

New England Contractors Experience with Modified Asphalt

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Pike Industries Inc.

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Pike Industries Inc.

- Established in 1872 by the Pike Family.
 - 1923 Pike purchased the Warren Bros plant which averaged 7 tons per hour.
 - 1949 Milo Pike joined the company. He assumed the management of the company in 1952.
 - The company continued to grow in the 60's and 70's.



Pike in the 80's

- In 1987 Pike produced 1.7 million tons with 25 batch plants spanned across four states NH, VT, ME and NY.
- 1988 Milo sold the company to Oldcastle Inc. and we continued to expand.

Pike in the 90's & 00's

- Under the management of the fifth generation Pike- Randy Keith Pike, Pike has grown to operate in five states (NH, ME, VT, MA and RI).
- Pike produces over 5 million tons of HMA and 8 millions tons of aggregate and employees over 1,300 people.

Styrelf from Koch (Sem Group)

- Produced in 1990.
- Laid on I-89 north of Grantham, NH.
- 7.3 miles.
- To date this pavement is still performing better than any pavements of this age in the state.





Latex

- 1991-1992 Two Projects
- Tilton Resurfacing –
 - Batch Plant
 - Introduced 3% by weight of solids
- Columbia, NH
 - Drum Plant (parallel flow)
 - Drum's pollution system sucked 50% of the latex into the baghouse.
 - No rusting

Latex

- More recently we have used the latex in airports.
 - Typically the designs call for 3% by weight of solids.
 - In the early 90's we also saw the use of TLA incorporated in these designs.

NASCAR BUILDS

- As the sport grew in the 90's new tracks were built and the old ones were repaved.
- This left a lot of fresh pavement on tracks ripe for destruction.
- The second tire war between Goodyear and Hoosier took place in 1994.







Airport Designs for NASCAR?

- 1994 and 1995 saw NASCAR pavements being ripped apart by tires that achieved much higher temperatures and had more grip than in the past.
- Pike modified these designs for use on New Hampshire International Speedway.


1996 Design

- 5% Latex
- PG 64-22 & Trinidad Lake Asphalt
 - 60:40 Ratio
- Fine Graded Mixture – 96% passing the # 4 sieve (3/16”) (Not an Airport Gradation)

Joint Research Project

- The Bahres, the owners of NHIS, and Pike began an extensive research project to determine what mixture would work the best.
- We enlisted Bill Pine and Gerry Huber of the Heritage Group in this effort.
 - Gradation
 - Binder blend

The Gold Standard

1996 Design 	Tested at 40 C		64-28 Chevron w/ TLA and Latex	Average Voids	Indirect Tensil Strength
	Shear @ 10 Hz	Shear @ 0.01 Hz			
	130,483	30,621		6.65	282

...But We Are Not Ready!

- NASCAR Wants Side by Side Racing
- NASCAR Wants the Racing Groove Wider.
- NASCAR Wants a Dual Sloped Track

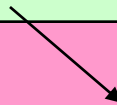
2.9 %TLA +0.5% Latex = 450 F





Tested at 40 C				
Shear @ 10 Hz	Shear @ 0.01 Hz		Average Voids	Indirect Tensil Strength
50,037	20,520	Pike 82-22		
			3.1	264.8
36,425	9,051	82-22 + Koch		
			3.2	157
128,288	29,584	82-22 Koch w/ TLA 60:40		
			6.15	267
130,483	30,621	64-28 Chevron w/TLA and Latex		
			6.65	282

New, Improved & Safer





NASCAR

Winston Cup Series

PF-3200

BLAW-KNOX

CATERPILLAR

Paving in Tandem







Vermont Modified Asphalt

- Roughly 40 % of the binder used on Agency of Transportation's work is 58-34 or 70-28 and at times is modified.
 - Bitumar
 - Petro-Canada
 - Shell

Maine

- DOT uses no modified grades – all binder is 64-28.
- At our urging, the ME Turnpike has used a 70-28 on all of their work for the past few years.

Mixing & Compaction Temperatures

- Skeptical of the mixing & compaction temperatures we receive from suppliers.
- They don't seem to jive with reality in the field.
- NCHRP Study 9-39 may address this issue by the end of this year.

Tender Mix Issues

- These issues have all but evaporated.
 - Finer mixes allow the plants to dry the aggregate better.
 - The industry has become more accustomed to the characteristics of the mixes.



Timing is everything

- Many contractors have issues with traffic and the timing of their operations.
- It is no different in Vermont. Operations are often timed around very strict time tables set up by the local community.
- If our timing was off, we had to wait!
- Here is one of those situations:



Designing with Modified Asphalt

- We do not have any issues designing with these binders.
- We have found that binder contents rarely change when using different grades or the modification process.

