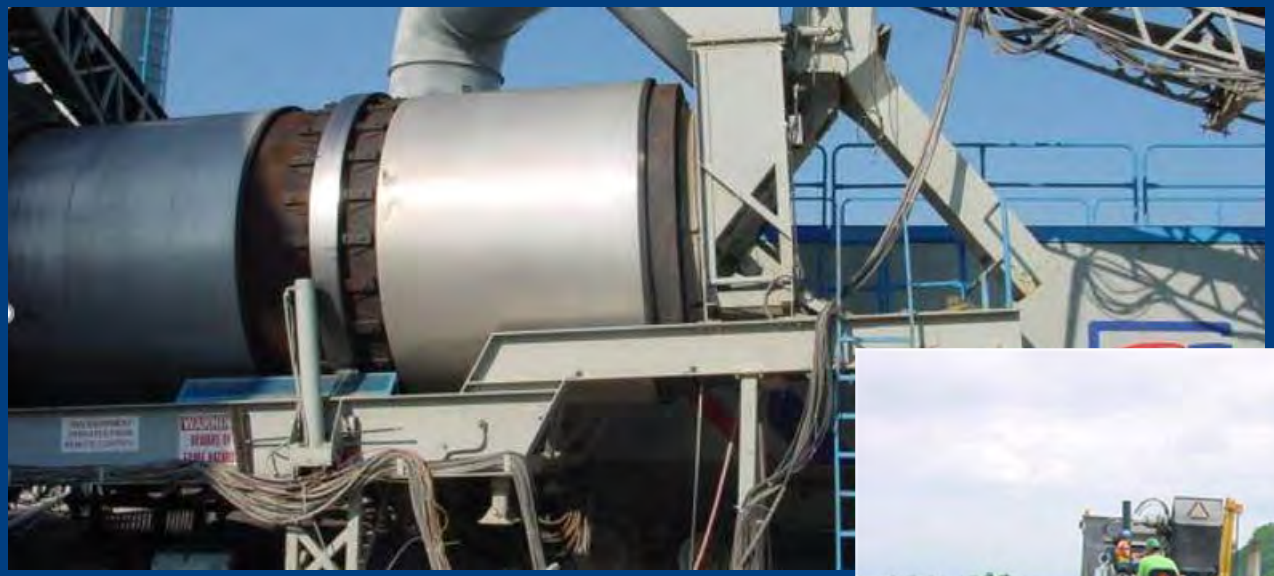
2023 PAPA REGIONAL CONFERENCE



KEVIN GNEGY, MARCH 2023

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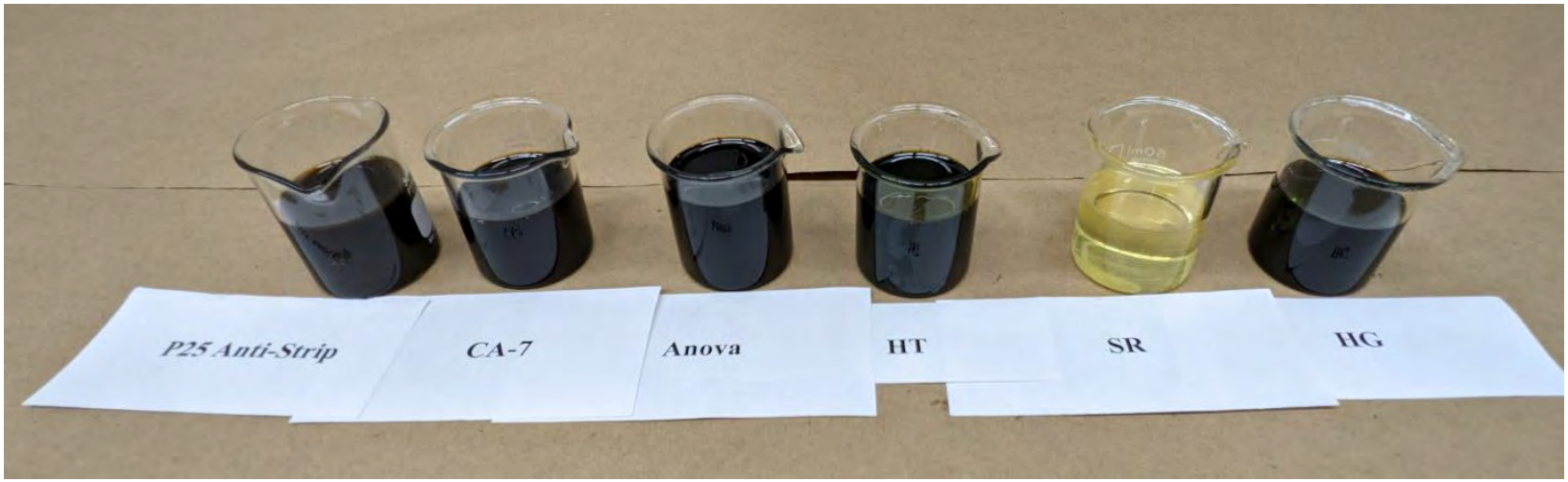
RESEARCH/PILOTS

