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Developing Trends in Rubberized Asphalt

U.S. EPA SMM Web Academy Webinar Series

February 21, 2013

Liberty TIRE RECYCLING

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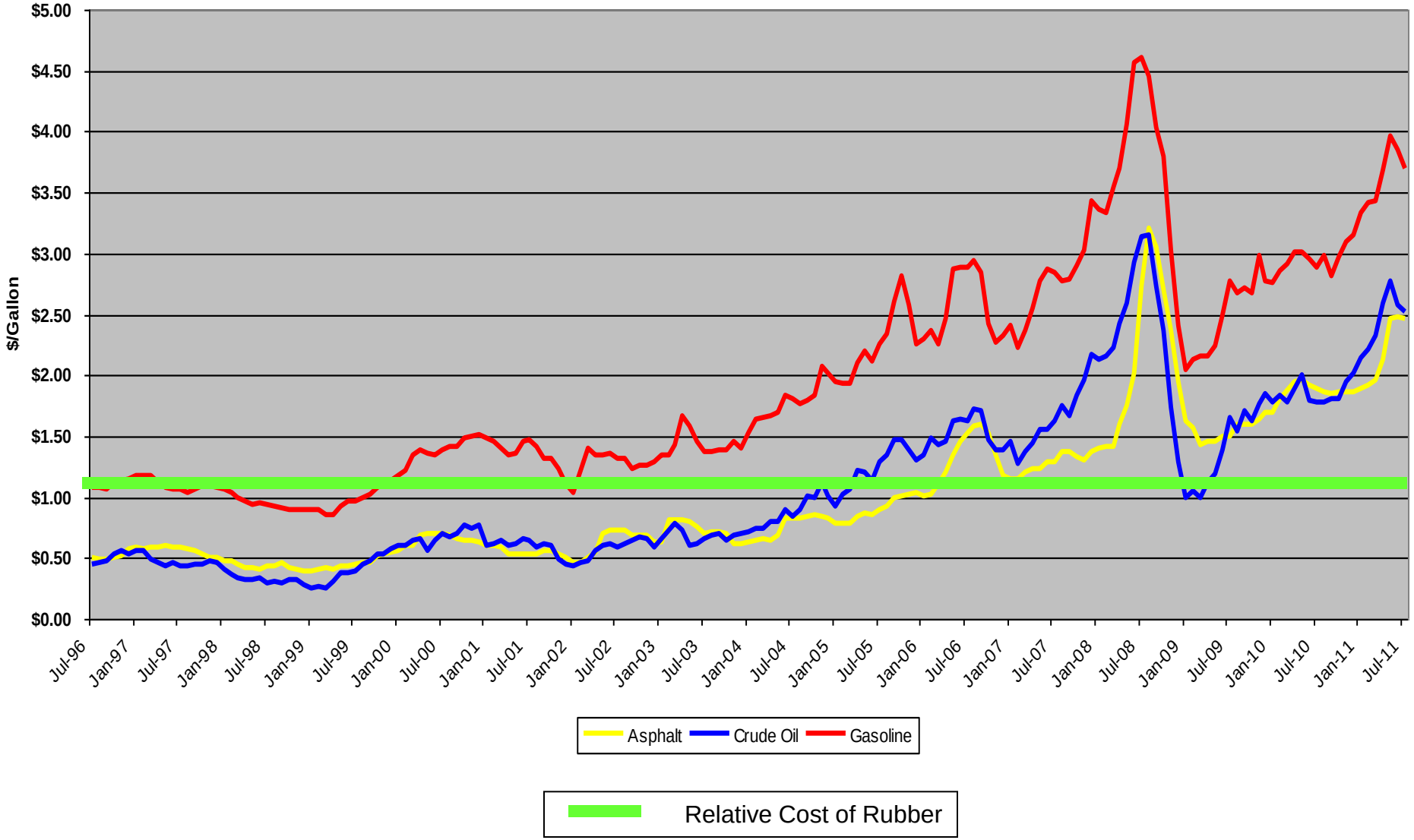
Dramatic Increase in Cost
Rubber Costs Less

