

1ST INTERNATIONAL CONFERENCE ON **Stone Matrix Asphalt**

CONFERENCE REPORT



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www.AsphaltPavement.org/SMAConference

A Global Conversation

On November 5–7, 2018, the National Asphalt Pavement Association and the Transportation Research Board of the National Academies, with support from the Federal Highway Administration and in partnership with the Asphalt Institute, the Association of Asphalt Paving Technologists, the Rubber Pavements Association, and the U.S. Tire Manufacturers Association, hosted the 1st International Conference on Stone Matrix Asphalt in Atlanta, Georgia.



The 1st International Conference on Stone Matrix Asphalt engaged 265 attendees from 32 U.S. states and 21 countries.



Stone matrix asphalt (SMA), also called stone mastic asphalt, was developed in Germany in the 1960s to provide heavily trafficked roads with a durable, rut-resistant wearing course. SMA uses a gap-graded aggregate structure and a modified asphalt binder to achieve these goals.

SMA has been used worldwide for almost 50 years, and in the U.S. for the past 25 years, but only a handful of states have widely implemented. Since its introduction to the U.S., SMA technology has evolved, which may make it beneficial in broader applications. This conference discussed advancements made worldwide in SMA mixtures and pavements over the past 50 years.



SMA Design, Production, & Construction

“SMA saves pavement life, money, and time, and it provides structural and functional improvements in durability and performance.”

Pablo Bolzan

Argentina-based Pavement Consultant

Designed to improve rut resistance and durability, SMA uses a stable stone-on-stone skeleton held together by a rich mixture of asphalt cement, along with stabilizing agents such as fibers and/or asphalt modifiers.

SMA can be produced in most asphalt plants. It may require contractors to use materials not commonly used with other mixtures, such as mineral filler

and fibers; however, the key to producing a high quality SMA is calibration and preparation of the plant.

SMA has an open texture and cools faster than typical mixtures. Compactors should stay close to the paver, as temperature is the most critical component of compaction. Follow best practices and be sure to monitor mixture pickup on steel drums.





SMA Performs

Carrying a Heavy Load

One goal of the conference was to show countries and agencies that do not use SMA that these mixtures can deliver performance. While SMA may have started in Germany, states like Virginia, Pennsylvania, Maryland, and Georgia in the U.S. have widely adopted SMA because they have seen the increased service life and performance. SMA has been placed on roadways that carry some of the heaviest traffic in the world and in the most extreme climates. It is also the solution when roadway owners, such as the German Autobahn, demand peak performance.

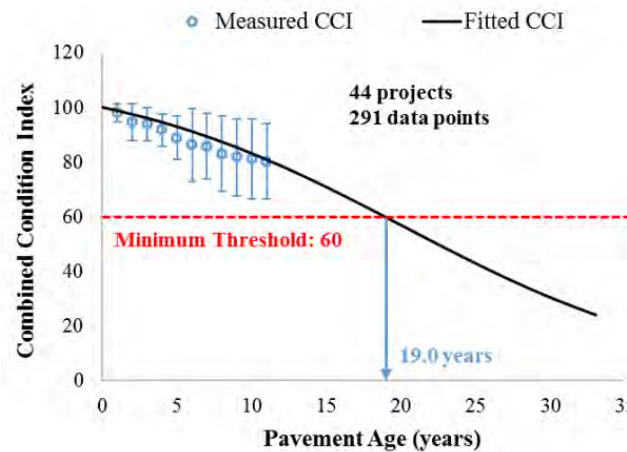
"If you can get 20 to 30 years out of pavement, that's a heck of a value."

Pete Rahn
Secretary and Chairman,
Maryland Transportation Authority

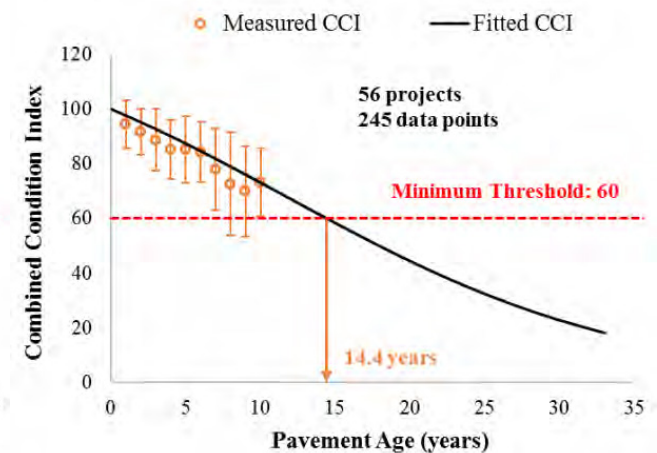
"It's so durable and so long lasting. SMA is just the best solution around."

