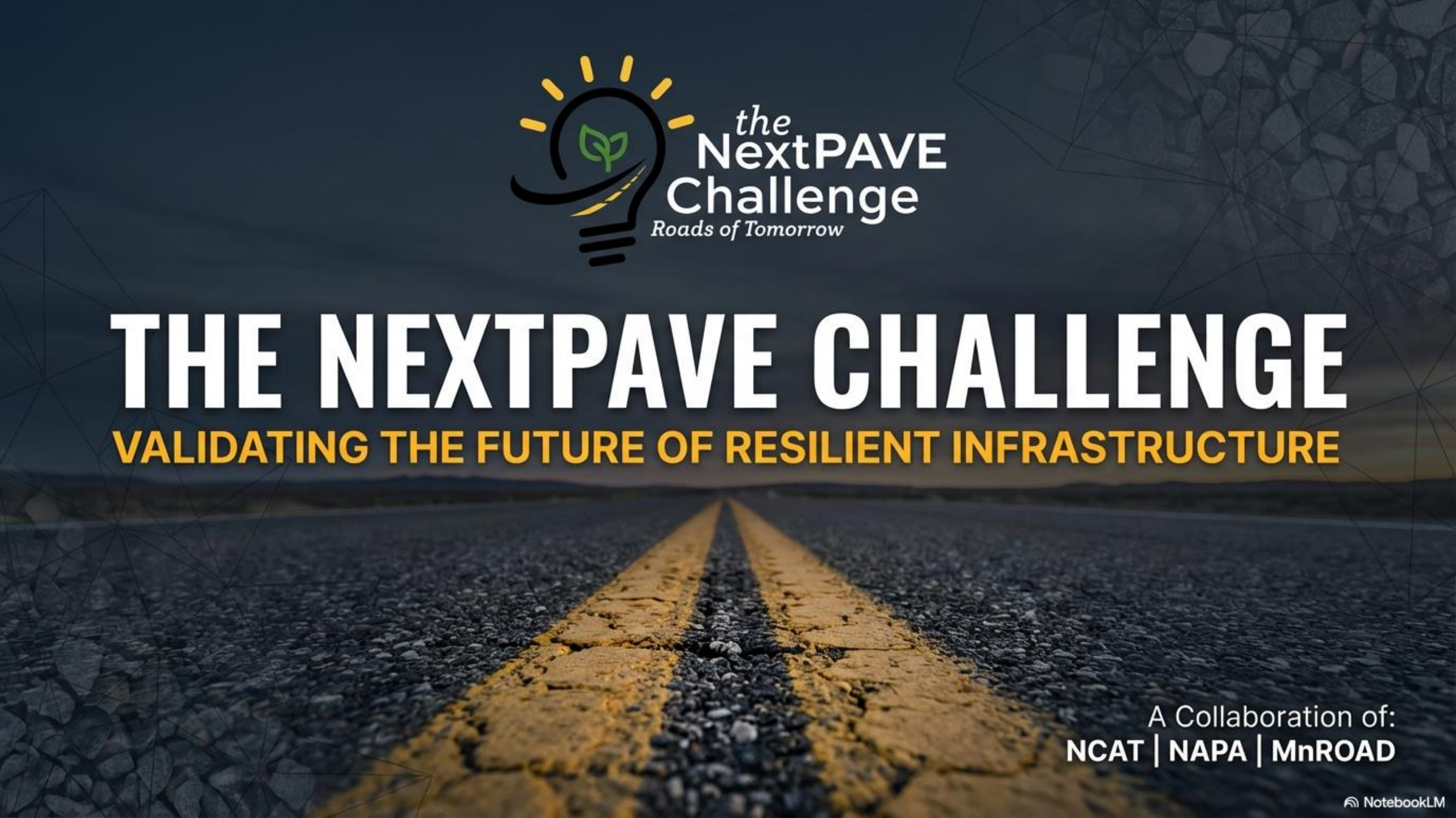

the NextPAVE Challenge
Roads of Tomorrow
THE NEXTPAVE CHALLENGE
VALIDATING THE FUTURE OF RESILIENT INFRASTRUCTURE
A Collaboration of:
NCAT | NAPA | MnROAD
NotebookLM

# A COALITION FOR INNOVATION

National Center For Asphalt Technology
NCAT
AT AUBURN UNIVERSITY

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

MnROAD
SAFER, SMARTER, SUSTAINABLE PAVEMENTS THROUGH INNOVATIVE RESEARCH

## THE MISSION

To identify, evaluate, and advance high-potential pavement technologies through a structured, transparent, and rigorous process.

