

# Advancements in Mastic Technology for use in Next Generation Pavement Maintenance



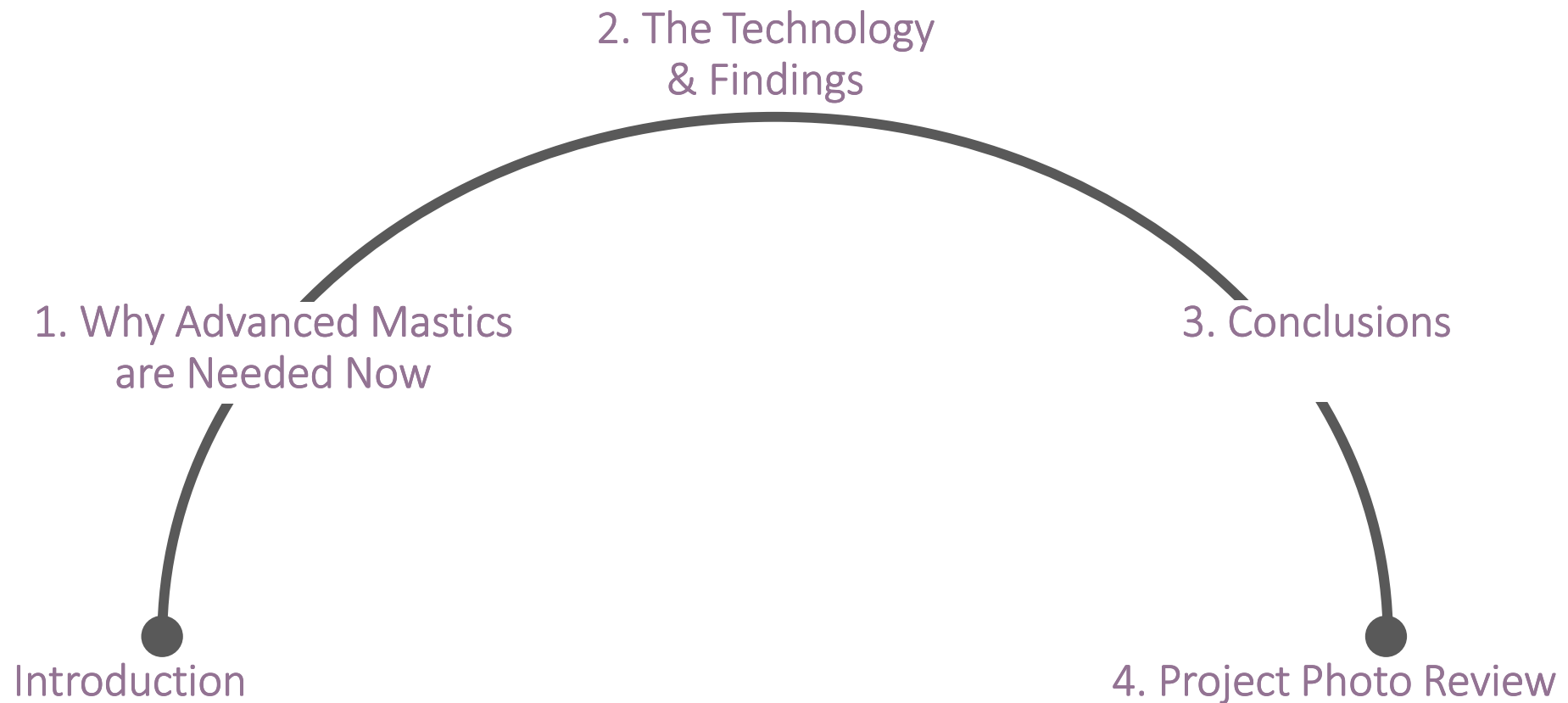
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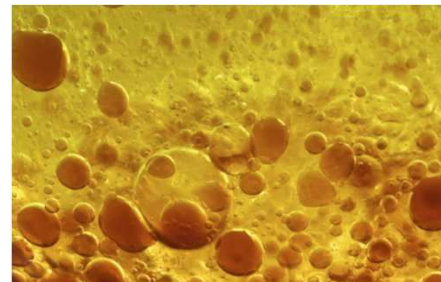
InVia Pavement  
Technologies





## Definition: Advanced Mastic Technology

“A composite material made up of bitumen, polymers, particulate reinforcing materials (clays, etc.), surfactants and emulsifiers, and synthetic aggregate that is used in pavement maintenance applications.”




