

USE OF RHEOLOGY TO STUDY BINDER PERMANENT DEFORMATION

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ABSTRACT

Bituminous mixtures used in flexible pavements are complex materials consisting of a high volume fraction of graded aggregate, air voids and binder. This paper is part of a larger study to understand the permanent deformation behaviour of these mixtures. Such understating depends, partially, on the elucidation of the binder's behaviour in these mixtures. As the binder is a viscoelastic material, its performance must be characterised using test methods that take into account the rate, or time, of loading and temperature. Recently, rheology has been widely used to categorise and evaluate bituminous binders according to their performance-related properties.

In the present paper, a Dynamic Shear Rheometer (DSR) has been used to study the steady state permanent deformation of binders over a range of temperatures. A 100/150 pen bitumen was used. Also, two mastics were studied, at similar filler/binder ratios to those that exist in two asphalt mixtures. The oscillation technique was used in the DSR to arrive at steady state stress levels for different loading rates, where the material begins to deform plastically. The sets of data were then plotted on a strain rate versus steady state stress graph. The Modified Cross Model was used to describe the permanent deformation properties of these binders at different temperatures.

KEY WORDS: Binders, permanent deformation, rheology, modelling.