- Rejuvenator Research Project
- Recycled Plastic in Asphalt
- Post-Consumer Shingles Research
- Fiberless SMA and 5% ≤ 10% RAP
- VRAM
- HiMA

ASPHALT REJUVENATOR RESEARCH - COMPLETED



- Two Principal Categories of Rejuvenating Agents (RA's)
  - Petroleum Based
    - Paraffinic oil, aromatic extracts, engine oil
  - Plant Based (Bio-Based)
    - vegetable oil (virgin, modified, or waste), tall oil

OUTCOMES

- Effects on asphalt properties.
  - Softening effects, dosages, interaction with RAP/RAS, …
    - Inline Blending or Marination of RAP/RAS
- Effects on long term aging resistance.
  - Proved to be effective both short term and long term
- Evaluation performed through Binder Testing and Mixture Testing.

OUTCOMES

- So… What did we find out??
  - Cracking could be mitigated at higher RBR's
  - HWTT rutting typically decreased, as expected.

- Final report is published and includes usage guidelines.

- Next- Determine test(s) for performance evaluation of rejuvenators and mixtures. (Bulletin 15 & Bulletin 27)
  - Future pilot projects.

RECYCLED PLASTICS IN ASPHALT

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RECYCLED PLASTICS IN ASPHALT

- Research project initiated with PSU- July 2022. Anticipated completion Sept. 2025

  - Work on going…
  - Three pilot projects- Two completed Dist. 6 & Dist 11. One planned for Dist. 8 in 2024.
  - Includes field & lab testing from pilot projects .

  - Stay tuned…

POST-CONSUMER SHINGLES

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POST-CONSUMER SHINGLES

- Current Policy-

- PennDOT allows up to 5% of the mix to be from manufacturer waste asphalt.

- PennDOT specifications do not currently allow post-consumer shingles to be used in asphalt pavements.

POST-CONSUMER SHINGLES

- Research project Completed 2021
  - Three pilot projects- Districts 1, 2 & 6 in 2022
  - Includes field & lab testing from pilot projects .
  - Work on going…
    - Specification changes, review & refinement

POST-CONSUMER SHINGLES

- Post-consumer shingle processing requirements?
  - Contamination- Nails, wood, residual waste
  - Environmental concerns (asbestos).
  - Post-consumer shingle mix design requirements and techniques?
  - Performance related testing available to evaluate mix design performance.

5% ≤ 10% RAP IN SMA PROJECT

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5% ≤ 10% RAP IN SMA PROJECT

- **Illinois DOT** allows the use of up to **15% of FRAP** in SMA mixes
- **Illinois Tollways** allows up to **20% of FRAP** in SMA mixes
- **Virginia DOT** allows up to **20% of RAP** in wearing courses
- **Maryland State Highway Administration** allows up to **20% of RAP** in SMA
- **Texas DOT** allows up to **15% of FRAP** in wearing courses
- **Alabama DOT** allows up to **20% of RAP** in SMA
- Pennsylvania **10% RAP** pending research.

RAP IN SMA RESEARCH PROJECTS

District 11 - **Allegheny Co.**

- ECMS 91790 - Let 2/28/2019
- SR 0885 (Boulevard of the Allies)
- Mill, scratch, and overlay with 1.5” 9.5mm SMA
- Paved in 2019 Construction Season.

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RAP IN SMA RESEARCH PROJECTS

District 4 - Lackawanna Co.

- ECMS 102557 - Let 6/6/2019
- SR 6006, Mill, scratch and overlay with 9.5mm SMA
- Paved in 2021 Construction Season.

USAGE OF 5% ≤ 10% RAP IN SMA

- This change would allow Districts to choose to allow up to 10 percent recycled asphalt pavement (RAP) in SMA mixtures. ***Districts would have the option of bidding Virgin or RAP SMA – Different Item Numbers and Descriptions***, due to this being a premium mix.