“Problems cannot be solved  
by the same level of thinking  
that created them”

-Albert Einstein



Why Advanced Mastics  
are Needed Now

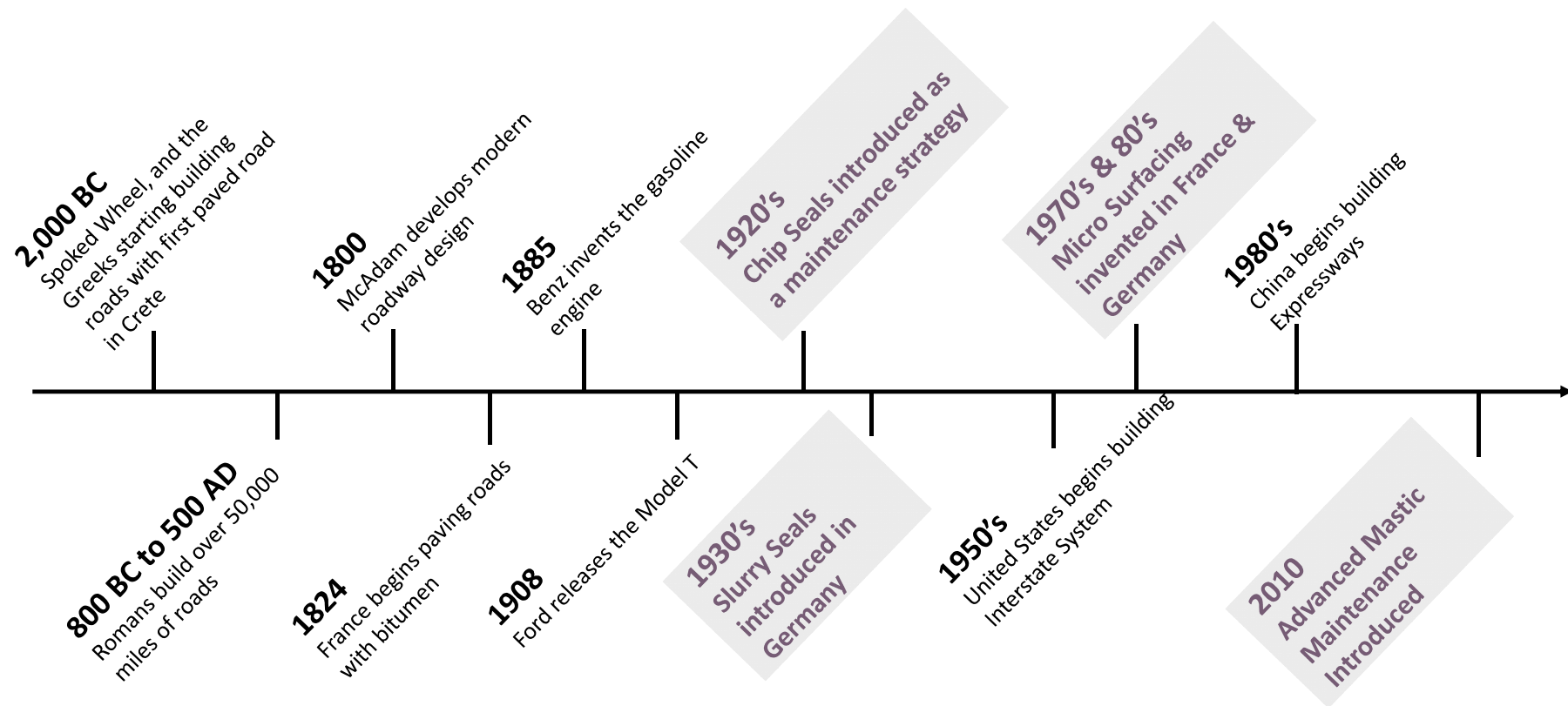


# WHY ADVANCED MASTICS ARE NEEDED NOW

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## The Historical Need for Advancements in Maintenance





