Florida Department of Transportation Research

Field Test Method to Determine Presence and Quality of Modifiers in Liquid Asphalt

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Current Situation

Approximately five million tons of asphalt mix are produced each year for the Florida Department of Transportation (FDOT), of which 60% is modified with styrene butadiene styrene (SBS) polymer and/or ground tire rubber (GTR). Asphalt binders are the most expensive part of an asphalt mix – *modified* asphalt binders even more so. It is important that FDOT be able to verify that the correct asphalt binder is being used during construction without causing delays. However, there is currently no accepted field test to identify and quantify the modifier content during road construction.

The durability of asphalt mixes for Florida roads is improved by the use of modifiers.

Research Objectives

In this project, University of South Florida researchers worked to identify and evaluate a practical field method to detect and quantify modifiers in binders and mixtures.

Project Activities

In the literature, the researchers found a variety of tests to detect or quantify modifier in asphalt binders. However, most were lab tests and not suitable for use in the field. In addition, a survey was conducted nationwide to examine current practice in this area. Based on these efforts, the researchers determined that Fourier transform infrared spectroscopy (FTIR) best met the objectives of simplicity of procedures, speed of analysis, and portability.

Three FTIR portable spectrometers were tested: TruDefender FTX (Thermo Fisher Scientific), ExoScan 4300 (Agilent Technologies), and Alpha FTIR (Bruker Corp.). To determine the accuracy and precision of portable devices, their results were compared with those from laboratory devices with tests using binder samples with known polymer contents. These results were also used to develop prediction models. Two modified binders from different sources with known SBS and GTR contents were tested. Each of the modifiers and coated and uncoated aggregates were also tested.

Using the prediction models, researchers tested samples of unknown content. Some samples were from FDOT field projects, and some were laboratory prepared.

The researchers concluded that a portable FTIR system could work in the field for the purposes of identifying an asphalt binder modifier, but work will need to be done to properly calibrate the system and validate and adjust the models created.

Project Benefits

Projects like this one provide quality assurance of contracted materials, an important safeguard for FDOT expenditures and of the quality and durability of Florida roadways.

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