Crude Oil, Gas and Asphalt Costs



Recycled Materials Have To Perform Better, Save Money, and be Sustainable

Three Ways To Save With Rubber

1. Reduce Thickness

   Asphalt-Rubber

   18-22% Rubber Content

2. Substitute Virgin Polymers

   Rubberized Asphalt

   8-12% Rubber Content

3. Less Maintenance Over Time

   Asphalt-Rubber, Hot Mix and Chip Seals

SAVE : MONEY

1. Reduce Thickness

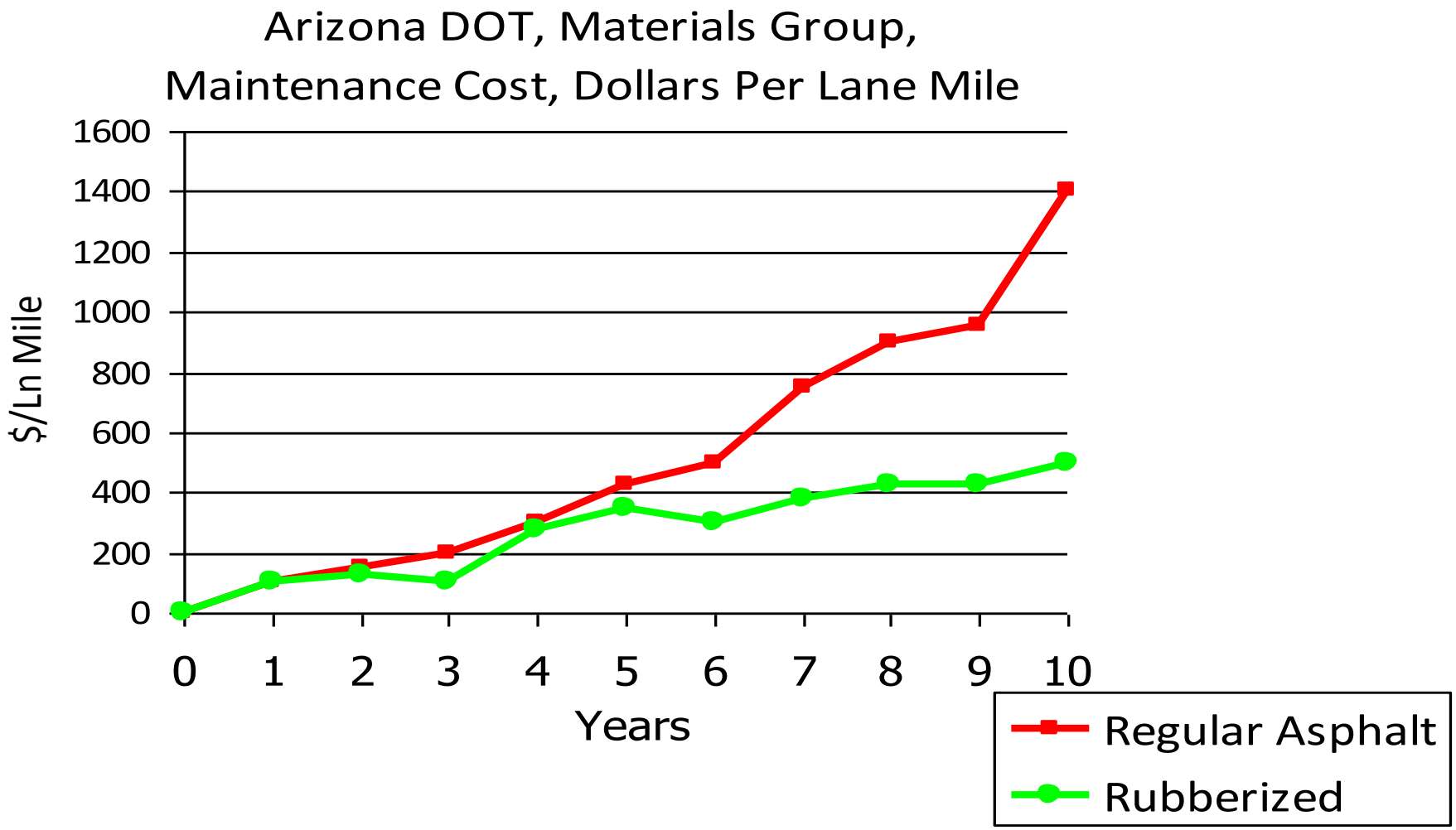
City of Hemet, CA Design Alternatives	Design	Cost	Savings from Rubberized Asphalt Option
Conventional Option A (not feasible due to curb and gutter)	135 mm (5.3 in) conventional asphalt overlay	$363,000	**$124,000***
Conventional Option B (reconstruction)	90 mm (3.5 in) conventional asphalt over 330 (13 in) mm Class 2 aggregate base	$646,000	**$382,000***

Rubberized Asphalt Option -
39 mm (1.5 in) A-R HMA over 48 mm (2 in) conventional HMA.

