Environmentally Friendly Asphalt Pavements

by Ray Brown

Topics

- **Warm Mix**
- **Quiet pavements**
- **Porous mix**

Why Warm Mix Asphalt?

- Reduce production and laydown temperatures
- Reduce emissions
- Reduce energy costs
- Reduce aging of binder
- Improved workability

U.S. WMA History

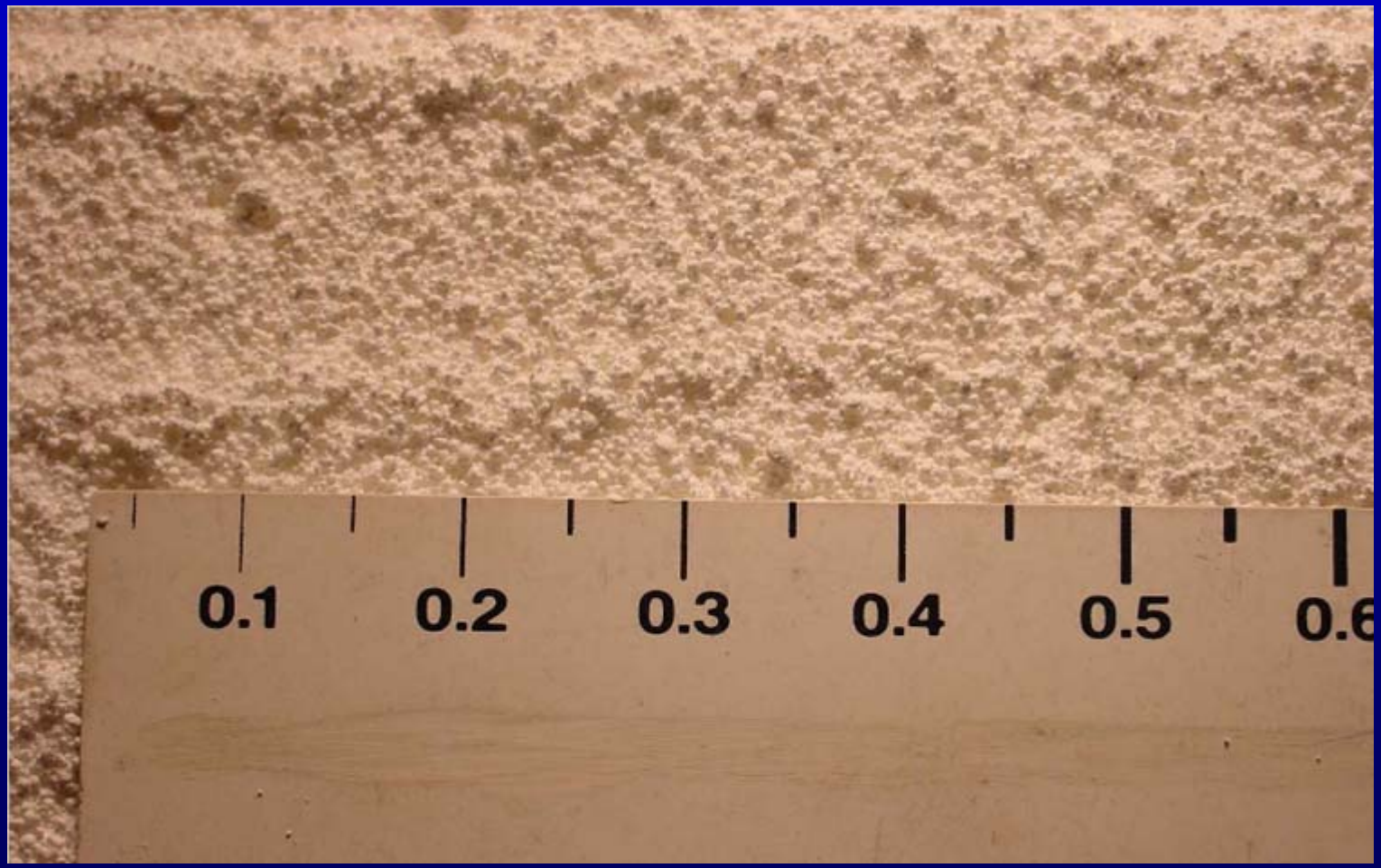
- NAPA Study Tour 2002
- First test section constructed with Aspha-min zeolite in February 2004 in Orlando, FL
- Numerous sections constructed in 2005 thru 2007