## THE CONTEXT

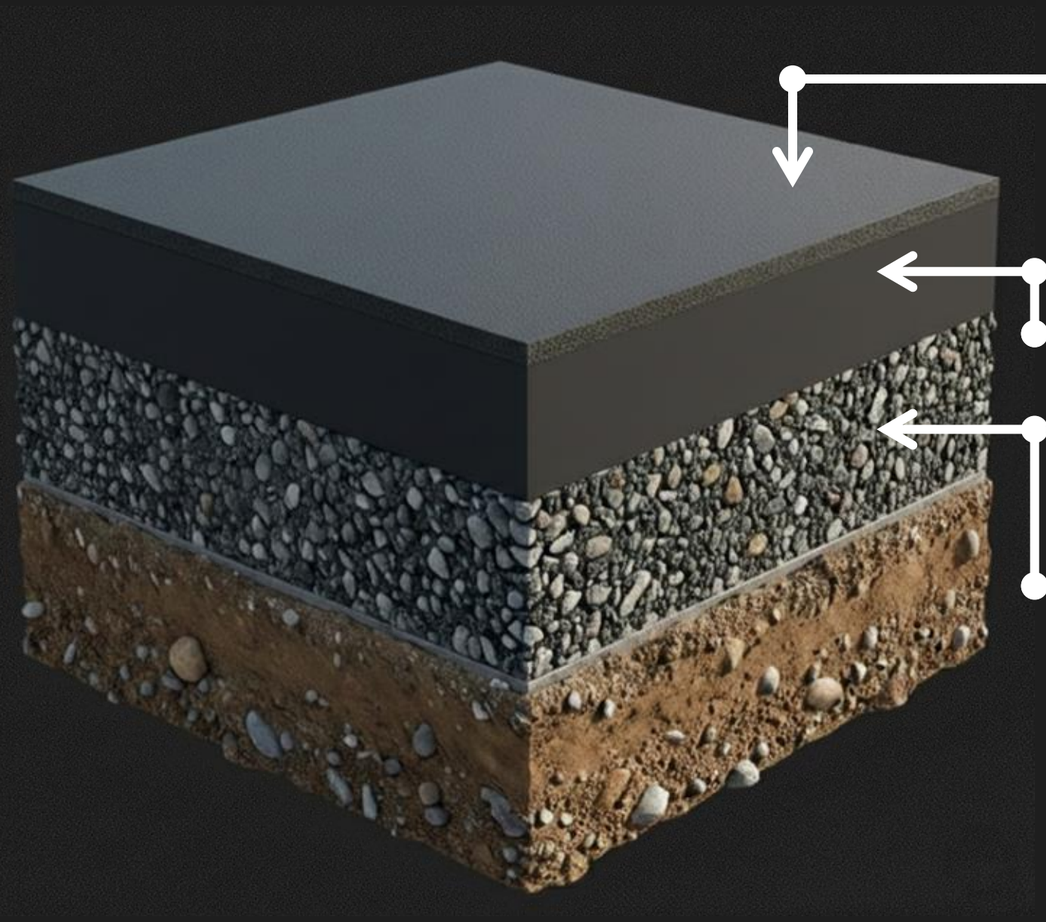
With 94% of U.S. roads paved in asphalt, the industry demands solutions that drastically reduce life-cycle costs and enhance long-term performance.

## THE GOAL

Accelerate the adoption of market-ready solutions for durability, sustainability, and resiliency.

NotebookLM

# INNOVATION AT EVERY LAYER



## CATEGORY 1: ON THE ASPHALT

Surface rejuvenation, friction treatments, noise-reducing surfaces, and preservation.

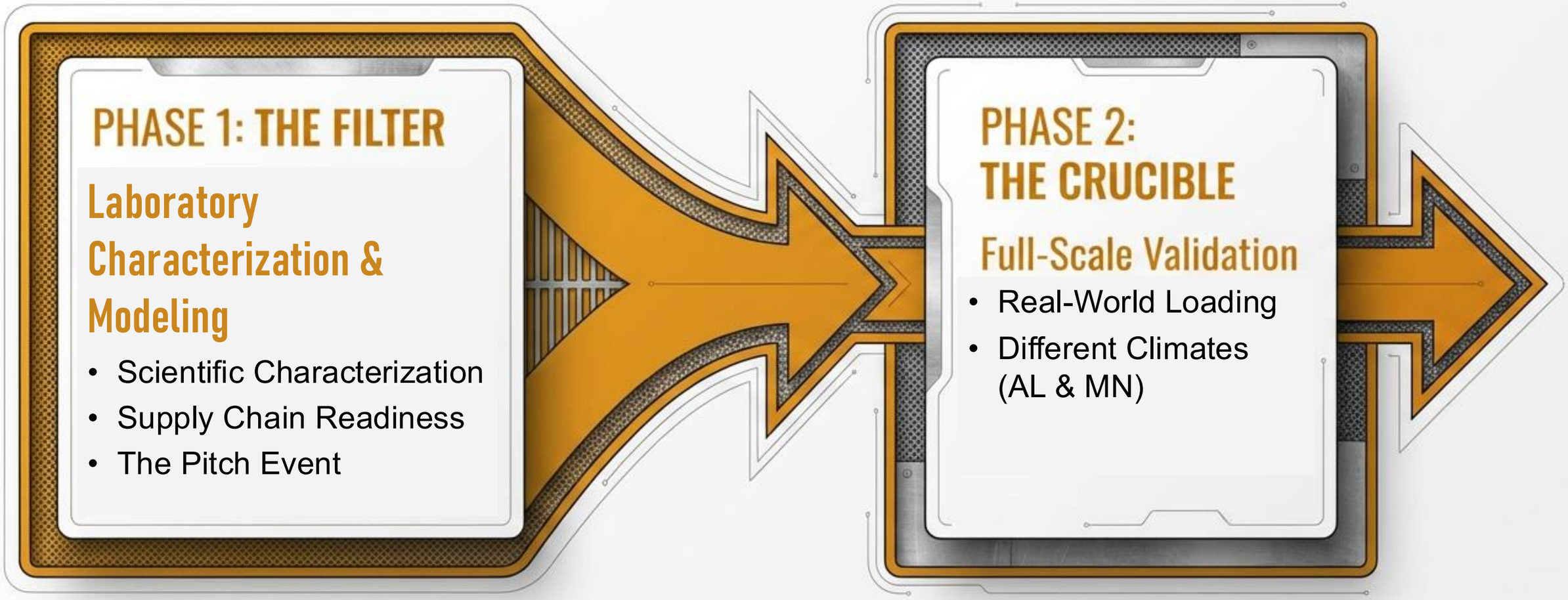
## CATEGORY 2: IN THE ASPHALT

Mix additives, alternative binders, chemical additives, and recycled material facilitators.

## CATEGORY 3: BELOW THE ASPHALT

Soil or base stabilization methods.

# THE EVALUATION ECOSYSTEM




A rigorous, science-based pathway from the lab to full-scale national implementation.

NotebookLM

# PHASE 1: LAB, LOGIC, & SCALABILITY

The Gatekeeper Phase ($25k Entry)



## TESTING & MODELING

Laboratory characterization utilizing advanced pavement modeling (FlexPAVE™ & PerROAD).