2. Substitute Virgin Polymers

Cost of Components	Neat	Polymer	ASTM A-R	PG Rubber
Neat Content in Binder	100%	97%	80%	88%
Rubber/Polymer Content in Binder	0%	3%	20%	10%
Additive				2%
Neat Cost	$550	$533	$440	$484
Rubber or Polymer Cost		$108	$80	$40
Additive Cost				$1.6
Binder Material Cost/Ton	**$550**	**$642**	**$520**	**$526**

3. Less Maintenance Over Time



Common Gradations for Rubberized Asphalt

Sieve size	Field Blend – Asphalt Rubber	Terminal or Field Blend- Rubberized Asphalt
	% Passing	% Passing
2.36-mm (#8)	100	100
2.00-mm (#10)	100	100
1.18-mm (#16)	75-95	100
600-μm (#30)	30-60	90-100
300-μm (#50)	5-30	>20
150-μm (#100)	-	-
75-μm (#200)	0-5	-

RTR switch for SBS

Evaluation of Ground Tire Rubber in Asphalt Binders and Mixtures

Liberty TIRE RECYCLING

National Center for Asphalt Technology NCAT at AUBURN UNIVERSITY

NCAT PG Results

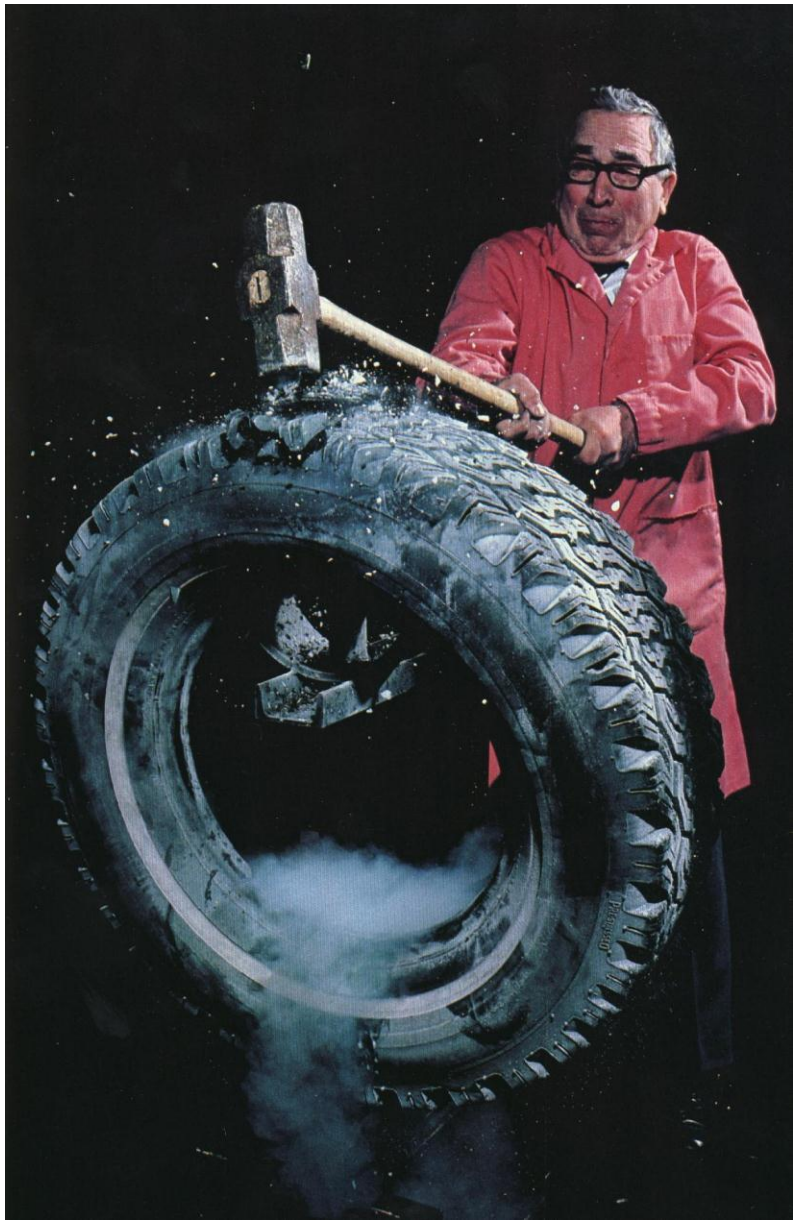
Rubber Product	Dosage Rate, %	True Grade	Performance Grade
-30 Liberty	10%	80.7 – 23.6	76 – 22
-20 Liberty	10%	83.1 – 24.6	82 – 22
-20 Liberty	15%	87.9 – 21.3	82 – 16
Crackermill	10%	82.8 – 23.1	82 – 22
Cryo-Hammer	10%	82.2 – 23.2	82 – 22
Cryo-Hammer	15%	86.7 – 19.3	82 – 16
-30 Liberty Fines	10%	79.8 – 20.4	76 – 16
-16 Powderizers (1mm gap)	10%	76.3 – 21.8	76 – 16
-16 Powderizers (2 mm gap)	10%	84.7 – 21.8	82 – 16
Virgin Binder		69.2 – 24.7	67 - 22