FIBERLESS SMA

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FIBERLESS SMA

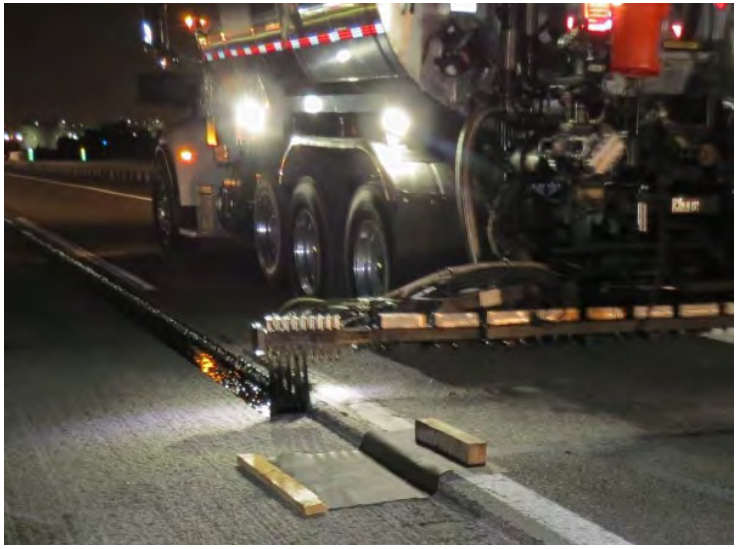
- ***Brief explanation on this presentation, as this topic is being presented later today…***
- Cellulose fibers – One tool to control draindown.
- Why permit to eliminate cellulose fibers ??
  - **Cost** of equipment, additional labor, fibers.
  - Plant typically dedicated to SMA material only during production.
  - Fibers clumping during production & placement **(PIB !)**
    - Correction factors affected...
    - Fiber clumps in mat.
    - Absorb additional asphalt.

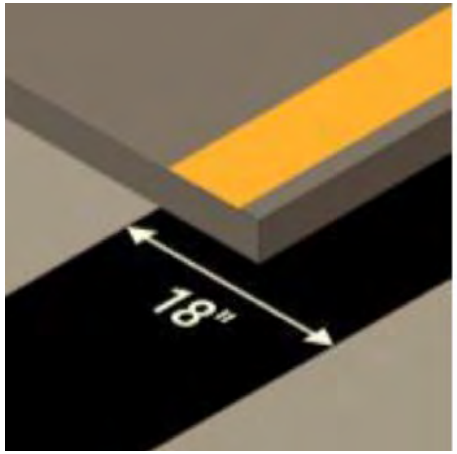
FIBERLESS SMA

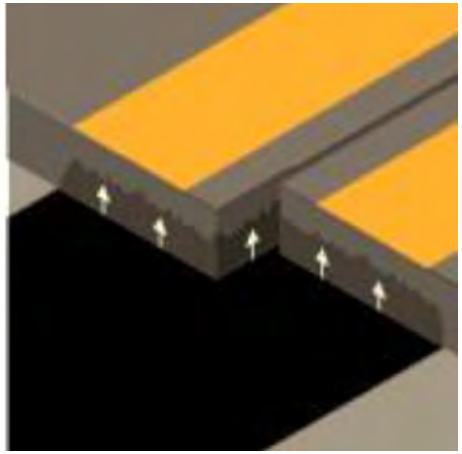
- How can we eliminate fibers ??
  - Utilizing WMA technologies that we now have available.
    - Lower production Temp's. to control drain down.
  - Slight reduction of AC content and VMA due to removal of fibers.
    - Less surface area & absorption.
- Lower Temp's coupled with WMA technologies can have a significant increase in fatigue resistance while still having a workable & compactable mix…
- ***Detailed presentation of pilot production & placement later today…***

QUICK UPDATES - VRAM & HIMA

- ***Quick updates:***
  - Void Reducing Asphalt Material **(VRAM)** for Longitudinal Jt's.
    - Pilots continuing across State.
    - Currently in Clearance Transmittal #1 (CT#1).







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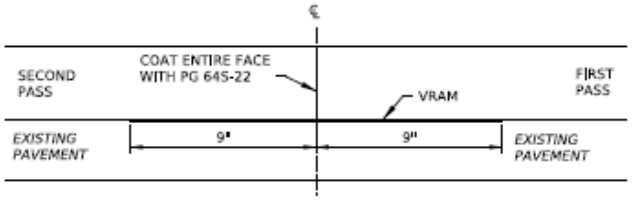
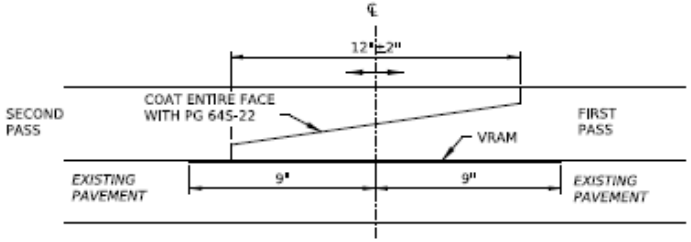
VRAM