## SCALABILITY

Rigorous assessment of supply chain capacity to ensure technology can meet national infrastructure demand.



## THE PITCH

Technology providers present to an independent panel of expert judges, supported by NCAT data.

Note: NDA participants are permitted for testing but cannot advance to Phase 2.

NotebookLM

# PHASE 2: THE ULTIMATE STRESS TEST



## NCAT Test Track (2027)

- Accelerated Heavy Truck Loading
- Extreme Southern Heat

## MnROAD Facility (2028)

- Freeze/Thaw Cycling
- Extreme Cold Weather Performance

Fully funded by a consortium of state highway agencies and private-sector sponsors seeking proven solutions.

NotebookLM

# THE PATH FORWARD




***Accelerating the development of pavement systems that last longer, cost less, and serve the future.***

eng.auburn.edu/the-nextpave-challenge/

On the Asphalt

Corrective Asphalt Materials

PAVE, LLC

Pavement Technology, Inc.
Real Science. Real Results.

In the Asphalt

DOW

ingevity

Innophos

Cargill

ITERCHIMICA

ARKEMA

UNIVERSAL MATTER
ADVANCED MATERIALS

certainteed
SAINT-GOBAIN

Hi-Tech
ASPHALT SOLUTIONS

NEW RUBBER TECHNOLOGIES
Innovating Unique Compounds

aerogel coating
TECHNOLOGIES

necoPave

ChemCo Systems

PUMA
ENERGY

REGEN RBR
Sustainability through innovation

KRATON

DRIVEN
PLASTICS

Western Research
INSTITUTE

Below the Asphalt

Zydex
Innovating for Sustainability

Tensar

ARKEMA

SURFACE TECH

# TECHNOLOGY INFORMATION

The following technology overview slides were provided by the individual technology developers.

Each organization is solely responsible for the accuracy and content of its slide. Inclusion in the NextPAVE Challenge does not constitute an endorsement, recommendation or validation by NCAT, Auburn University or the NextPAVE Challenge Steering Committee.

Corrective Asphalt Materials

**5–7 Years**
Added pavement service life

**50+ Years**
Field performance documented

**50M sq yds**
Treated by CAM annually



# Reclamite®

## Maltene-Based Spray-on Rejuvenator

**MRT**

### Maltene Replacement Technology
Restores asphaltene/maltene balance; penetrates up to 1" into the pavement

**ROI**

### Maximum Life-Cycle Return on Investment
Best if applied within 1–2 years of new construction or overlay

**APPLY**

### Sprayed like a Fog Seal
One pass, light coat of sand; traffic ~30 min

**DOT**

### 50+ Years on State & Local Roads
New pavements, state routes, county roads, city streets, chip seals & microsurfacing

**DATA**

### Up to 63% Viscosity Drop
Springfield, MO study: 54% lower viscosity vs. untreated at 3 years post-treatment

www.correctiveasphalt.com • (800) 374-5560

**Pavement Technology, Inc.**
Real Science.
Real Results.

## 5–10 Year
Pavement life extension

## NOx & VOC
Pollutants removed

## LEED & ISI
Sustainability credits

*U.S. Green Building Council & Sustainable Infrastructure*



# PlusTi™ A.R.A.-1 Ti®

Asphalt Rejuvenator / Sealer

*America's First $TiO_2$-Enhanced Photocatalytic Rejuvenator/Sealer*

**MRT**

## Maltene Replacement Technology
Restores asphalt flexibility & extends pavement life 5–10 years

**PCT**

## Photo Catalytic Technology
$TiO_2$ & sunlight remove nitrogen oxides (NOx) & volatile organic compounds (VOCs)

**UHIE**

## Urban Heat Island Effect Mitigation
Solar-reflective surface reduces heat absorption & radiative forcing

**$H_2O$**

## Stormwater & Microplastic Reduction
Super-hydrophilic surface supports stormwater management

www.pavetechinc.com • 1-800-333-6309



ePAVE is a two-component polymer modified Portland cement mortar applied to asphalt.

The first component is a dry ingredient powder, the second a liquid polymer emulsion resin.

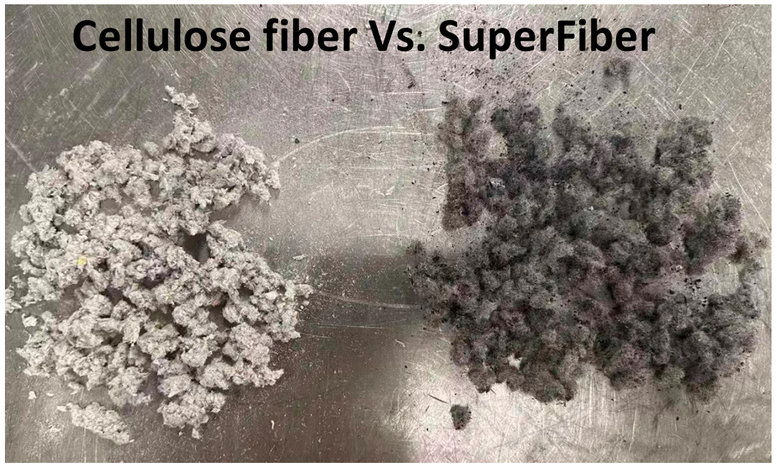
- Extends pavement life while mitigating urban heat island effects
- Rapid installation
- Quick return to traffic
- Protects against UV rays, rain, snow, road salt, chemicals, fuels and lubricants

