

Rheological and mechanical properties of hot mix asphalt incorporating polypropylene and polyethylene fibers

Rashida Ferdaus^{1,a}, Khairil Azman Masri^{2,b*}, Ramadhansyah Putra Jaya^{3,c}, Shoaib Md. Shahnewaz^{4,d}

¹ MSc., Faculty of Civil Engineering Technology, University Malaysia Pahang, 26300, Gambang, Kuantan, Pahang, Malaysia.

² PhD., Faculty of Civil Engineering Technology, University Malaysia Pahang, 26300, Gambang, Kuantan, Pahang, Malaysia.

³ PhD., Faculty of Civil Engineering Technology, University Malaysia Pahang, 26300, Gambang, Kuantan, Pahang, Malaysia.

⁴ MSc., Faculty of Civil Engineering Technology, University Malaysia Pahang, 26300, Gambang, Kuantan, Pahang, Malaysia.

^a rashida.umppmy@gmail.com, ^{b*}khairilazman@ump.edu.my, ^c ramadhansyah@ump.edu.my, ^d shahshoib2012@gmail.com

ABSTRACT

Polymer-modified binders in hot mix asphalt (HMA) mixtures have become more widely used in recent years. To prevent fatigue, rutting and various distresses, different types of polymer modifiers have been utilized. This study investigates modifying asphalt mixture in dense asphalt mixture with polypropylene (PP) and polyethylene (PE) fibers. The performance test includes softening point, penetration test as physical properties, and dynamic creep test for mechanical behavior of modified PP, PE, and unmodified asphalt. The dosage of PP and PE adopted for this study was 0.5% - 2.5% by weight of the asphalt binder. The results of the study are that the effect of polypropylene and polyethylene fibers on asphalt mixture behavior is sensibly good from considering rheological and mechanical properties. Furthermore, PE offers a better blend in comparison to PP was found in softening point and penetration tests. Consequently, a modifying content of 2% of PP and PE by weight of asphalt is suggested for the enhancement of asphalt mixtures, as determined by the dynamic modulus test at 40 C. A further consideration is highlighted that combining a polymer with hot mix asphalt maximized the service life of the pavement.

KEYWORDS

Polypropylene; Polyethylene; Hot Mix Asphalt; Dynamic Creep

ACKNOWLEDGMENT

The authors would like to express deep appreciation to the University Malaysia Pahang and the Ministry of Higher education for funding this research under grant vote no PGRS2003178 and PDU203206.