Warm Mix Asphalt Processes

- Wax-like additives (Sasobit)
- Mineral additives (Zeolite)
- Foaming (WAM foam and Astec process)
- Emulsion Based (Evotherm)
- Others

Wax-like additive (Sasobit)

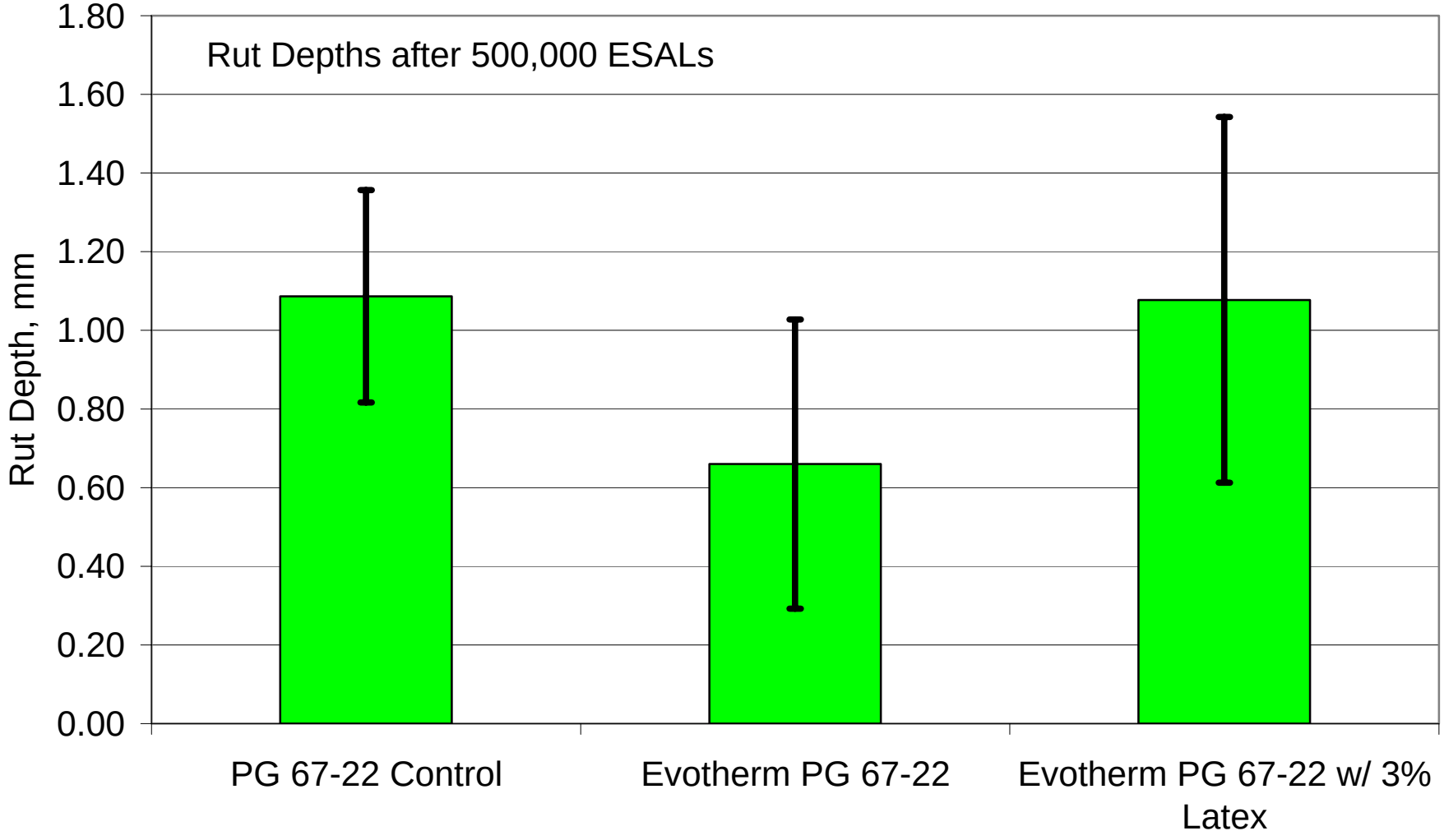
Mineral additive (zeolite)