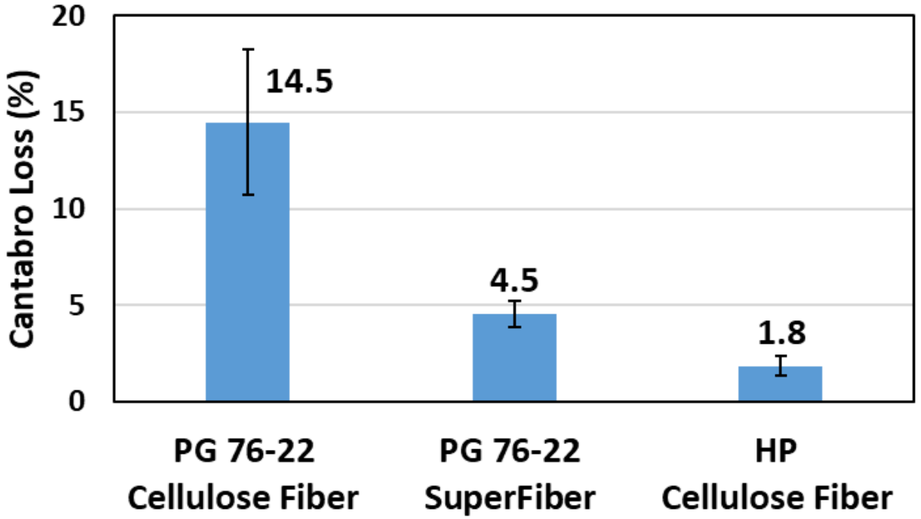


# SuperFiber: A cost-effective strategy to improve OGFC Durability

- OGFC is prone to **premature failures** (i.e., raveling).
- High-polymer (HP) binder is commonly used to improve OGFC durability, increasing cost by about **$15 per ton**.
- SuperFiber is a proprietary synthetic stabilizing fiber designed to reduces raveling, improves fatigue resistance, and increases moisture durability.
- SuperFiber dosage in OGFC mixture is **0.3%.**
- Replacing the traditional cellulose fiber with SuperFiber could increase the cost by about **$3 per ton**.
- SuperFiber offers a cost-effective, high-performance solution for **extending OGFC service life** while maintaining excellent surface friction and drainage.

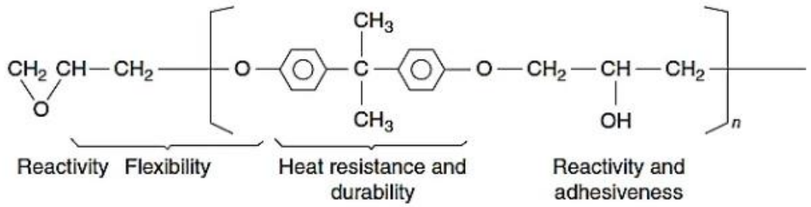
Hi-Tech ASPHALT SOLUTIONS



# High Performance OGFC using Epoxy Asphalt Binder

ChemCo Systems










- The epoxy asphalt binder includes flexible epoxy polymer (thermoset) and mixture of specialized asphalts.
- Performance advantages of epoxy asphalt binder
  - Excellent rutting and shoving resistance
  - Excellent fatigue resistance and durability
  - Superior aging resistance to oxidation aging and resiliency loss
  - Providing high strength bond to the underlying substrate
- OGFC is prone to premature failures (i.e., raveling).
- Epoxy asphalt has been used as an extremely durable binder for OGFC mixtures in New Zealand and Netherlands.
- Lab testing and field trials from the New Zealand project suggest that OGFC surface life could increase by approximately 4 to 5 times.

# Low Temp HiMOD and Next-Gen HP Polymers

## Study Overview

Ingevity's Evotherm WMA technology in combination with a new innovative Kraton SBS Polymer will enhance the performance of HiMOD, which is widely used in Utah and currently being piloted by DOTs across the nation.

The HiMOD dense-graded mixture design in this study uses locally sourced aggregates and 20% RAP, designed to 1% air voids, utilizing a high performance (HP) binder (MSCR>90%R, <0.1 $Jnr_{3.2}$).

## Objectives

1. **Reduce Traditional HiMOD Production Temperatures** - minimizing binder oxidation, hitting target density and cutting emissions.
2. **Reduce Polymer Loading** - using the new Kraton MD1199 HP Polymer at a reduced polymer loading with the same binder quality.
3. **Validate Field Performance** - prove both technologies together ensure successful production/construction and the longest-lasting, best-performing pavement.

KRATON™

EVOTHERM®
WARM MIX ASPHALT TECHNOLOGY

# INNOVALT® Amplify

Innophos

## A cost-efficient, upcycled additive that enhances the SBS polymer network

**Easy-to-Use & Highly Compatible**

**Enhances Performance**

**Economical & Eco-friendly**

| Sample | Neat 58-28 | +1.0% Linear SBS | +1.0% SBS + 1.5% Amplify |
|---|---|---|---|
| MSCR @ 64°C (T350) | Failed | Failed | V |
| % Recovery 3.2 kPa (T350) | 0.0 | 3.7 | 44.7 |
| Separation (D7173) | N/A | Passing | Passing |

% RECOVERY

12x HIGHER!

**Blending Temp:**
163 - 180 °C

**Form:**
Solid, granular

LONGER LASTING ROADS • COST SAVINGS

# *Genable*™ Pavement: Wet Addition

Graphene-enhanced asphalt modifier engineered to improve road durability and extend pavement service life.

**Dry addition validated**
HMA plant + NCAT / field trials

→

**Wet addition launched**
Blend into binder at terminal

## Product benefits

**Terminal-ready adoption**
Added into liquid binder at the bitumen terminal using standard mixing equipment.

**Balanced durability performance**
Improves rutting, fatigue cracking, stripping, and low-temperature durability.

**Superior economics**
Economic advantage due to the reduced dosage rate vs. SBS (Target Range: 2–2.5% Genable™) and no cross-linker

**Sustainability + Aging**
Improved aging and weathering resistance leading to longer-life pavement potential.




Universal Matter Inc.'s polyhedral graphene with advanced polymers creates a high-performance additive designed to outperform conventional modifiers.

