Road & Airfield Pavements with SMA

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Stone Matrix Asphalt (SMA) was developed in Germany during the 1960's as a durable asphalt mixture which was resistant to studded tire wear and permanent deformation. In 1990, the American Association of State Highway and Transportation Officials (AASHTO) European Asphalt Study Tour brought the German asphalt mix technology known as "splittmastixasphalt" to the United States. The initial interest in the use of SMA on highway pavements in the U.S. was later overwhelmed by the release and subsequent implementation of the Superpave mix design system. As of this year, SMA has been identified as having been used on 34 airfields in seven countries to date.

One of the major advantages of SMA mixtures is its increased durability. The results of a literature review and survey of SMA by Auburn University support the following conclusions:

- SMA is rut resistant.
- Cracking was minimal with SMA pavements.
- SMA reduced the rate of propagation of reflective cracks.
- State departments of highways estimated that SMA provided 33 to 103% longer service lives than conventional dense-graded mixes.
- Life cycle cost analysis using performance data from in-service pavements indicated that SMA would still be cost effective even if it were 82 to 94% more expensive initially than conventional mixes.
- SMA has a higher macro-texture than dense-graded pavements (average 1.26 mm reported) for better friction.
- SMA can successfully be designed with coarse aggregates having L.A. Abrasion loss in excess of 30 percent. Several state departments of transportation support L.A. Abrasion loss of 40 percent, which means local gravel aggregate sources can be utilized.
- The results from Hamburg wheel-tracking device tests indicated that SMA improved the performance of certain aggregate sources and provided a more consistent level of performance across aggregate sources.
- Analysis of the volumetric and permanent deformation data indicated that mixtures designed at 4% air voids using either the 50- blow Marshall or 65 gyration laboratory compaction effort should produce similar volumetric properties, allow a range of aggregate properties including more local materials and provide for excellent rutting performance.

The overlay tester indicates a 435 percent increase in cycles until cracking occurs for SMA mixtures as compared to dense-graded mixtures (produced with polymer modified binder).[1] **This increase in durability is the most significant benefit of SMA mixture**.

SMA was adopted by the Ministry of Transportation in Ontario (MTO) in 2000 as a premium asphalt pavement surface to replace Portland cement concrete (pcc). SMA has since been used in Ontario on major highways. Under these loads and cold temperatures, its reported advantages include: good durability over time and increased service life and reduced noise,[2] which is an important design consideration in an urban freeway environment.

Mn/DOT has placed SMA wearing course at six locations within the state. The most recently constructed project (TH 212 – Chaska) was let as an alternate design-bid project (head to head with pcc for initial cost and future maintenance). At the time, crude oil was higher in price than the current market. The outcome was SMA as the most cost-effective pavement!

The asphalt pavement industry has new technology and innovation available to provide exceptional performance in a very cost-effective sustainable environment for future generations.

TH 212 in Chaska, paved with SMA in 2008.

FOR MORE INFORMATION: Contact the Minnesota Asphalt Pavement Association at 651.636.4666 or at info@mnapa.org or visit our website at www.asphaltisbest.com.

[1] "Evaluation of Stone Matrix Asphalt (SMA) for Airfield Pavements (AAPTP)," Auburn University (NCAT), Feb. 2009

[2] "Road Talk," Ontario Ministry of Transportation, Spring 2009, Vol. 15, Issue 3