

A NEW APPROACH IN FATIGUE TESTING AND EVALUATION OF HOT MIX ASPHALT USING A DYNAMIC SHEAR RHEOMETER

Taher M. Ahmed and Hussain A. Khalid

School of Engineering, University of Liverpool, UK

ABSTRACT

This paper describes a successful trial using a dynamic shear rheometer (DSR) for fatigue testing of hot mix asphalt (HMA) under controlled strain and stress test modes. A new fatigue index, FI^R , has been derived from the stress–pseudostrain hysteresis loop to be used in evaluating fatigue performance. Results have shown that there is a plateau region in the relationship of FI^R and normalised shear modulus, which can be used to evaluate fatigue performance. FI^R values were in agreement in terms of the ranking order with the results from other reliable approaches, such as the traditional and energy ratio approaches. In this work, limestone and granite aggregates were used with two binder grades: 40/60 and 160/220 to prepare four mixtures with two different gradations: gap-graded hot rolled asphalt and continuously graded dense bitumen macadam. The study demonstrated the suitability of the DSR for fatigue testing of full HMA. Also, limestone mixes were better fatigue performance than granite.