National Center for Asphalt Technology NCAT at AUBURN UNIVERSITY

**Dry-addition proof point**

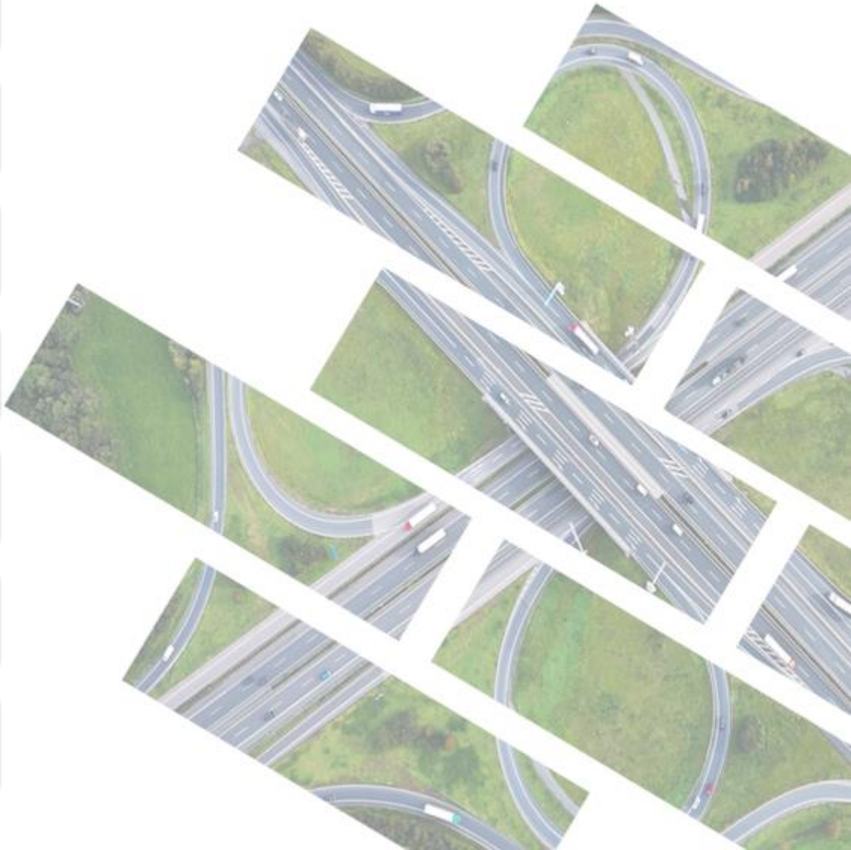
+7M ESALs applied • minimal rutting • no cracking • steady IRI • improved aging & weathering resistance

**Now scaling into a terminal-additive wet application.**

# High Polymer Pavement Innovation with High Elasticity ELVALOY™ Copolymers

A reactive elastomeric terpolymer designed to enhance binder performance and enable more durable, high-performance pavements

- **Novel high-elasticity resin** designed for HP binder specifications
- **Low dosage (2–4 wt%)** required to meet high polymer (HP) specifications
- **Up to 4 PG grade bumps**
- **Faster processing** that boosts production throughput
- **Permanent chemical bond with binder** enabling long-term storage stability
- **Meets viscosity targets** for reliable field workability
- **Domestic manufacturing** supports Buy America alignment and reduces supply chain risk



# High Elasticity ELVALOY™ Copolymers + rPE Modified Binder Targeting HP Binder Performance

## Driven Plastics + Dow

Combines High Elasticity ELVALOY™ Copolymers from Dow with post-consumer recycled polyethylene (rPE) processed by Driven Plastics to develop a modified asphalt binder targeting High Polymer (HP) binder performance from a neat base binder.

NCAT will evaluate the system in a RAP and high-polymer mix design with increased asphalt content and lower design air voids, compared against NCAT's conventional HP binder benchmark.

## Value to DOTs and Industry

- Creates a high-value reuse pathway for hard-to-recycle rPE
- Targets HP binder performance in a controlled modified binder system
- Supports rutting, fatigue cracking, and long-term aging performance
- Supports Buy America alignment and reduces supply chain risk



*rPE material by Driven Plastics*

Elvaloy™ copolymers for alloys by DOW

DRIVEN PLASTICS

ITERCHIMICA

# ITERLOW 2000: The Two-in-One Solution for Sustainable Pavements

Advanced bio-based chemical technology trusted across 5,000+ miles of laid asphalt.

## Dual-Action Mechanism




**Dosage:** 0.2% – 2.0%
(by binder weight)

## Lab Test Results

*WMA Technology (WMA vs. HMA)*

**-35°F**
**Reduction**
in Mixing Temperature, from 310°F to 275°F

**-15°F**
**Reduction**
in Compaction Temperature, from 290°F to 275°F

**+7.5%**
**Increase**
In TSR, from 75.0 to 82.5%

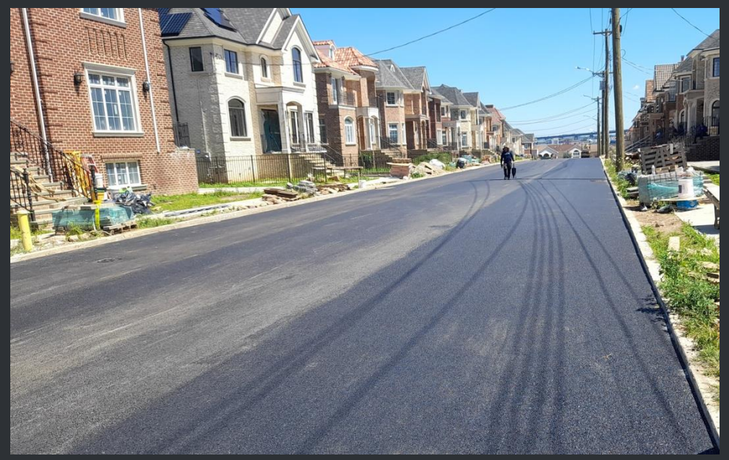
*Rejuvenation (HMA vs. HMA+45% RAP+ITERLOW)*

