Comparative study on laboratory and field ageing of bitumen

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Abstract

Ageing behaviour of bitumen is evaluated in laboratory based on ASTM recommended test methods like Thin Film Oven Test (TFOT), Rotating Thin Film Oven Test (RTFOT) and Pressure Ageing Vessel (PAV) test. These test protocols focus on artificial ageing of bitumen by subjecting the bitumen films to oxidation at higher temperatures. The study attempts to access the efficacy of two different laboratory techniques, TFOT and RTFOT on evaluating short term ageing of bitumen occurring inside a hot mix asphalt plant. Observations suggest that even though the physical characteristics of bitumen after laboratory and field ageing are similar, the underlying reasons contributing to these are different for both ageing options. An increase in aromatic fractions and volatilisation is contributing to the physical property change in laboratory samples where as an increase in molecular size and increased interactions of bitumen chains is contributing to behaviour of field aged samples. PAV was not evaluated as part of the study due to non availability of equipment.

Keywords: Bitumen, Ageing, Thin film oven test (TFOT), Rotating thin film oven test (RTFOT), Fourier transform infrared spectroscopy (FTIR), Size exclusion chromatography (SEC), Atomic force chromatography (AFM).