

INVESTIGATION OF THE FATIGUE PROPERTIES OF ASPHALT MIXTURES REINFORCED WITH NATURAL FIBERS

H. Delgado *

PhD student, Ecole National des Travaux Publics de l'Etat (ENTPE), FR

L. Arnaud *

Professor, Ecole National des Travaux Publics de l'Etat (ENTPE), FR

* Université de Lyon, Lyon, France; ENTPE, Département Génie Civil et Bâtiment (CNRS, URA 1652), 3, rue Maurice Audin, Vaulx-en-Velin, F-69120. {Horacio.DELGADO, Laurent.ARNAUD}@entpe.fr

ABSTRACT

This study investigates the potential use of natural fibers (hemp fibers) as a modifier for asphalt paving materials. Four different lengths of fiber and three different proportioning were investigated to assess the influence on the fatigue behaviour.

The influence is determinate by means of complex modulus test, in tension-compression mode at various temperatures (-25°C to 35°C) and frequencies (0,03Hz to 10Hz). The fatigue characterization of fiber-reinforced asphalt mixtures is evaluated for different stress ratios (0,64MPa to 0,48MPa). A non destructive test based on ultrasound P-waves propagation device enables to follow up the mechanical evolution of the medium as function of time during the fatigue test.

Tests results reveal a reduction of the values of complex modulus and phase angle for fiber-modified asphalt mixtures in comparison with the control mixture. That reveals an improvement of the flexibility of the modified mixtures but also a stiffness reduction. The fatigue life (N_f) was improved for a fiber-modified asphalt mixture with fibers of 5cm length and percentage of 0,4%. The analysis of the ultrasonic measures shows a reduction of the dissipation of energy due to the incorporation of the natural fibers. Therefore it is concluded that the application of natural fibers

KEY WORDS: Asphalt mixture, natural fibers, complex modulus, fatigue life.