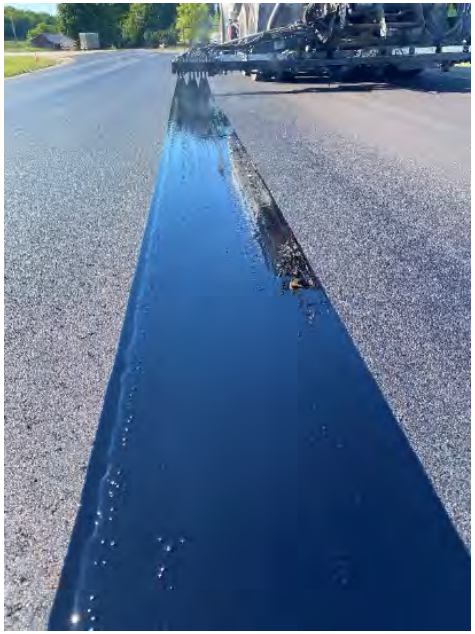
- Draft RC-28M :
  - Heavy/thick application of polymer modified asphalt at joint.
    - Wicks up into wearing course at joint (Weakest link in mat).
      - Reduces air voids in joint area.



VRAM VERTICAL JOINT DETAIL



VRAM NOTCH WEDGE JOINT DETAIL



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HIMA

- **Hi**ghly **M**odified **A**sphalt **(HiMA)**
  - Polymer content 7% - 8%. About twice the amount of traditional polymer modified asphalts, e.g. PG 64E-22.
  - Used for high ESAL roadways to alleviate rutting and increase life, up to 10X rutting and fatigue resistance. Another tool in the box…
  - Pilots continuing across State.
  - Goal- Future inclusion into PennDOT Spec's/Pubs.

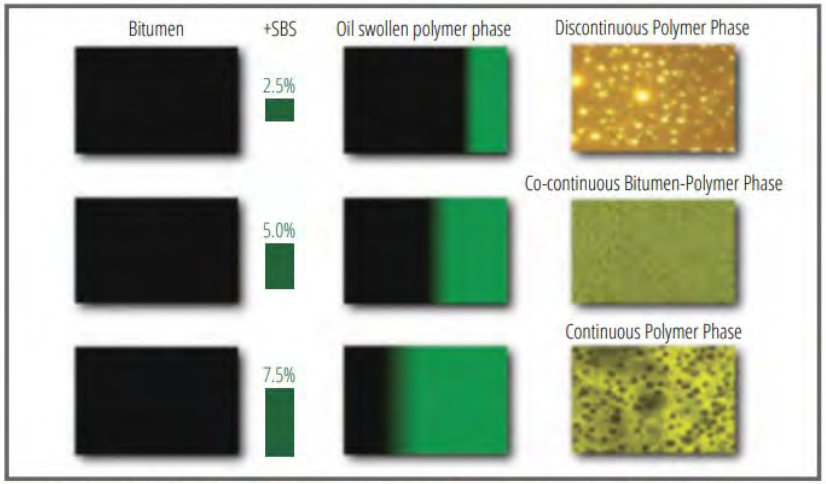

Figure 1. Effect of increasing styrene-butadiene-styrene polymer content on binder/polymer morphology (Source: Kraton Polymers)

HIMA (PG 76E-28HP)

Property		AASHTO Test Method	Requirements by Performance Grade
			PG 76E-28HP
ORIGINAL BINDER			
Flash point temp, °C		T 48	230 min.
Rotational Viscosity, Pa·s	Test temp @ 135°C	T 316	3.0 max.(1)
Dynamic Shear, kPa ($G^*/\sin\delta$, 10 rad./sec.)	Test temp @ 76°C	T 315	1.00 min.
RTFO RESIDUE			
Mass Change %		T 240	1.00 max.
MSCR, Extremely Heavy Traffic "E", Test Temp @ 76°C	J_{nr} at 3.2kPa^{-1}	T 350	0.1 max.
	% Recovery at 3.2kPa		90 min.
	J_{nr} % Difference		--
PAV RESIDUE, conditioning temp, time, pressure		R 28	100°C, 20 h, 300 psi
Dynamic Shear, kPa ($G^*\cdot\sin\delta$, 10 rad./sec.)	Test temp @ 28°C	T 315	6000 max.
Creep Stiffness, *S*, MPa	Test temp @ –18°C	T 313	300 max.
Creep Stiffness, *m*-value			0.300 min.
Notes	**The Representative may approve an increase in the Rotational Viscosity Limit to 5.0 Pa·s if the binder supplier and Paving Contractor agree that the binder is suitably workable.**		

THANK YOU

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