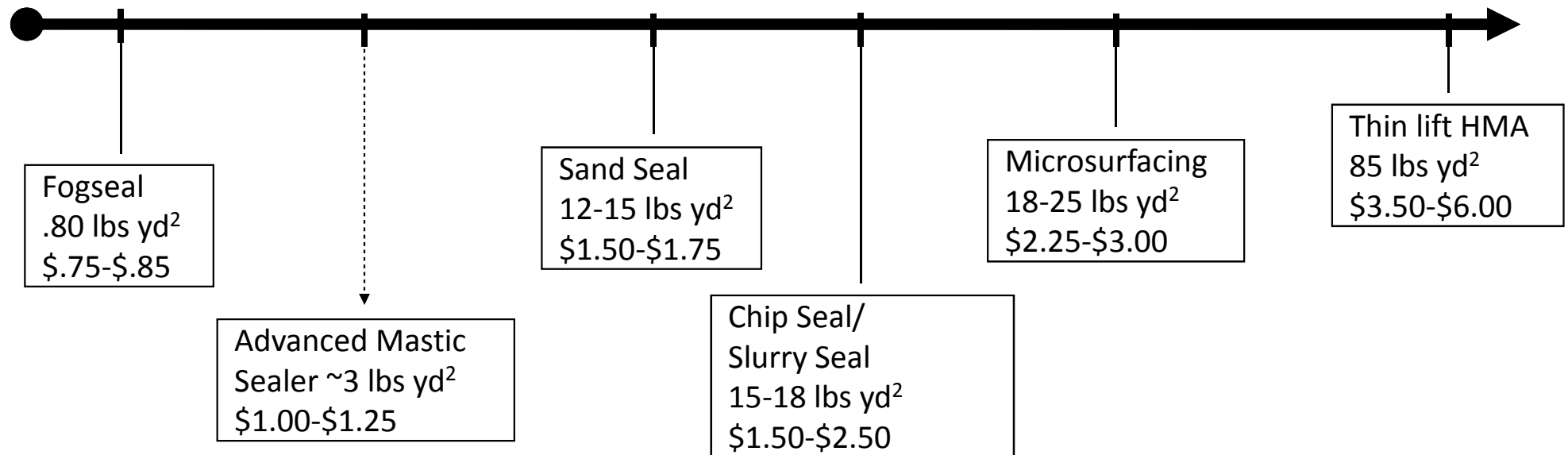
## The Economic Need for Advanced Mastic Technology

Year	Commodity Bitumen	Polymer Modified Bitumen	Standard Surface Mixture	Stone Mastic Asphalt
2006	\$435	\$448	\$51	\$61
2013	\$480	\$866	\$68	\$93
Percent Change	10%	93%	33%	52%