Storage at Plants

- Tankage is an issue.
- Industry has not geared up for constant use of modified binders.
- We have received more complaints on odors than before.
 - We are trying different products on called Esco-Sorb

DOT/NEUPG Agreement

- ...any supplier that provides a “modified” asphalt must indicate the type of modification in their **QC Plans** and on their **COA's**.
- Extended to be on the Bill of Lading.
- Very Helpful to Plant Operators.

NEUPG requirement

- **Types of Modification**
- **Block Copolymers (SB, SBS)**
- **SBR Latex**
- **Polyolefins**
- **Engineered Binders**
- **Crumb Rubber**
- **Chemical**
- **Polyolefins (Plastomers)**
- **Molecules containing a simple double bond are olefins**
- **Types of polyolefins**
- **Low Density Polyethylene (LDPE)**
- **Reactive Terpolymer (Elvaloy AM)**
- **Ethylene Vinyl Acetate (EVA)**
- **Polyolefin (Vestoplast)**
- **Functionally modified polyolefin (EE-2)**
- **Amorphous PolyAlpha Olefins (APAO)**
- **Crumb Rubber**
- **Crumb Rubber is made up of two different materials from the waste stream**
- **Reclaimed Rubber (Raw unprocessed rubber)**
- **Recycled Rubber (Processed used tires)**
- **Ground tires can contain a wide range of polymers**
- **Natural Rubber**
- **SBR**
- **Polybutadiene**
- **Tires also contain Carbon Black, Silica and other ingredients**
- **Chemical Modification**
- **Polyphosphoric Acid (PPA)**
- **Oxidized (Air Blown)**
- **Liquid anti-strip**
- **Others**

New Hampshire

- Occasional use of PG 58-34 on new construction & mill and fills.
- Very minor amounts of 70-28
- Toll booths and intersections are paved using Gilsonite.
- 64-28 often is modified with PPA.
 - 1/3 of all 64-28 in the region is modified with PPA.

Some issues reported with PPA

Northern Maine and parts of CT have reported issues using 64-28 modified with PPA.

- Pike has not documented these issues in NH or southern Maine.
- On the contrary, a study done with two 64-28 binders indicated very little difference in lay down characteristics.

Pike PPA Research Project

- Route 28 in Alton NH
- 4,000 tons laid of 12.5 mm with Neat 64-28.
- 4,000 tons laid of 12.5 mm with PMA 64-28.

Findings

- PPA 64-28
 - In place Voids = 5.1
 - Pay Factor = 1.04
 - Ride RN = 4.08
 - Temp. after finish roll =
132.5
- Neat 64-28
 - In place Voids = 5.8
 - Pay Factor = 1.01
 - Ride RN = 4.05
 - Temp. after finish roll =
141.5 F

No Clear Winner or Loser

Route 28 Research Project Modified vs. Neat Binders

Test	Temp	PPA Modified	PPA cores	Change in PPA binder	Virgin un-modified	Un-modified Cores	Change in Un-modified Binder
Specific Gravity	77°F	1.032	1.040	0.008	1.032	1.042	0.010
Specific Gravity	66°F	1.038	1.046	0.008	1.039	1.048	0.009
API		4.82	3.73	-1.09	4.75	3.49	-1.26
LBS /GAL		8.654	8.724	0.070	8.658	8.739	0.081
Rotational Viscosity	135°C	0.433	0.574	0.141	0.475	0.823	0.348
	165°C	0.128	0.158	0.030	0.143	0.205	0.062
Mass Loss		-0.122	-0.801	0.679	-0.687	-1.202	0.515
Original Binder							
DSR: G*/Sin Delta	64°C	1.098	2.193	1.095	1.312	3.492	2.180
Min. 1.00 kPa	70°C		1.047			1.688	
RTFO Residue							
DSR: G*/Sin Delta	64°C	2.876	4.744	1.868	3.614	8.741	5.127
Min. 2.2 kPa	70°C		2.191			4.239	
PAV Residue							
DSR: G* Sin Delta	22°C	2587	3905	1318	3533	4814	1281
Max. 5000 kPa	25°C		2675			3312	
	28°C		1804			2242	
	31°C		1213			1503	
BBR Creep Stiffness							
Stiffness (S)	-12		107			130	
Max. 300 MPa	-18	198	222	24	264	285	21
M-Value	-12		0.348			0.354	
Min. 0.300	-18	0.309	0.301	-0.008	0.317	0.300	-0.017

SBR Latex in OGFC

- MA has adopted a program several years ago requiring the use of 3% solids in their OGFC.
- This went well and is probably a worthwhile application.

HM³ from The Hudson Companies

- Elastomeric Friction course (OGFC)
- Some problems with Tank Storage
 - Need to store in heated tankers at Plant Site.
 - Varying temperatures can be problematic with drum plant
 - Again, some odor issues need to be overcome.

Thank You

- Questions
and

Happy Trails