RTR Alternative Modifier

- About 3 x RTR loading is needed compared to SBS for similar properties.
  - Example: 3% SBS content = 9% RTR Content
- Suppose SBS costs $2.00/Pound and RTR Costs $0.50/Pound
  - Example:
  - 3 Pounds SBS = $6.00,
  - 9 Pounds RTR = $4.50
- Project with 1000 Tons of Modified of Binder
  - SBS at 3% = 30 Tons Needed @ $2.00 = $120,000
  - RTR at 9% = 90 Tons Needed @ $0.50 = $90,000

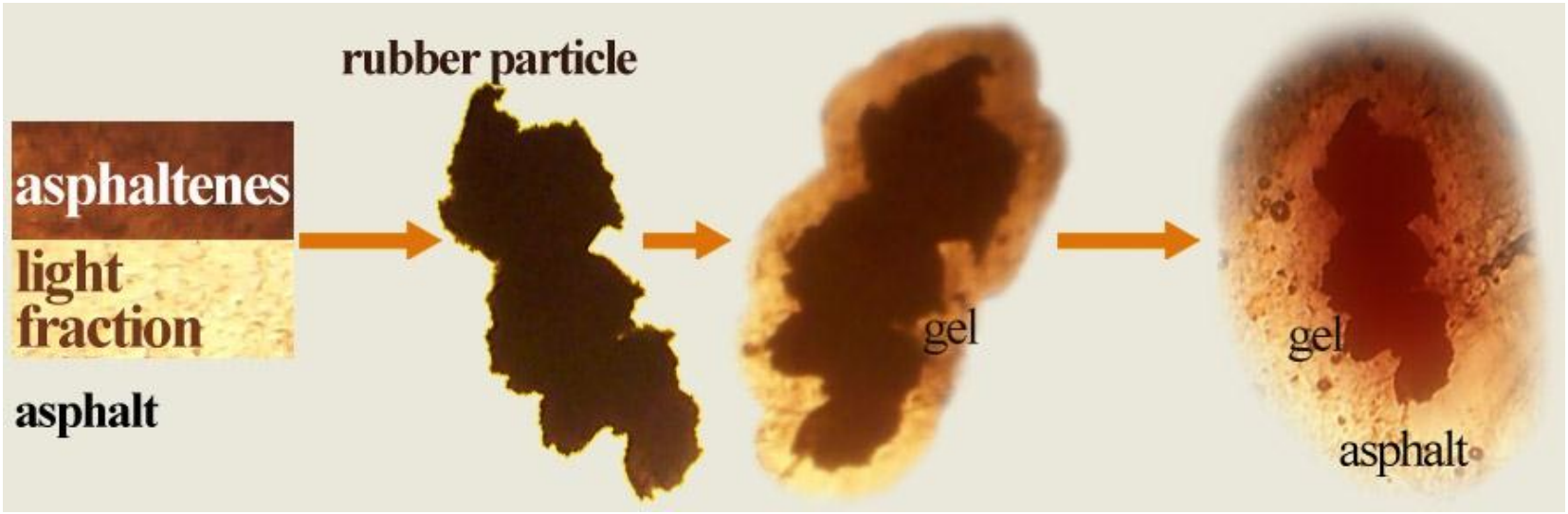
Tire Rubber Performs In A Wider Range Of Temperatures than Asphalt