## Initial Project Cost is Critical for Maintenance

Low Cost

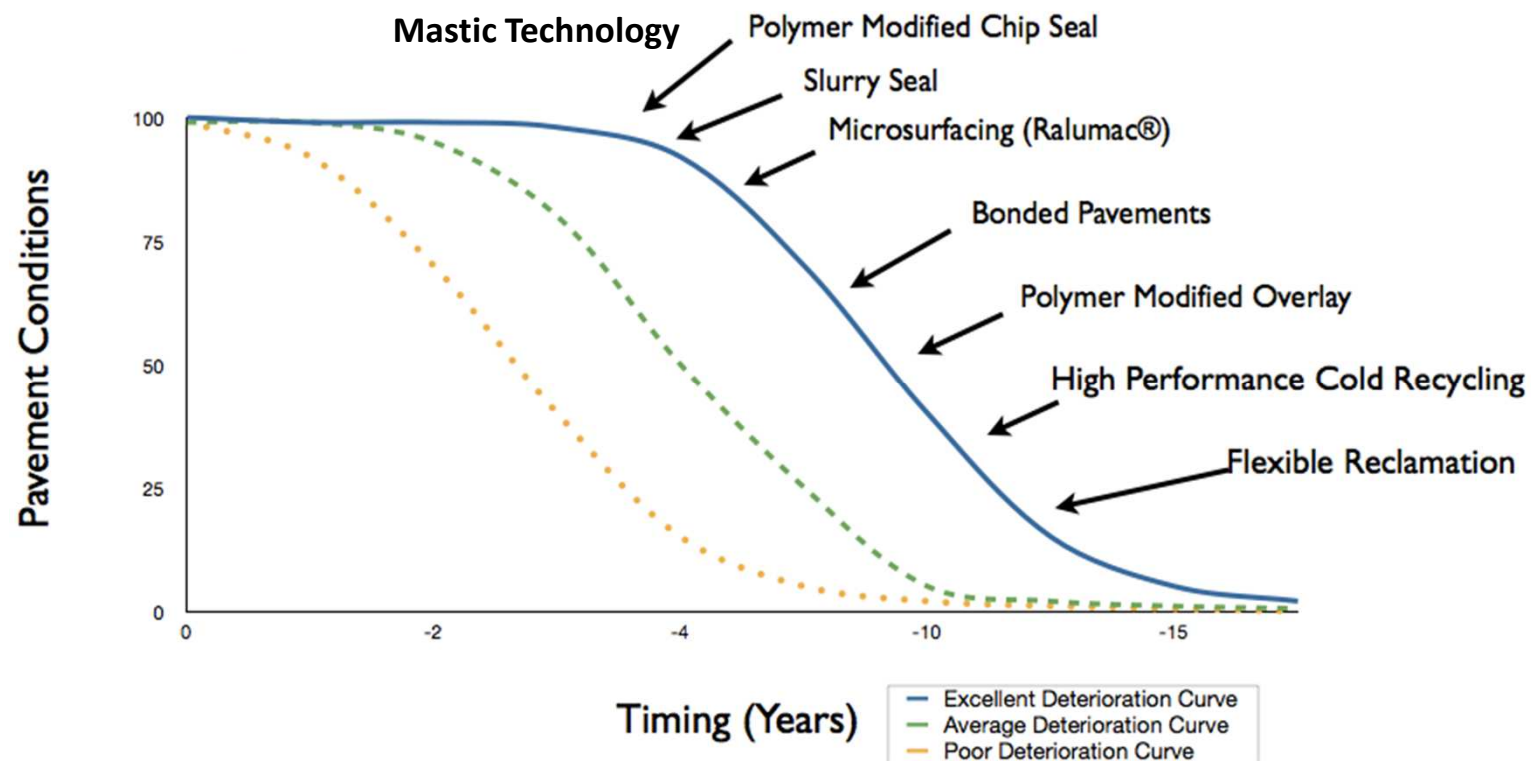
High Cost







## How Lifecycle is Driving the Need for Advancements



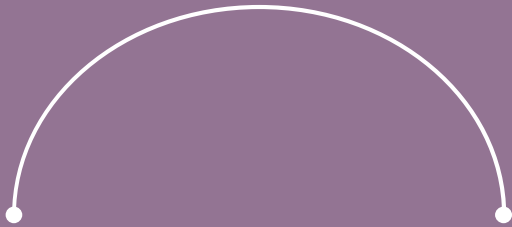
# Society Demands Turn Key Technology

**"We've got a lost generation that has grown up with factory electronics that just work all of the time. ... When they [break], we throw them away and buy something new... These days we are rather more interested in the ends than the means. ... We want instant gratification."**

– Danielle George (Engineering Professor at University of Manchester)



