APPLICATION OF POLYMER MODIFIED ASPHALT IN HIGHWAY PAVEMENTS

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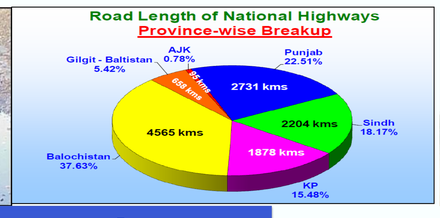
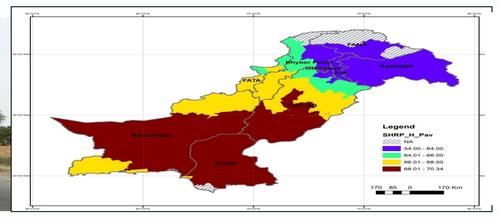
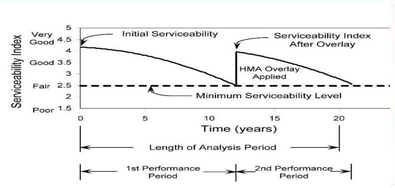






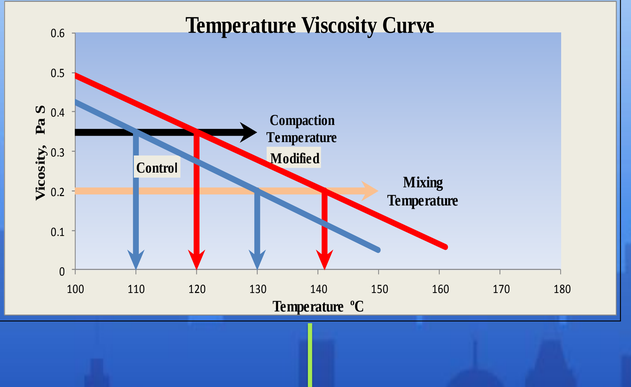
Summary of research

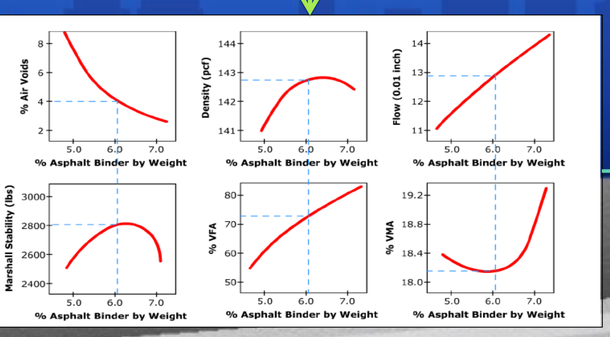
This study investigated the effect of polymer modified asphalt in flexible pavements. A SBS polymer is added in asphalts to increase the rutting resistance. The overall effect proved to be noteworthy as pavements serviceable life increases due to lesser rutting. This type of asphalt reduces the degree of saturation of mixes which will be beneficial. Also the temperature effect on modified asphalt mix performance was lesser compare to traditional asphalt mix. It was also found that load carrying tendency of modified asphalts was greater than that of control asphalts. Shear modulus values & stability retained values of modified asphalts were greater which is a good indication as pavements will have resistance against cracking.

Methodology

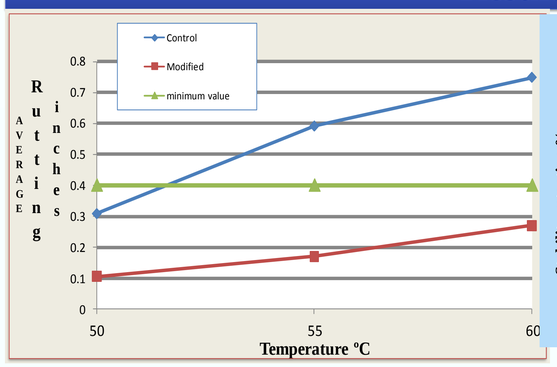
1. Samples were prepared by adding optimum binder content of both type of asphalts with aggregates.
2. Mixing & compaction temperatures were determined so that asphalt binds with aggregates properly.
3. Samples were compacted by gyrator compactor & placed in Wheel tracking device.
4. The samples were tested at 3 different temperatures i.e. 50, 55 & 60 C for rutting. Results were compiled & analysis was done by help of empirical formulas.

