RESEARCH
PROJECT CAPSULE [23-1B]
June 2023
TECHNOLOGY TRANSFER PROGRAM

Effect of Fillers on the Moisture Resistance and Performance of HMA

JUST THE FACTS:

Start Date:
May 1, 2022

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24 months

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TT-Fed/TT-Reg-6

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Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used / Implementation Potential

PROBLEM

Asphalt mixtures consist of two main components: asphalt binder and aggregate structure. As part of the aggregate structure, a mineral filler is defined as the fraction of the aggregate blend with particle size in the range of 0 to 200 um. A mineral filler is used to fulfill a number of functions in the mixture; first, it is used to fill the voids in the aggregate skeleton structure, which increases the density, stability, and toughness of the asphalt mixture. Second, it allows the formation of the asphalt mastic, which coats the coarser aggregate particles and incorporates the dust particles as part of a colloidal suspension in the asphalt mixture. Previous studies have shown that the filler properties significantly affect the performance of asphalt mixtures and asphalt mastic against major distresses including fatigue cracking and rutting.

Figure 1. Mineral fillers used in hot-mix asphalt (Source: Sarsam and Hlail, 2015)

OBJECTIVE

The main objectives of the proposed study are two-fold:

1. To evaluate the effects of various types of inert and active fillers on the moisture resistance and laboratory performance of asphalt mixtures.
2. To propose change to the specifications to optimize the use of mineral fillers in hot-mix asphalt (HMA).

METHODOLOGY

To achieve the objective of this study, the research team will conduct the following tasks:

1. Conduct a literature review of research studies on mineral fillers in asphalt mixtures
2. Select materials and develop test factorial
3. Evaluate the physical and chemical characteristics of fillers
4. Design and prepare asphalt mixes
5. Evaluate the effects of fillers on the moisture resistance and mixture performance
6. Prepare and submit a final report

IMPLEMENTATION POTENTIAL

This study will conduct a comprehensive laboratory evaluation of conventional and innovative mineral fillers including manufactured fillers obtained from industrial wastes and will identify the most promising fillers for enhanced mix durability and life-time extension. In addition, it will develop possible modifications to the current specifications for the acceptance of mineral fillers. It will also improve pavement performance by optimizing mix durability against major distresses including moisture damage. As part of Task 6, the research team will develop an implementation plan that presents a strategy to incorporate the results into the state-of-the-practice, pavement rehabilitation, and specifications of the Department. This research will influence DOTD, highway contractors, transportation and civil engineers, and Louisianans in general.