The Technology & Findings



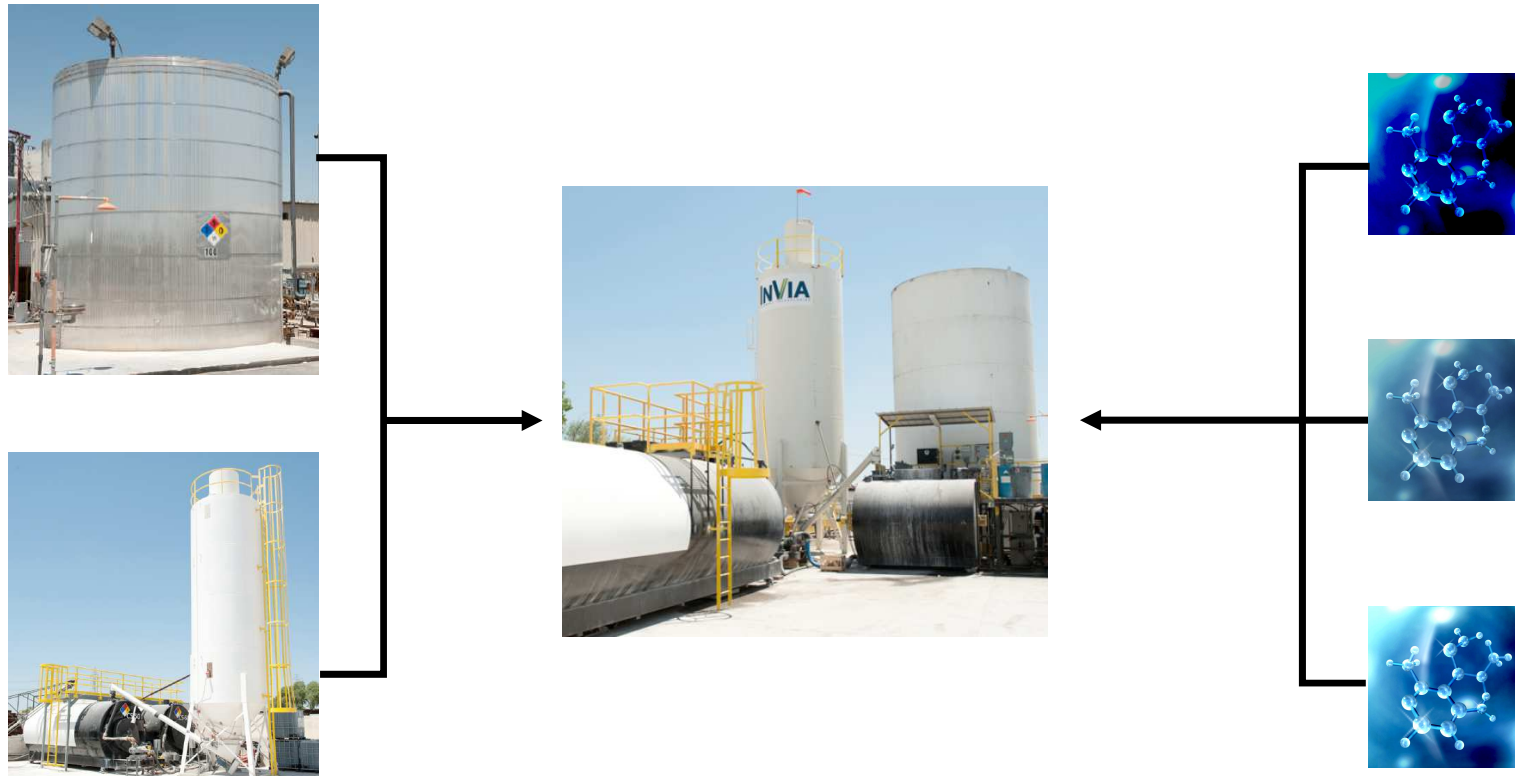
# THE TECHNOLOGY & FINDINGS | 2

# What is in Advanced Mastics Technology that Make it Work?



Bitumen	Aggregate	Clay	Polymers	Surfactants & Additives	Emulsifier
Typically a PG 64-22 (60 -75 Pen)	Synthetic Aggregate	Engineered Source	Latex Nontraditional	Stabilizers, etc.	CSS Chemistries
15 -25%	15 - 25%	10 - 20%	2 - 6%	1 - 3%	1 - 2%

# How are Mastics Made



# Application Method for Mastics



- 1) Sweep Mixing Storage
- 2) New pumping for consistency
- 3) New Spray-bar technology for larger particles

## Product Guidelines for Agency Specification Development

### Aggregate

#### Physical Properties

Criterion	Standard	Min	Max
Water Absorption, percent	T 84	--	8
Micro-Deval, percent	T 327	--	20

#### Gradation

Sieve	Standard	Master Grading Band Limits Percent Passing	Target Tolerance
No. 8	C136	100	
No. 16	C136	75 – 100	
No. 30	C136	75 – 100	+/- 5
No. 60	C136	50 – 85	+/- 5
No. 100	C136	40 – 65	+/- 5
No. 200	C117	25 – 65	+/- 5



