**ABSTRACT**

In order for an asphalt binder to be suitable for the conditions that it is going to be used for it should pass the various performance grading tests. The polymer modified binder in this study presented higher viscosity than unmodified binder, therefore an increase in the mixing and compaction temperature is needed to obtain the required viscosities for pumping and workability. Mixing and compacting temperatures of 180 and 165 °C, respectively, were found. After characterization of the binder a performance grade of PG70-40 was determined.

**BACKGROUND**

There has been an increase use of polymers to make modified asphalt binders to improve performance properties. The addition of polymers modify the viscoelasticity of the binder, affecting the temperature range thus improving performance. The increased viscosity from the polymers increases resistance to rutting under heavy loads, while increased elasticity improves the fatigue resistance from repeated cycles of heavy loads over the lifetime of the pavement. Since the addition of polymers affects the properties of the binder, testing ensures that the properties have enhanced.

**TEST METHODS**

<table>
<thead>
<tr>
<th>Experimental Plan</th>
<th>Sample</th>
<th>Density</th>
<th>RV</th>
<th>DSR Unaged</th>
<th>DSR RTFO-Aged</th>
<th>DSR PAV-Aged</th>
<th>BBR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gap 1mm</td>
<td>Gap 1mm</td>
<td>Gap 2mm</td>
<td>XX</td>
</tr>
<tr>
<td>PG58-40E</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

Viscometer (RV) – AASHTO T316 - Used to determine the viscosity of asphalt binder at high temperatures.

Dynamic Shear Rheometer (DSR) – AASHTO T315 - Used to measure binder stiffness and elasticity properties at intermediate to high temperatures.

Bending Beam Rheometer (BBR) – AASHTO T313 - Used to measure low temperature stiffness and failure properties.

Rolling Thin Film Oven (RTFO) and % Mass Loss – AASHTO T240 - Provides simulated short term aged binder for physical property testing and calculation of mass lost during RTFO aging.

Pressure Aging Vessel (PAV) – AASHTO R28-09 - Provides simulated long term aged binder for physical property testing.

**RESULTS & GRAPHICS/CHARTS**

The following charts and table summarize the results obtained after performing the different test methods for the characterization of the performance grade of a polymer modified binder laid out in the experimental plan.

**DISCUSSION**

The density of the polymer modified binder goes along with the density of an unmodified binder; 1.01~1.03. The average viscosity of the polymer modified binder is higher than the average viscosity at the same testing temperatures of an unmodified binder, as well as the mixing and compaction temperatures (180 and 165 °C, respectively). From the DSR results of the unaged and RTFO aged material, the high performance grade of the binder was found to be PG70. The average mass loss was 1.35%, somewhat higher than the maximum accepted criteria. The binder meets the required criteria for the PG grading of the PAV aged material from the standard, which is set at 19°C. The BBR results showed that the low temperature grading of the binder is PG-40. In summary, the performance grade of the binder under study is a PG70-40, further testing of the Multiple Stress Creep Recovery (MSCR) is needed to characterize this binder.

**ACKNOWLEDGEMENT**

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