Performance Grade of Tire Rubber



- 140 C Softens and losses strength
- -70 C Glass transition
  - A PG 140-70?

Interaction Between Asphalt and RTR

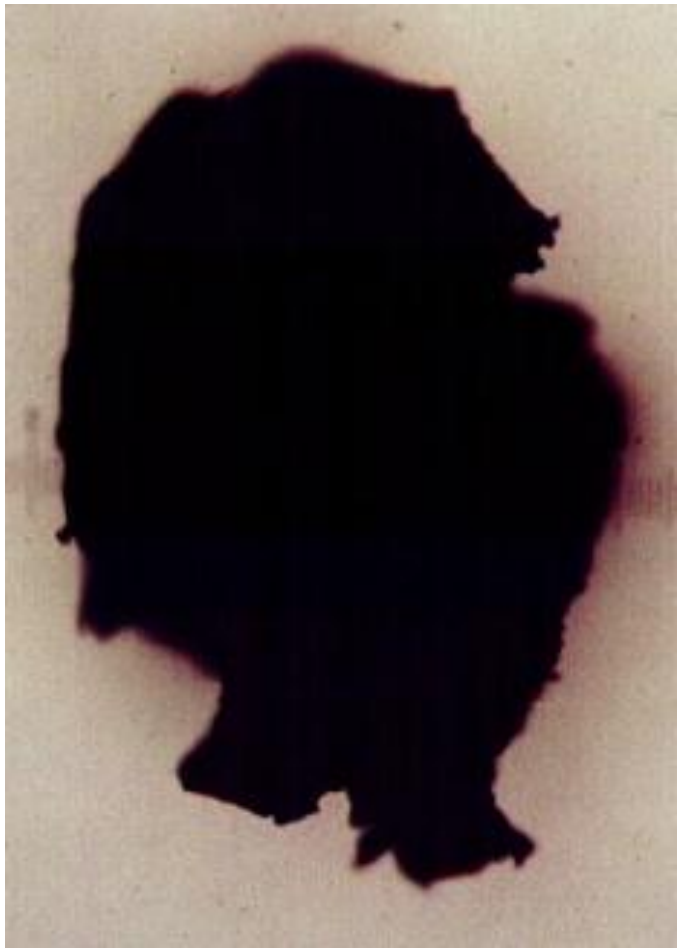


A Change in Acceptance Testing

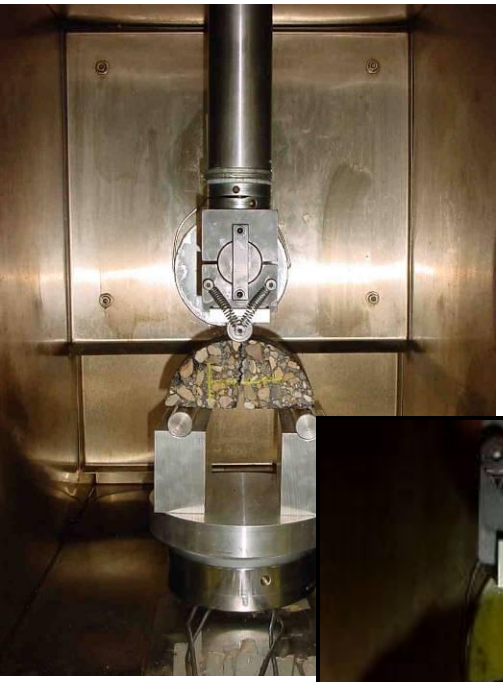
- In 2008, a substantial price spike in asphalt costs struck the paving industry nationwide.
- The use of Reclaimed Asphalt Pavement and Recycled Asphalt Shingles increased to solve the problem of high asphalt costs.
- The performance of RAP and RAS is measured through mix tests, not the liquid binder.
- This is a significant opportunity for Recycled Tire Rubber, as long as it costs less than asphalt and does not increase the liquid requirement (add cost) at the asphalt mix plant.

