decrease in emissions that are harmful to workers and the environment. The decrease in binder viscosity can also lead to achieving greater in-place densities with less compactive effort.

In the last decade, WMA has increasingly been used across the country. Many states have developed special provisions or have modified their standard specifications to accommodate the use of WMA. As stated above, a number of different WMA technologies are being used by the various state agencies.

OBJECTIVE

The objectives of this study were:

- 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.
- 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.
- 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.

LTRC Report 534

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SCOPE

The scope of this research included:

- A literature search and review was conducted on available articles and papers using library and Internet sources. Information was collected on the use, properties, methods of construction, advantages and disadvantages, construction problems, long-term performance, cost, and other variables of WMA.
- A 25-question survey was sent to materials personnel in 12 southeastern states: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Caroline, South Carolina, Tennessee, Virginia, and West Virginia.
- Information on specification changes or special provisions that were made or written to accommodate WMA in each southeastern state was obtained by extensive Internet searches.
- As in the previous section, much of the information on the approval process or procedure used in each state to approve WMA was available on the Internet. However, a considerable amount of information was obtained by personal conversations with materials personnel in a number of southeastern states.

SUMMARY & CONCLUSIONS

Currently all states in the southeast region of the United States utilize WMA technology to some extent. To facilitate the use of WMA, each state has modified their standard specifications or has written special provisions to accommodate this technology. The majority of these specification changes have primarily focused on lowering permissible temperatures for mixing and laying WMA. In general, all other laboratory tests necessary for approval and acceptance of HMA are the same for WMA.

The approval process for the acceptance of WMA technologies has varied across the region; some have written policies specifically for WMA, while others use established new product committees to approve WMA. Others have used more informal (and possibly unwritten) procedures for WMA approval. All three major types of WMA technologies chemical additive, organic additive [waxes], and water additive [foamed]) are being used in the region, with water foaming being the predominate technology currently being used.

Based on the information reviewed during this study, there appears to have been minimal problems with WMA during construction and thus far the performance of WMA pavements has been comparable to those constructed with HMA. Continued long-term performance monitoring is necessary.

Most states indicated they had not experienced any significant cost difference between WMA and HMA. In addition, it also appears that the presence of WMA has not increased competition among bidders.

The use of WMA technology as a replacement for conventional HMA paving appears to be a viable alternative and it seems that its use will continue to increase.

WMA Technology	Process
Double Barrel Green	Foaming
Evotherm	Chemical Additive
Low Energy Asphalt (LEA)	Foaming
Rediset WMX	Chemical Additive
Sasobit	Organic Additive
Synthetic Zeolite	Foaming
WAM-Foam	Foaming