

Evaluation of Lignin as an Antioxidant in Asphalt Binders and Bituminous Mixtures

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Introduction

The chemical process of oxidative age-hardening in asphalt pavements is one of the major distresses leading to hot mix asphalt (HMA) pavement failure as evidenced by fatigue and thermal (low temperature) cracking.

Research investigations at the Western Research Institute (WRI) prior to 2005 suggested the addition of lignin may reduce the oxidation rate of asphalt binder. Research efforts by Bishara, Robertson, and Mahoney (2006) at the Kansas Department of Transportation's Research Chemistry Laboratory in 2005 also suggested the addition of lignin to asphalt binder appeared to reduce the oxidation rate of the binder, and therefore, had the potential to be an antioxidant for HMA pavement.

*Gyratory Plug for
Bulk Density*



Project Description

The objective of this 2007 limited laboratory research project was to determine the potential of reducing the oxidation rate of HMA pavements by adding lignin to the asphalt binder used to produce the HMA mixture. The testing matrix for this study consisted of two binders, two basic aggregate mixtures, and one hardwood lignin at one concentration. Eight total mixtures with and without lignin were tested after long-term aging to determine if the lignin had any effects on the material properties. The test results from this project showed minimal differences between the lignin test specimens and the control specimens.

Project Results

Based on the results from this limited study, there is no clear evidence adding lignin to HMA mixtures reduces oxidation or the lignin acted as an antioxidant.

Project Information

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