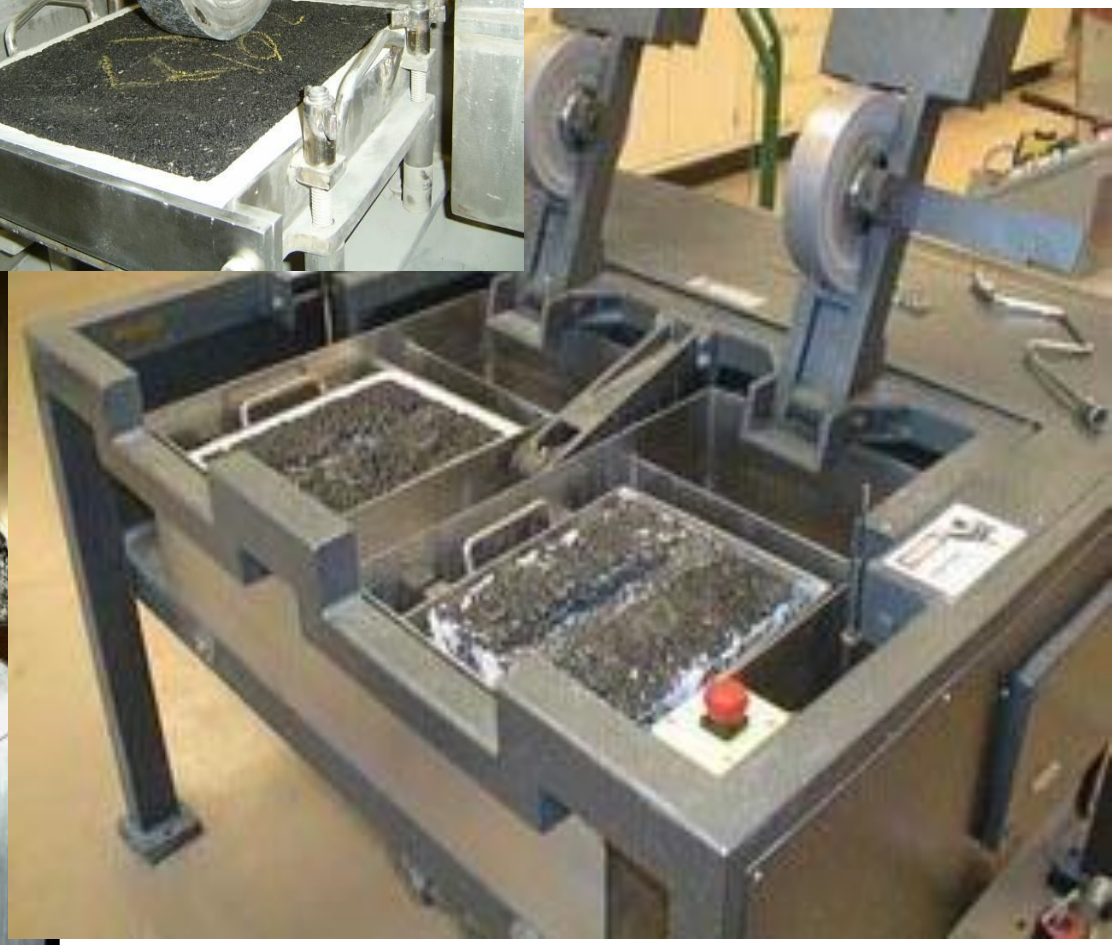
New “Dry Process”

- Research Published at the LTRC, (Sam Cooper and Louay Mohammad), work underway at several Universities and with-in suppliers to the asphalt industry
- Rubber particles pre-treated with useful liquids before packaging, or co-packaged with low melt processing aids or powders before delivery to mix plant
- GA DOT using a co-packaged “Plant Mix” rubber