Foamed asphalt

Asphalt Emulsion

Evotherm Field Rut Depths - NCAT Test Track



2006 Field Sections

Project	Date	PG	NMAS	Aggregate	N_{design}	Technology	RAP,%
Hall St. St. Louis, MO	May 2006	70-22	12.5	Pophyry Limestone	100	Three technologies	10
Ryan Rd. Milwaukee, WI	June 2006	64-28	12.5	Gravel	75	Two technologies	14
Austin Hwy. San Antonio, TX	Aug. 2006	64-22 +2.5% SBR	9.5	Gravel	100	One technology	0
OH 541 Kimbolton, OH	Sept. 2006	70-22	9.5	Limestone Nat. Sand	50 Blow	Three technologies	15
M 95 Iron Mountain, MI	Sept. 2006	58-34	9.5	Gravel	86	One technology	0
NCAT Test Track	Oct. 2006	76-22	12.5	Granite Limestone	60	One technology	45

Astec Process

- Foamed Asphalt
- Moisture added is 0.1% by wt of total mix
- High RAP Content
- Mix at 270 degrees F
- Works for polymer asphalt, virgin mix, and recycled mixture
- Haul, place and compact using normal procedures

Placement in Chattanooga

No Smoke

Compaction of Joint

Status of Astec process

- Uses standard foamed asphalt process but at 270 degrees F
- Mix looks good to date
- Mix placed on city street
- Price reduced over 25% from typical cost of virgin HMA---primarily due to RAP
- Performance continues to be monitored on city street project

Summary of Warm Mix Asphalt

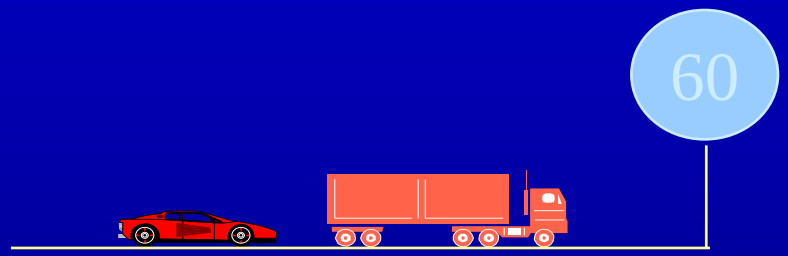
- So far good performance with warm mix asphalt
- Still need mix design method
- Some mixtures have marginal results in moisture susceptibility

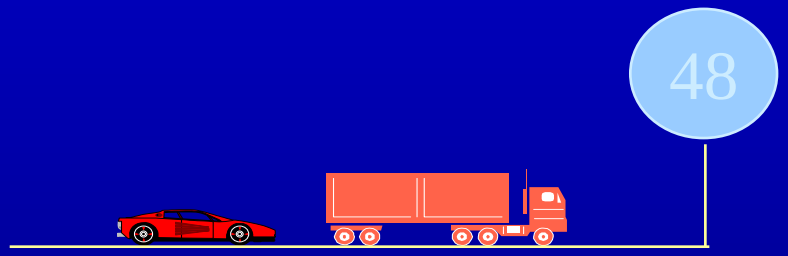
Noise has become a bigger issue especially in larger cities