**+20.3**
**$N_f$ Cycles**
increased from 225 to 245.3
(Tex 248-F)

**+0.9**
**$CT_{Index}$**
Increased from 14.6 to 15.5

**Restored PG Grade**
After 2 PAV cycles

## Field Project in the U.S.



**Application**
1.5-inch surface lift

**Binder**
PG 70-22

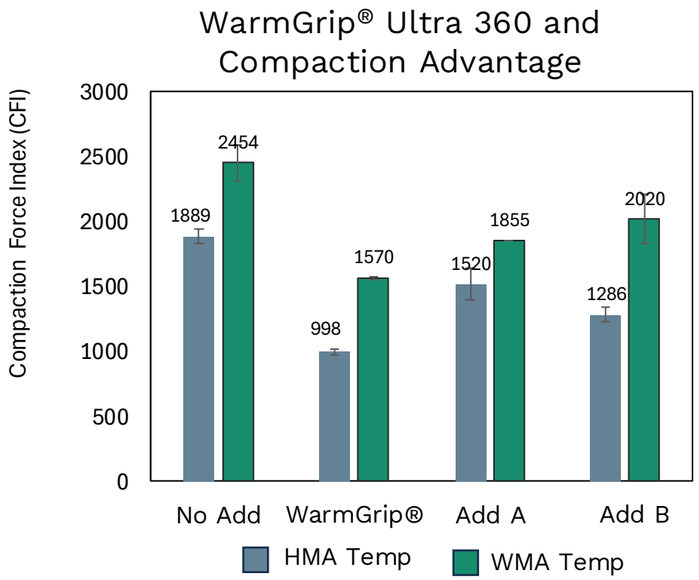
**Dosage**
0.5% by binder weight

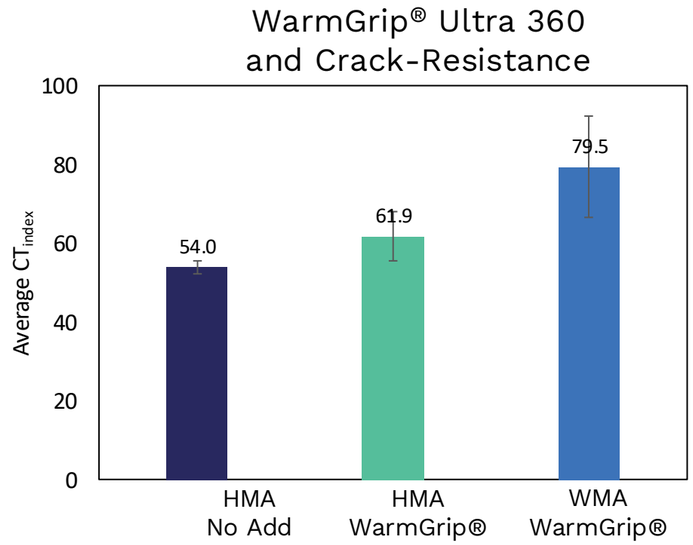
**Temperatures**
284±9°F Production
248±5°F Compaction

# WarmGrip® Ultra 360

## WARM MIX ADDITIVE – BALANCED PERFORMANCE

- WarmGrip® Ultra 360 offering balanced mix performance:
  - Excellent anti-stripping performance
    - NTPEP / PEAS published data
  - Improved RAP incorporation
  - Reduced compactive effort at WMA temp.
  - Geared to support BMD adoption and improving crack-resistant performance



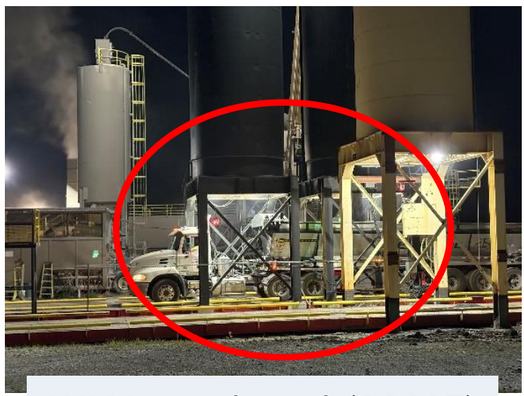

- True warm mix performance:
  - Capable of true warm mix
    - Maintains workability in the mix
    - Incorporates high RAP % (40+%)
  - Improves EPDs / blue smoke elimination
    - Immediate effect at lower temp production



HMA produced (340°F)



WMA produced (320°F) WarmGrip® Ultra 360



WMA produced (280°F) WarmGrip® Ultra 360

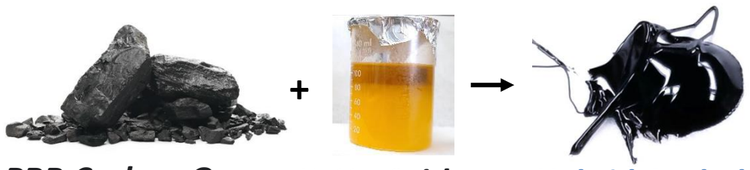
Western Research Institute

# Coal-based Asphalt Binder

University of Wyoming | School of Energy Resources

## THE PRODUCT

A petroleum-free paving binder from Wyoming PRB coal, solvent-extracted and chemically reacted with renewable fatty acids. A true chemical bond— not a physical blend.



