Implementation of Warm Mix Asphalt in Sri Lanka: Case Study

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Abstract

Warm Mix Asphalt (WMA) is the technology that allows a reduction in the production and paves temperature of Asphalt. WMA can be produced using four different technologies; chemical additives, organic additives, water-bearing additives and water-based processes. Adaptation of WMA may reduce the production cost, paving cost, and emission of greenhouse gases and allow longer paving season. Therefore, implementation of WMA in Sri Lanka is vital as WMA can be an answer to the economic crisis and has been recognized as the future of Asphalt. Organic additive technology or chemical additive technology was decided to select for the implementation of WMA in Sri Lanka as the minimum plant modifications in these technologies. Sasobit®, which is an organic WMA additive, was selected for the implementation as it is available in the south Asian region, and further, this was successfully implemented in India. Sasobit® is a synthetic wax which decreases the viscosity of the bitumen in lower temperatures. However, below 900C, Sasobit® creates a crystalized lattice structure allowing the modified bitumen to stiffen and increase the rutting resistance. The optimum Sasobit® percentage was determined as 2.5% by mass of binder by analyzing the results of viscosity against the Temperature curve. A Series of samples with bitumen modified by optimum Sasobit® percentage shall be prepared in different mixing temperatures and different compaction temperatures falling under the WMA temperature range. The mixing temperature and compaction temperature shall be selected where the optimum density was achieved, and results are within the limitations stated in ICTAD specifications for Marshal Test. The mixing temperature was found as 140^0C, and the compaction temperature was 130^0C. The section selected for the study is 500m in Mawanella. A paving trial was conducted near the selected study area for 57 m, and it was observed that the required degree of Compaction was achieved with lower roller compaction coverage. The bitumen decentering plant was modified to achieve the modification by Samsonite®. Bitumen was circulated through the plant for 2 hours after Sasobit® was added, and the temperature was maintained at 140^0C. The mixing of Asphalt was maintained at 140^0C, and the Compaction at the field was started when the temperature was 130^0C. One breakdown roller coverage was able to be reduced, and four intermediate roller covers were ably reduced from typical roller coverage, and still, the required degree of Compaction was achieved. Further, it was observed that the temperature drop to 60^0C in the WMA is 120 minutes (2 hours). Temperature is lowered in WMA bitumen production by 10-15^0C allowing cost saving duet lowered use of fuel in heating of materials. Further, the required degree of Compaction was achieved by lower roller coverage. Moreover, the road can be open to traffic less than 2 hours from the time of the paving. Therefore, the paving season can be increased /which is beneficial for roads with heavy traffic flow. Implementation of WMA in Sri Lanka is vital at this stage, and it is evident WMA can be used as absolution for the current economic crisis. However, there are more options for modification methods, and the use of recycled Asphalt is more feasible in WMA. Hence, it is recommended to study more along these avenues.

Keywords: *Warm Mix Asphalt, Organic Additive, Cost, Roller Coverage, Paving Season*

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