TIRE NOISE TESTING

Noise walls

Noise Reduction - OGFC
Effect of -3dB(A)





Equivalent to 20% Speed Reduction

Equivalent to 1/2 the Intensity

Best approach to decrease noise

- Porous mixture
- Small maximum aggregate size
- Place thicker

Double Layer Paver

Double Layer Paver

Double Layer Paver

Double Layer Paver

Double Layer Paver

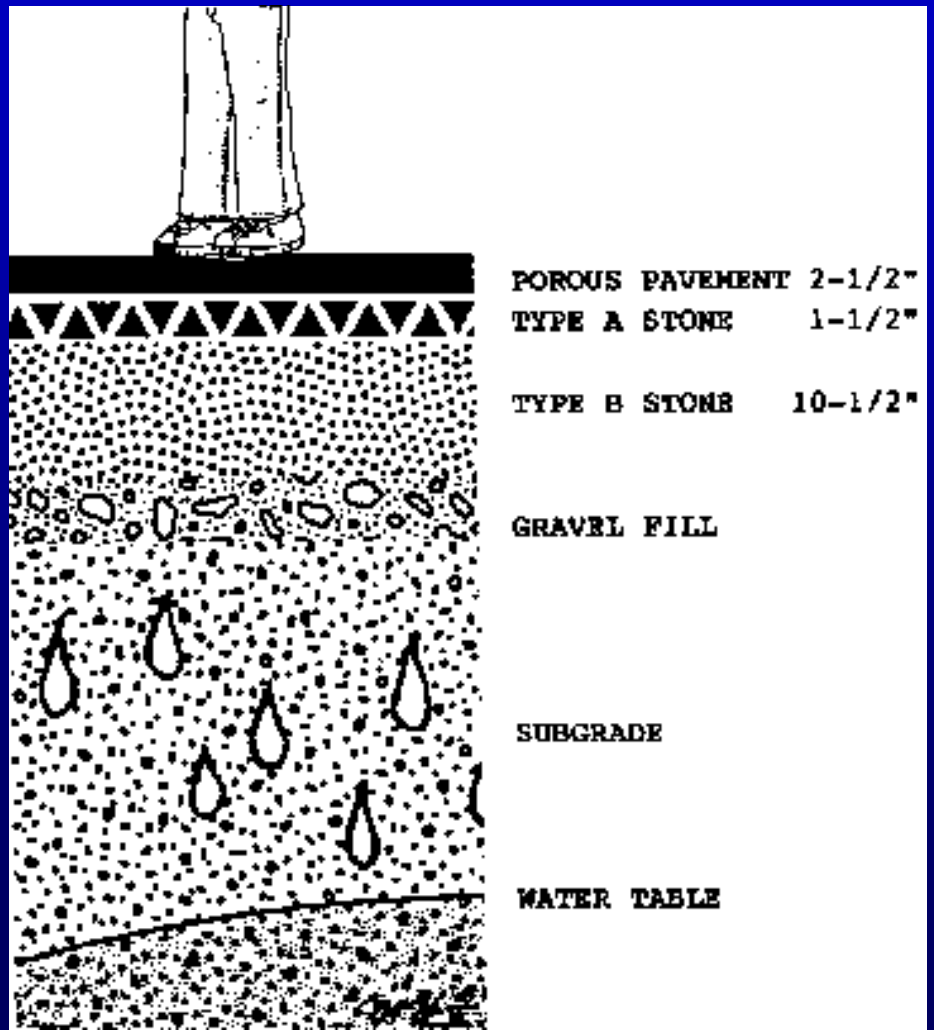
More interest in using porous pavements to get rid of surface water

- Roads
- Paths
- Parking lots

Porous asphalt pavements

Porous mixture

Schematic of Porous pavement



After Miller

Porous pavements are becoming more common in solving surface water problem

Much emphasis will be placed on warm mix asphalt, noise, and porous mixtures in the near future.

Also more emphasis on using a higher amount of RAP