## Product Guidelines for Agency Specification Development

### Emulsified Asphalt

Criterion	Standard	Min	Max
Viscosity, Saybolt Furol at 77deg F, seconds	T-59	15	100
Residue by Distillation, percent	T-59	57	--
Penetration at 77 deg F, 100 g, 5 seconds (Test on Residue from Distillation)	T-49	15	150

### Asphalt Mastic – Mix Design

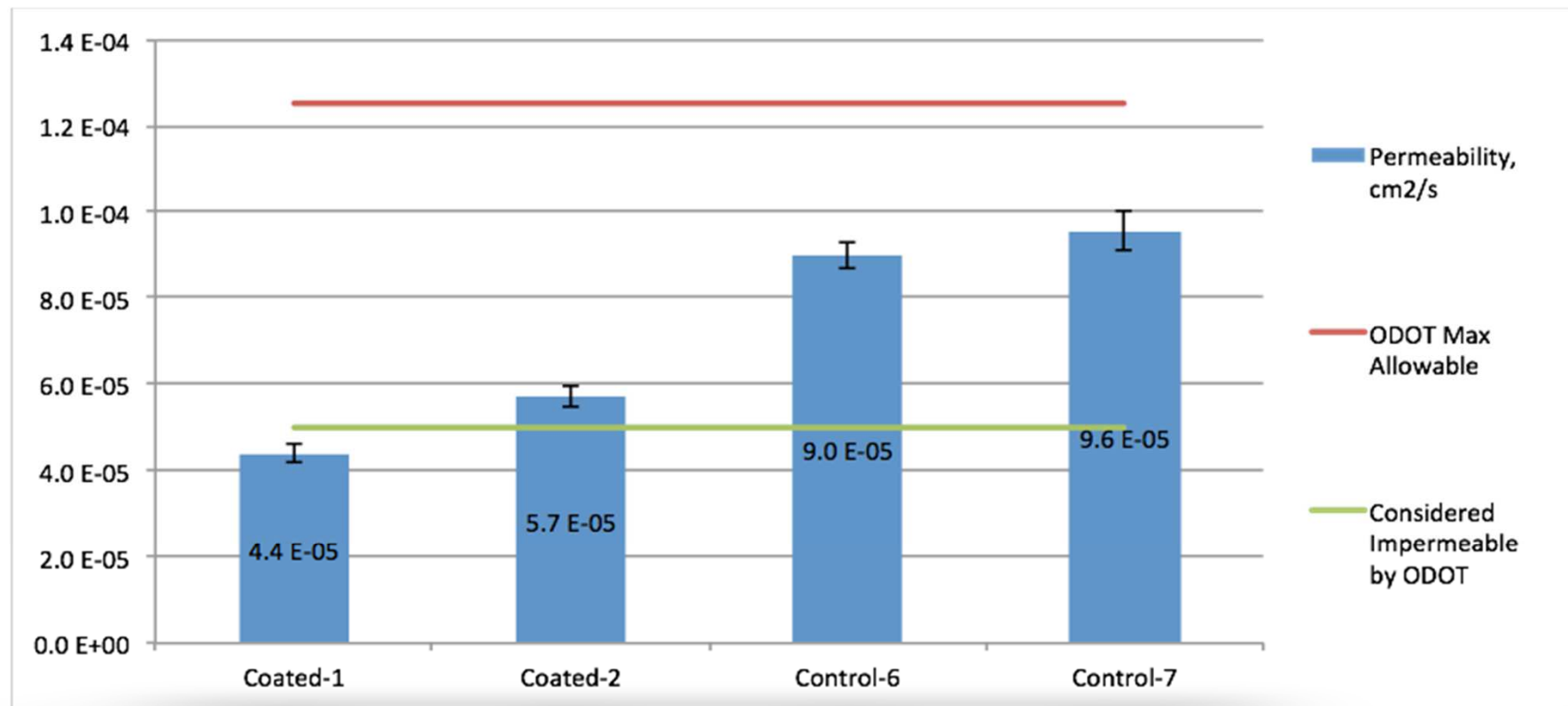
Test			
Wet-Track Abrasion Loss (3 day soak), g/ m <sup>2</sup>	TB 100 ASTM D3910 (a)	--	80
Asphalt content by Ignition Method, percent	T 308 - modified	30	--
Dynamic Friction Test Number @ 20 kph	E 1911 (b)	Report	

NOTES: (a) Use the modified method to account for realistic application depth and fine emulsion mixture.