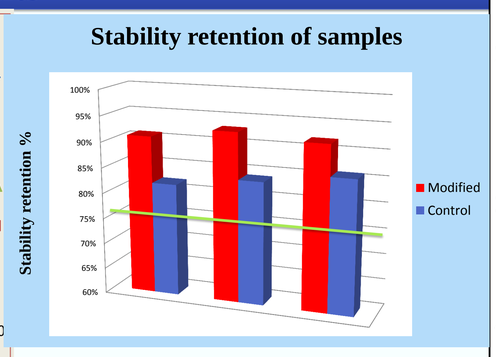
Experimental setup

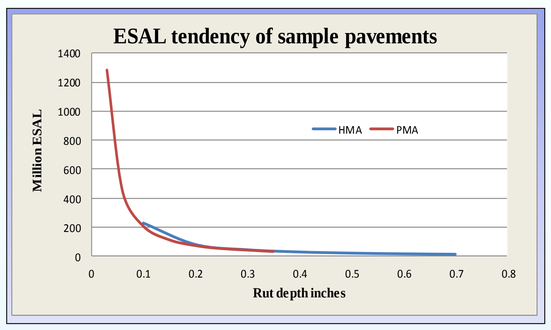


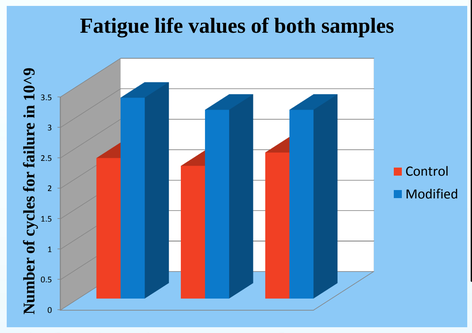


Results



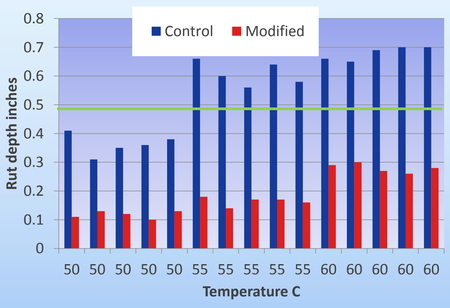


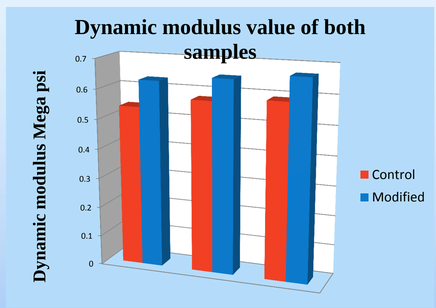


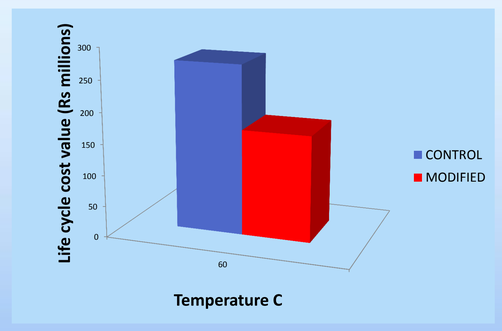


$$\log RR = -1.173 + 0.717 \log w_0 - 0.658 \log(N_{18}) + 0.666 \log \sigma$$

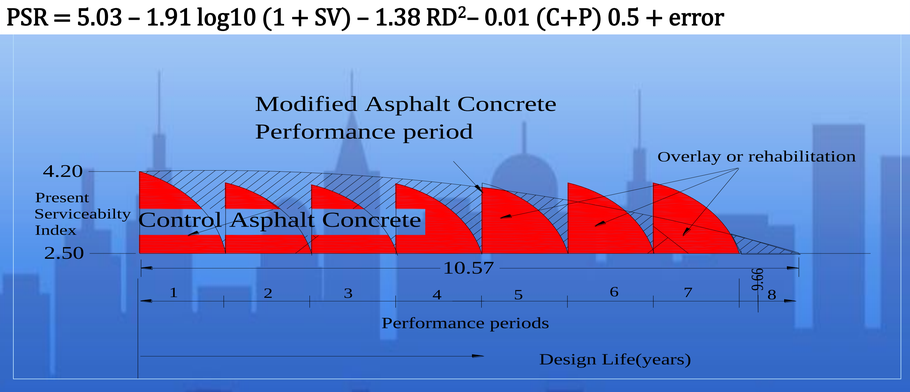
$$\log|E|^* = \delta + \alpha/(1 + e^{\beta})$$



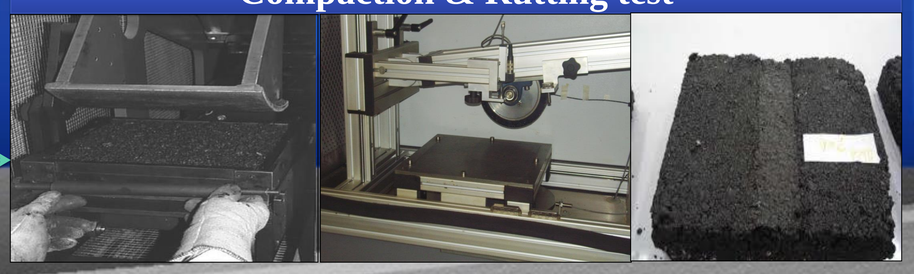




PSR = 5.03 – 1.91 log10 (1 + SV) – 1.38 RD^2 – 0.01 (C+P) 0.5 + error



Compaction & Rutting test



Conclusion

1. Rutting in modified based samples was significantly low compare to traditional asphalt based samples even at higher temperature.
2. Load carrying tendency of modified asphalt based sample was greater compare to natural asphalt based sample. The reason was that modified asphalt has greater rutting protection.
3. At 3 different temperatures, the rutting of modified asphalts are lesser than the maximum value rut value recommend by Asphalt Institute.
4. Greater dynamic modulus values were observed for modified asphalt mix samples.
5. Greater shear modulus values were observed for modified asphalt mix samples.
6. Lesser degree of saturation for modified asphalt mix samples which shows resistance against moisture effect.

Guidelines for placement of PMB

