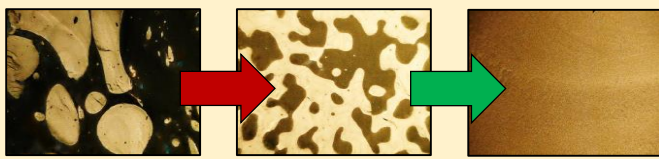


# Polymer Modified Asphalt

SBS polymer modified asphalt performance can be impacted by the compatibility between SBS and asphalt cement. The compatibility is influenced by:

- Asphalt cement chemistry
- SBS microstructure
- Cross-linking agents

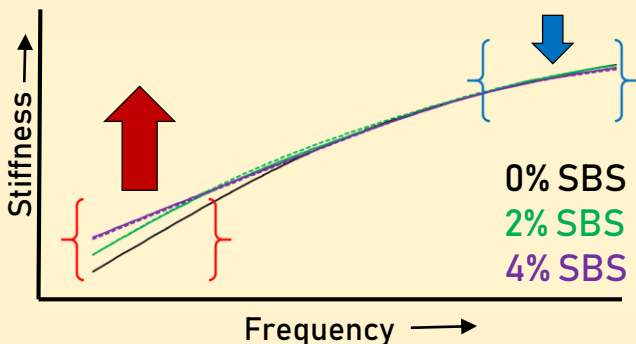
Good compatibility is required to ensure swelling of the SBS chains which maximizes the rutting and cracking performance by increasing stiffness and the elastomeric properties.



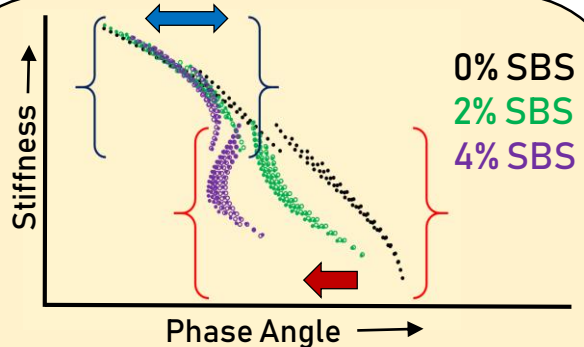
Increasing Compatibility

Compatibility is also influenced by concentration of SBS. Generally, an increase in concentration leads to improved performance. The blend transitions from an asphalt continuous phase to a polymer continuous phase.

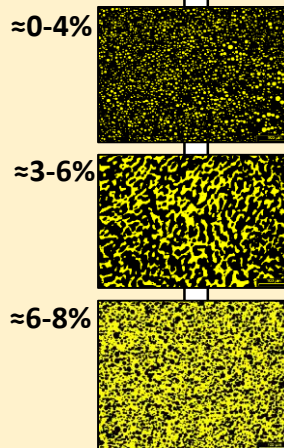
The increase in stiffness and elastomeric properties can be observed in the master curves and black space diagrams. Low frequency (high temperature) stiffness increases, while high frequency (low temperature) stiffness also tends to decrease. This can be described as a flattening of the curve.



**WARNING:** The addition of SBS to asphalt cement and oxidative aging have similar effects on the shape of the master curve despite drastically different effects on performance



The black space diagram plateaus in the low stiffness (high temperature) region while the effect of SBS on the intermediate temperature phase angle varies depending on the base asphalt used. Intermediate temperature phase angle tends to increase for stiffer asphalt but decrease for softer asphalts. The plateau region is indicative of a more elastomeric material and good compatibility.



Characterizing SBS modified asphalt using traditional PG testing can be difficult due to the increase in elastomeric properties. The Multiple Stress Creep Recovery (MSCR) test has been proven to be a very good way to evaluate the rutting properties and gives a good indication of polymer concentration, which can be used as an indicator for cracking performance.

Low strain testing that operates in the linear viscoelastic range (DENT, BBR, Cross-over temperature) is unable to properly characterize the increase in performance observed when using SBS modified asphalt. Unmodified asphalt exhibits a more brittle/ductile performance which is captured by these tests.

The use of large strain tests, such as the LAS or the ABCD, properly replicate the strains observed in pavements and as a result do a better job of characterizing the cracking performance of SBS modified asphalt. The tests are equally as capable of ranking unmodified asphalt as the low strain tests mentioned above. These tests represent a step forward in terms of general asphalt cement characterization.

For more information, please contact:

Mike Aurilio  
(289) 260-2934  
maurilio@yellowline.ca

**yellowline**  
asphalt products ltd.

Images- Planche, Elwardany, Adams, Rovani, Boysen, "Compatibility in Asphalt - A moving Target with Sources, Modifications and Aging", TRB Annual Meeting, January 13, 2020