(b) Test run on lab prepared specimen



## Mastics Impermeability



## Mastics Results: Friction



Skid Trailer used in Evaluation



Dynamic Friction Test



## Mastics Results: Friction

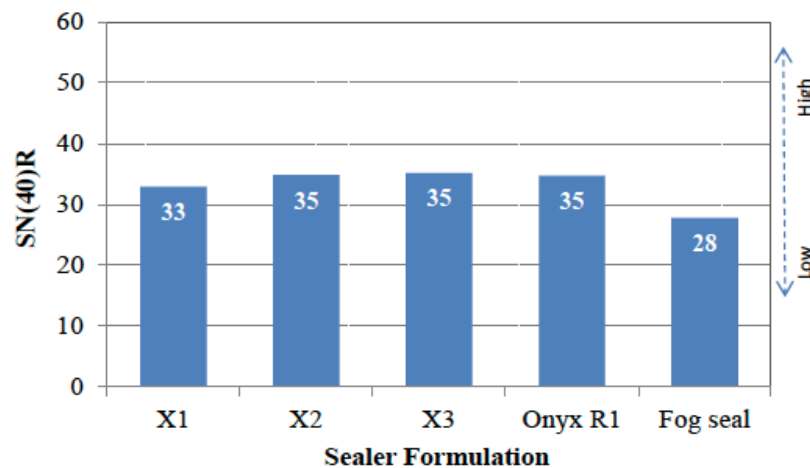


Figure 8. Average Skid Trailer Results.

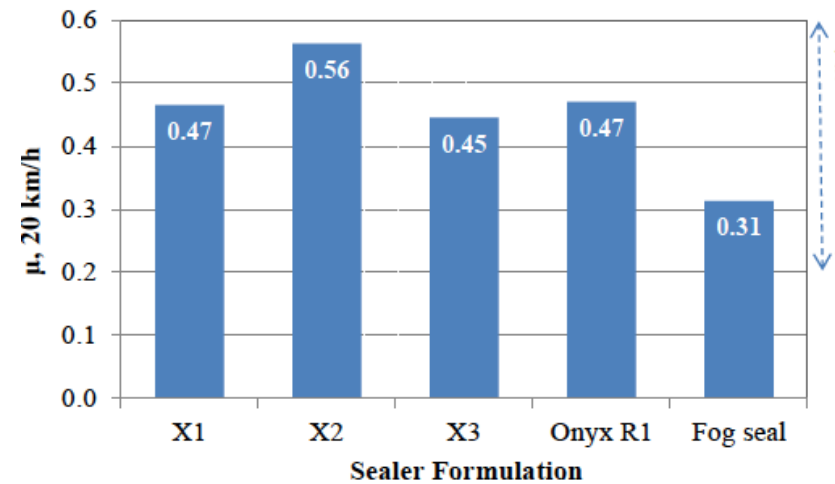
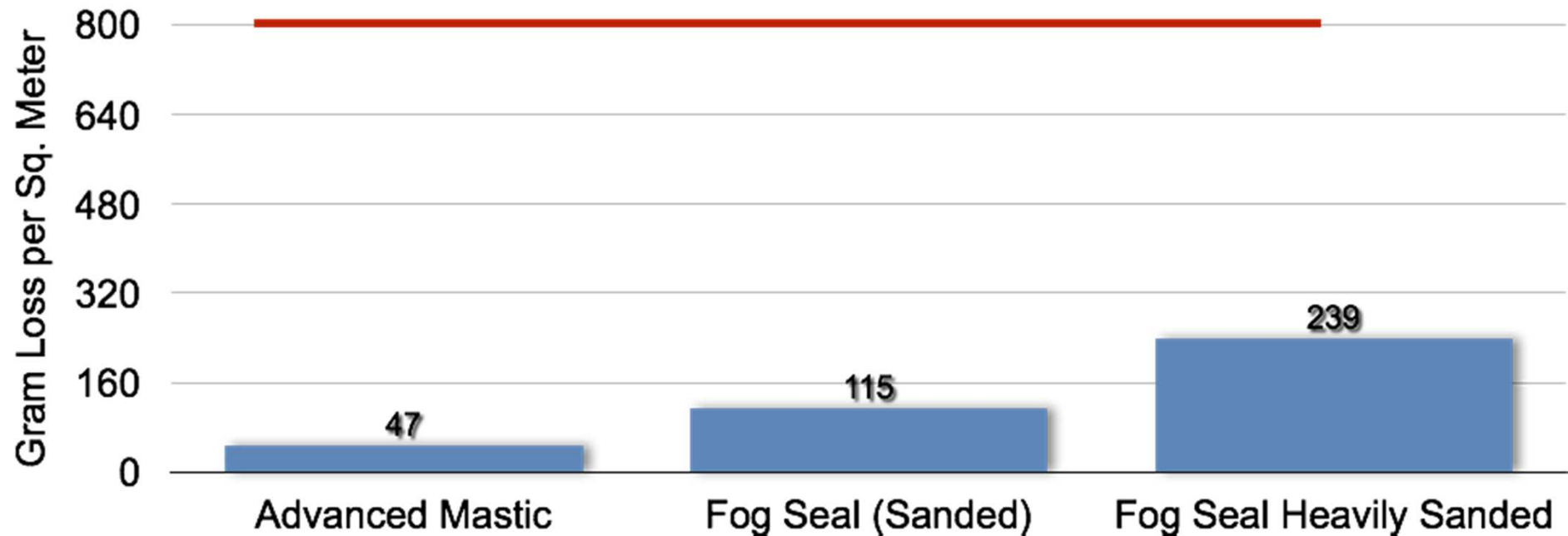