*PRB Carbon Ore* + *Fatty Acids* → *Hybrid Asphalt*

## PRODUCTION FLOW

Solvent Extraction → Filtration → Distillation → Fatty Acid Reaction → Formulation

## BENEFITS & LAB EXPERIENCE

### Potential Benefits

$ Estimated binder cost will be at the upper end of current asphalt binder prices

- New non-petroleum feedstock
- 5-6x lower upstream $CO_{2e}$

### Binder-Level Lab Experience

- ~30 lbs produced 2023 continuous pilot plant run — UWSER, Laramie, WY
- ~New large continuous pilot plant built 2024-2026 – UWSER, Laramie, WY
- ~30 lb batches produced in 2024-2025 at WRI, Laramie, WY
- **Rheology comparable** WRI tests showed results comparable to petroleum asphalt: PG 52-40 up to PG 76-16 have been produced

## SUPPLY CHAIN OUTLOOK



- ❑ **Mature** rail network
- ❑ **23.1B tons** recoverable PRB coal
  - ❑ **>900 yrs** of US asphalt supply
- ❑ **~$13–15/ton** feedstock cost

### Scale-Up Roadmap

**CURRENT – PILOT PLANT**

*Scaled pilot (22 lb coal/hr) - Laramie, WY*

**2027 – DEMO PLANT**

*$17M demo plant, 900 lb coal/hr, 24 hr/5-day – Gillette, WY*

**2028+ – COMMERCIAL**

***30k tons coal/day***

# CarbonBind®

## THE PRODUCT

### ORIGIN

Oil produced from agricultural plant waste that would otherwise be burned for energy.

### PROCESS

Proprietary chemical modification: extensive polymerization & cross-linking → viscosity increased by orders of magnitude → blended with conventional bitumen at Puma terminals.

### THE ROAD

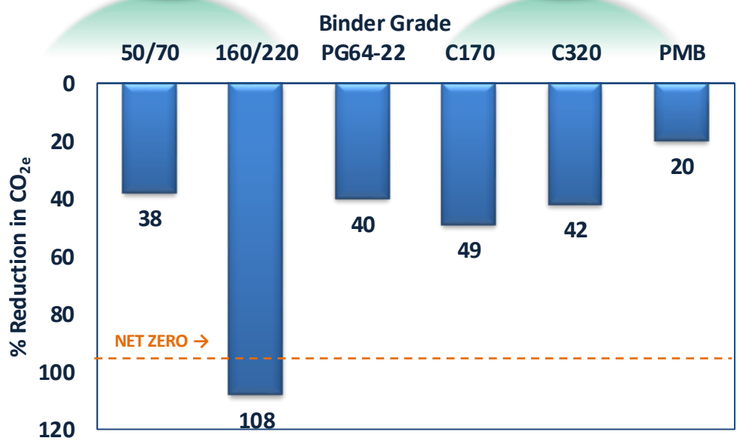
Finished binder meets AASHTO M320 / M332. Drop-in compatible — no changes to mix design, production, or paving.

## POTENTIAL BENEFITS

CarbonBind® products are formulated to comply with typical Australian, European and US paving grade bitumen and polymer modified binder specifications.

**Cost Effective**

**Net-zero Potential**




PATENT PENDING | EPD VERIFIED | ISCC CERTIFIED

## FIELD TRIALS

| | |
|---|---|
| 2021–22 | Lab R&D complete; full-scale plant trials |
| DEC 2022 | First PMB demonstrations — Australia |
| OCT 2023 | Paving grade demo — Wiltshire, UK |
| NOV 2023 | AfPA National Innovation Award |
| MAY 2024 | Western Sydney International Airport |
| DEC 2024 | First hard paving grade demonstrations |

## SUPPLY CHAIN

### Feedstock

- *Agricultural waste oils*
- *Does not compete with food production*
- *~10× supply vs. tall oil pitch*

### PRODUCTION

- *Puma terminals worldwide*
- *Integrated Trafigura network in US*

### DELIVERY

- *Finished binder to spec*
- *No plant changes needed*
- *Available at US scale now*

# Cargill Anova® Biosync™ Biobinder

## THE PRODUCT

### ORIGIN

Agriculturally sourced bio-based raw materials from renewable feedstocks, regrown every year. Not fossil-derived.

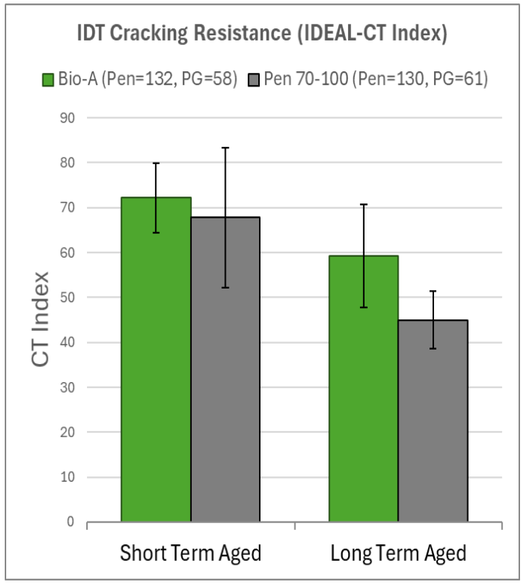
### PROCESS

Purpose-built formulation from Cargill's bio industrial expertise. Blends directly into bitumen at 10 to 30% by weight via low-shear mixing.




## POTENTIAL BENEFITS

- ❑ Enables >40% RAP content in mixes
- ❑ Negative overall GWP - verified EPD available
- ❑ Balanced cracking, rutting & moisture resistance
- ❑ Biogenic carbon locks $CO_2$ from atmosphere




*•Pen 40/60 (PG64-22) + 10% bio content: final grade (Pen 70/100 or PG58-28)*
*•Control Pen 70/100 (PG58-28) - Similar grade to the biobinder*

## SUPPLY CHAIN OUTLOOK

### FEEDSTOCK

- *Agricultural biobased sources*
  - *Regrown at least annually*
- *Industrial grade product*
- *Supply stability*

### PRODUCTION

- *Cargill Bio-Industrial facilities*
  - *Global footprint*
- *Blended at bitumen suppliers, depots, or plant*
- *Blends at ~150°C with low-shear mixing*

### DELIVERY

- *No special long-term storage requirements*
- *Drop-in: no plant modifications required*
- *Pumpable once heated to ~100°C+*

