The research of high performance properties of bitumen/sasobit blends

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Abstract

The purpose of this study is to evaluate the effect of sasobit as a modifier on the performance of bitumen at high temperatures. Mixes with different percentages of sasobit were prepared by mixing polymer with 60/70 penetration grade (PG58-22) base bitumen. The rheological properties of modified bitumen at high temperatures were measured using dynamic shear rheometer and the viscosity of the bitumen was evaluated using Brookfield Rotational viscometer .The results indicated that by increasing the Sasobit® content, the performance of modified bitumen has considerable improvement at high temperature, so that the upper limit of bitumen's performance grade has ascended from 58 to 70 for the Sasobit® modified bitumen containing 4% Sasobit®.

Keywords: FT-Paraffin, Sasobit®, Modified bitumen, Performance Grade, Viscosity

1. Introduction

Bitumen is a thermoplastic, viscoelastic liquid that behaves as a glass-like elastic solid at low temperatures and as a viscous fluid at high temperatures, pavements made of bitumen may show distress when exposed at high temperatures[1]. At elevated temperatures, pavement deformation (rutting) occurs and lead to channels in direction of travel. This is attributed to the viscous flow of bitumen in paving mixtures, which retains strains induced by traffic. Therefore pavement performance is strongly associated with the rheological properties of bitumen [2].

The best known form of bitumen improvement is by means of polymer modification, traditionally used to improve the temperature susceptibility of bitumen by increasing bitumen stiffness at high service temperature and reducing stiffness at low service temperatures. In addition, polymer modified bitumen generally prossess improved resistance to pavement deformation and low temperature cracking [3]. A large variety of polymers have been used to produce polymer modified bitumen, but only a few are satisfactory from both performance and cost points of view. Sasobit® is a long chain aliphatic hydrocarbon (chain lengths of 40–115 carbon atoms), which obtain from coal gasification using the Fischer – Tropsch process. At temperatures below the melting point, it forms a crystalline network structure in the binder that is reported to provide added stability [4]. Sasobit® a homogeneous solution with the based bitumen on stirring, and produces a marked reduction in the bitumen's viscosity After crystallization, Sasobit® forms a lattice structure in the bitumen, which is the basis of the structural stability of the bitumen containing Sasobit®. The recommended addition rate is 0.8% to 3% by mass of the bitumen**.**

Although in recent years, many researches have been done about FT- Paraffin in United States and Europe, but in Iran, there is not any special experimental study in this field. This research has focused on the effect of FT- Paraffin wax (Sasobit®) additives as a Commercial wax on the rheological properties of bitumen which is used in WMA. In this research, 5 types of modified bitumen were made by mixing based bitumen (60-70 penetration grade bitumen with PG58-22) and different contents of Sasobit® additive in amounts of