Dr. Helen Bailey
Founder & Managing Director,
The Driven Company

SMA:19 Years



Superpave: 14 Years



The National Center for Asphalt Technology conducted a performance analysis to compare long-term field performance of SMA versus comparable Superpave dense-graded mixes. Data from the Virginia Department of Transportation is shown above.

SMA Innovations

For the first 35 years of its existence, SMA remained unchanged. Engineers followed the tried and true method to ensure that the pavement would perform. However, over the past 15 years, roadway owners have wanted to modernize SMA to ensure the premium product for the asphalt industry embraces new technology and mix design methods. Research has been conducted to ensure that SMA is compatible with these new methods and materials and does not sacrifice performance.

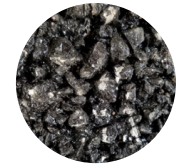
Some of the innovations being considered include:

- ✧ Moderate to high reclaimed asphalt pavement (RAP) content
- ✧ Low levels of recycled asphalt shingles (RAS)
- ✧ Recycled tire rubber (RTR) in place of polymers in binder
- ✧ New and local aggregate sources
- ✧ New mineral fillers, such as fly ash
- ✧ Use of warm-mix asphalt (WMA) technologies to reduce temperature or possibly eliminate the need for fibers in the mixture to prevent draindown
- ✧ Incorporation of SMA into Balanced Mix Design.

Roadway owners want to modernize SMA to ensure this premium product from the asphalt industry embraces new technology and mix design methods.



Local aggregate



New aggregate sources



Sintered fly ash



Fibers

Sustainable Solutions

The sustainability of a product is often defined by how it fits into the triple bottom line (TBL) of sustainability: economics, environment, and society. SMA provides benefits to roadway owners and users in **all three facets of the TBL**.

Economics

1 Fewer rehabilitation efforts due to increased service life.

Environment

2 Using recycled materials and WMA will continue to reduce the overall impact of paving on the environment. Extended service life reduces the need for virgin materials by increasing the time between maintenance and rehabilitation activities.

Society

3 SMA provides roadway users with a quiet surface that can reduce the noise associated with driving. This can reduce the need for costly sound barriers in urban areas.

Service Life: SMA vs. Superpave

Highway Agency	Performance Measure	Predicted Service Life (Years)		SMA Life Extension (Years)
		SMA	Superpave	
Illinois Tollway	Overall Condition Rating Survey	13.5	9	4.5
Maryland SHA (Principal Arterial)	Rutting; Cracking Index	21.8	19.6	2.2
Michigan DOT	Overall Distress Index	22.2	21.3	0.9
Pennsylvania DOT (Interstate)	Overall Pavement Index	21.1*	22.2	-
Pennsylvania DOT (Non-Interstate)	Overall Pavement Index	24.5*	11	13.5
Virginia DOT	Critical Condition Index	23.1	12.8	10.3

Note: *FMS data from a limited number of pavement sections

“SMA thin overlays are a thing of beauty. They cost 15 percent more, but last twice as long. We can't afford not to spend that.”

Martin McLaughlin

Head of Strategic Asset Management & Customer Strategy, Transport Scotland

New Opportunities

While SMA usage is primarily focused on highways, engineers should be willing to explore other applications as well. SMA has been used at Flughafen Frankfurt am Main in Germany and some of the other busiest airports in the world, and it is being implemented as a surface mixture at other airfields.

Famous race tracks like the Indianapolis Motor Speedway

have also turned to SMA to ensure superior performance.

In Scotland, thin asphalt SMA overlays are used as a pavement preservation treatment to extend pavement life and improve the pavement's life-cycle.

Denmark has developed the first low-rolling resistance mixture to counter the textural effects on pavement vehicle interaction.



SMA is the material of choice at the Indianapolis Motor Speedway, where quality, consistency, and durability are essential to the sport and driver safety.



In Australia, two SMA mixtures (one from China and one from Germany) are being tested on a taxiway at a Royal Australian Air Force airfield near Brisbane.

"SMA has a history that demonstrates its worth and value. Increasing SMA usage is our opportunity to innovate and to take asphalt pavements to the next level."

Dr. Richard Willis

Vice President for Engineering, Research & Technology,
National Asphalt Pavement Association



To download the conference papers and proceedings, visit www.AsphaltPavement.org/SMAConference.
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