Placement of the polymer modified asphalt shall be made only under the following conditions:

1. The pavement surface temperature shall be 40°F and rising.

2. The pavement surface is clean and absolutely dry.

3. The wind conditions are not excessive.

4. All construction equipment such as polymer asphalt distributor, cover material spreader, haul trucks with cover material and rollers are in position and ready to commence polymer modified asphalt placement operations.

5. Rain is not imminent.

6. The polymer modified asphalt mixture shall be applied at a temperature of 290°F to 375°F at a rate of .50 to .60 gallons per square yard as directed by the Engineer.

7. The polymer modified asphalt shall not be applied until sufficient screenings are on hand for immediate cover.

8.The polymer modified asphalt shall not be spread a greater distance than can be immediately covered by aggregate screenings unless otherwise permitted by the Engineer.

Selected References

- **Fwa FT, Pasindu RH & Ong PG. *Critical Rut Depth for Pavement Maintenance Based on Vehicle Skidding and Hydroplaning Consideration*. Journal of Transportation Engineering, 2012; 138(4): p. 423-429.**
- **Patel A. Kulkarni PM. Gumaste DS. Bartake PP. Rao KVK. Singh ND. *A Methodology for determination of Resilient Modulus of Asphaltic Concrete*. Advances in Civil Engineering, 2011: pp. 6.**

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