Mix Performance Tests Are More Common with the Use of RAP and RAS



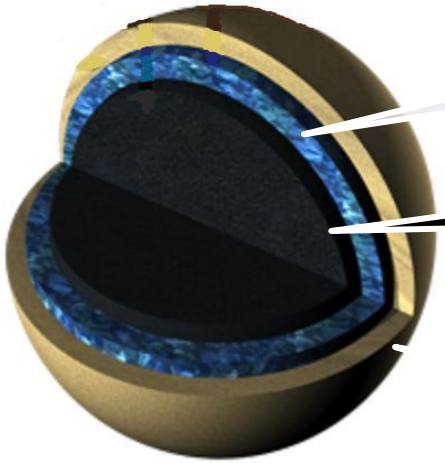


Test Section in Hawkinsville, GA on SR 26

RTR Blended with Reactive Type of Polymer

Blended RTR Being Added To Plant at RAP Collar

PELLETIZED ASPHALT-RUBBER



ASPHALTITE COVERING

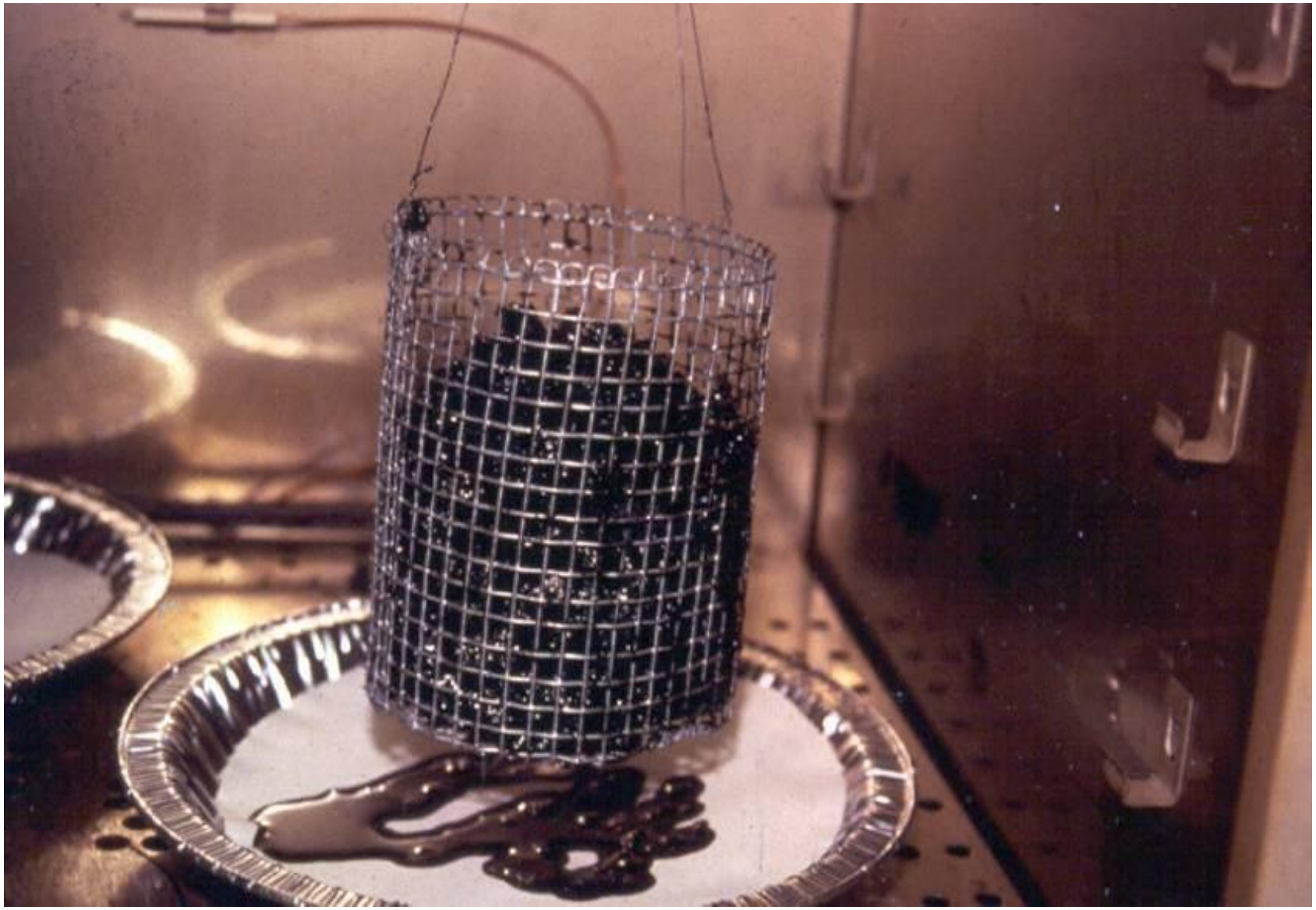
HYDRATED LIME

PelletPAVE™

Providing Asphalt-Rubber Technology
for Pavement Maintenance

Cost Effective and Convenient

Draindown Test for SMA & PFC

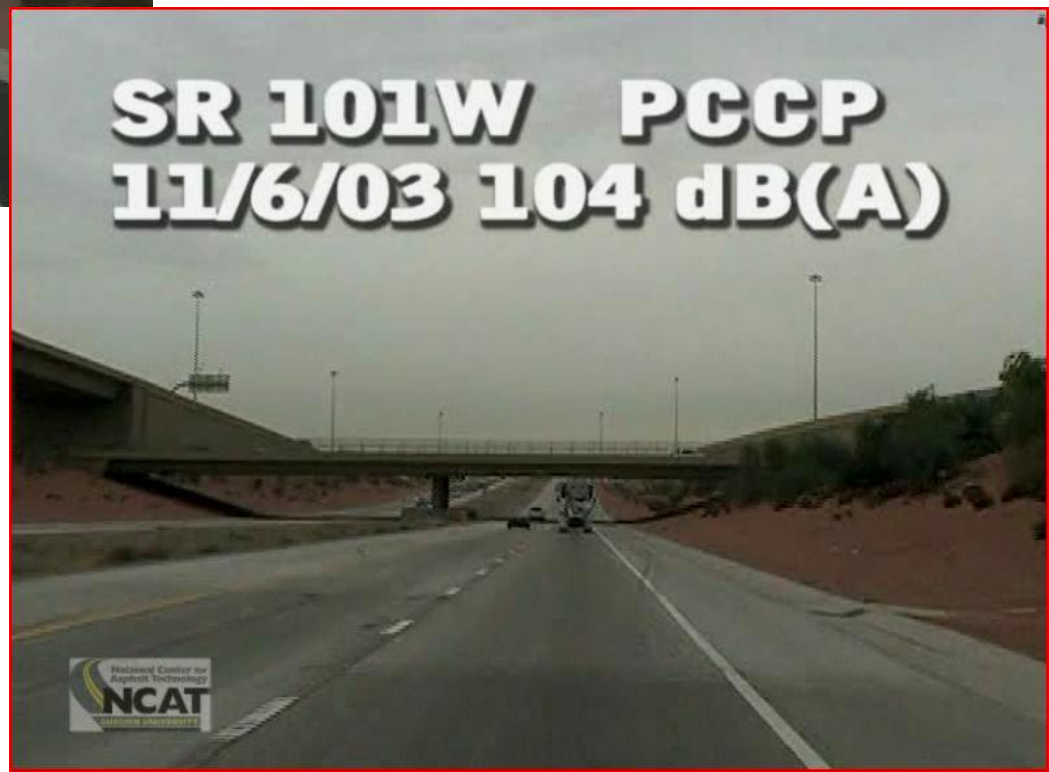


RTR for Polymer Mixes Work Well in Porous Asphalt

Video Courtesy of Seneca Petroleum Co and Modified Asphalt Solutions

Reduce Noise at the Source

A Rubberized Asphalt Surface Placed Over Concrete Reduced the Tire Noise by 13 dB(A) in a Quiet Pavement Project in Phoenix, AZ.



Rubberized Asphalt has the potential to help agencies reduce noise and the cost of sound walls by reducing the height requirement.

US 183 – Williamson Co.

South Bound near San Gabriel River

PFC Mix

Dense Grade (Type C)

Rubberized Asphalt Performs Better, Saves Money, and is Sustainable

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