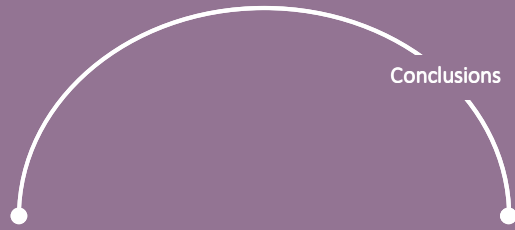
Figure 9. Average DFT Results.

- Mastic sealers on test section out-performed fog seals by 25% on skid trailer tests
- Mastic sealers on test section out-performed fog seals by 50% based on Dynamic Friction Tests



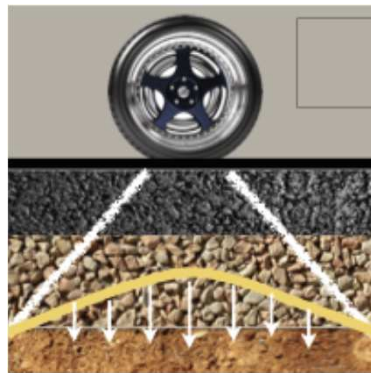
## Product Comparisons: Modified Wet Track Abrasion (ISSA TB100)





# CONCLUSIONS | 3

## Technical Conclusion for Advanced Mastics Technology

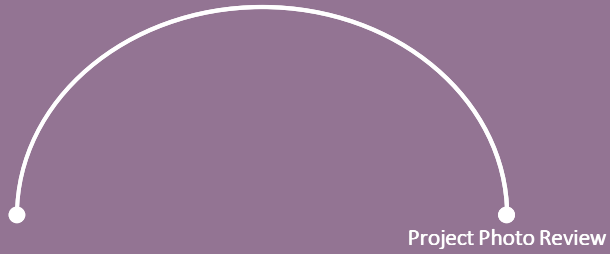


### Engineering Benefits

- Highly impermeable layer is an effective maintenance strategy.
- Laboratory wear performance is excellent
- Frictional characteristics is acceptable from a micro-texture

### Further Development

- Five year life-cycle tied to traffic count needs to be completed
- Further refinement in application methods are needed
- Next generation laboratory specimen conditioning is needed.



# PROJECT PHOTO REVIEW | 4

















## Advanced Mastics Technology for Pavement Maintenance