# Advanced Polymer-Modified Binder using Devulcanized Rubber Asphalt Modifier (DVR-AM™)

REGEN RBR
Sustainability through innovation

## PROCESS



**WHOLE TRUCK TIRES ONLY**
Closely monitor feedstock to ensure consistently manufactured DVR-AM™



**CRUMB RUBBER**

**PERFORMANCE ADDITIVES**



**DEVULCANIZATION (PATENTED PROCESS)**

**DVR-AM™**



## PRODUCT

- DVR-AM™ is a polymer replacement for polymer-modified asphalt binder production
- SBS-equivalent or better binder properties
- Very good storage stability
- Improved CT Index via BMD
- Patented process
- Ability to engineer product based on customer target specification and/or requirements

## BENEFITS

- Price competitive
- Improved performance
- Large $CO_2e$ offset – e.g., DVR-AM™ equivalent system to 3.5% SBS polymer-modified asphalt binder shows 76% reduction in $CO_2e$
- Energy savings (less mixing time compared to SBS)
- Pelletized form allows for drop-in using existing SBS equipment
- Achieve sustainability and ESG goals

aerogel coating TECHNOLOGIES





# RaC

**Rubberized-Aerogel Composite**

## WHAT IT IS & WHY

A next-generation composite that boosts asphalt-pavement performance, resilience and sustainability — countering asphalt's core weakness, thermal susceptibility (less deformation and cracking), with superior insulation and durability across climates.

**Dosing** dry-added at the plant (RAP collar or feeder), 12–20 lb/ton (~10–18% of binder)

***Making Smart Infrastructure with RaC***

## WHY RaC FOR PAVEMENTS

- **Reduces permanent deformation (rutting)** across all structural and climatic scenarios.
- **Substantially lowers thermal cracking** increasing service life above 50%
- **Improves fatigue resistance** and decreases lane-cracking percentage.

***Three priorities:*** *performance enhancement · waste valorization · reduced environmental footprint.*

## RaC ATTRIBUTES

| | |
|---|---|
| **Particle size** | 0.1 – 3 mm (pellets up to 10mm) |
| **Surface chemistry** | Hydrophobic |
| **Bulk density** | 0.32 – 0.60 g/cm³ |
| **Color** | Dark grey |
| **Operating temperature** | up to 250 °C |



## PROVEN IN THE FIELD

| | |
|---|---|
| **2021** | Kaiteki — 50-ton sections, SW Fisher Industries plant |
| **2024** | VESTAR — 420-ton parking-lot retrofit, Queen Creek AZ |
| **2025** | Arizona DOT — 1,000 tons, US-60 lane-mile, Show Low AZ |
| **2026** | City of Phoenix & City of Mesa pilots (Jul–Sep) |

★ **Recognition:** RAR 2025 — Best Innovation, Lisbon **Contact:** aCT@actinc-us.com

**Converting recycled asphalt shingles (RAS) into usable binder with renewable fatty amines.**

Patented method for modulating and processing “end of life (OR out of service)” petroleum-based hydrocarbons into new asphalt paving and roofing binders.



RenuMAT

Western Research INSTITUTE

US patent 12,076,663

# TRANSFORMING ASPHALT SHINGLE WASTE




| PERFORMANCE | EASE OF USE | WORKER SAFETY | SUSTAINABILITY |
|---|---|---|---|
| Softens hardened, oxidized asphalt to improve PG grade | Handles and stores long-term like RAP without degradation | Pellets are safe to handle | Stable recycle market allow for stabilized supply chain |
| Improves crack-resistance, significantly reduces rutting | Seamless integration into HMA feeds, no special equipment | Eliminates airborne fiberglass fibers on job site | Significantly reduces need for virgin asphalt binder |
| Meets quality standards for durable HMA applications | Stable pellet form eliminates re-agglomeration issues | | |

STRICTLY PRIVATE AND CONFIDENTIAL

# NAFCO – 100% RAP HMA Product

## Opportunity Overview

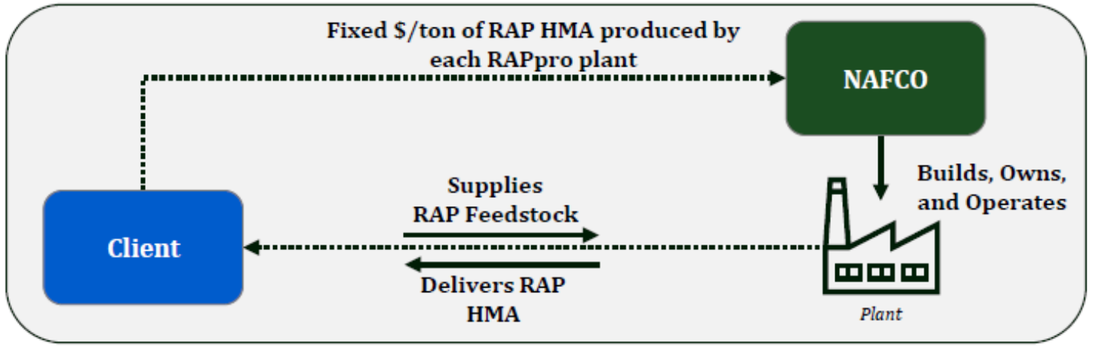
- NAFCO builds, owns, and operates HMA plants utilizing 100% RAP as aggregate feedstock.
- NAFCO's proprietary process and materials rejuvenate asphalt cement and maximize the utility of RAP, creating HMA with comparable performance to virgin HMA (as measured by IDEAL-CT and HWTT) at a significantly lower marginal cost.
- Plants consume no virgin aggregates and are agnostic to proximity to natural resources – a perfect fit for remote locations or temporary deployments near RAP stockpiles.
- Plants utilize recycled materials and proprietary technology for better margins and ~60% lower emissions.
- **NAFCO will deploy operating hot mix plants in 6 – 9 months at no capital cost to clients, enabling clients to offer a 100% RAP HMA product with superlative performance metrics.**

## Technology




## NAFCO's Role

- NAFCO partners with asphalt producers and pavers, providing RAP HMA production under a tolling-style service contract.
  - Clients and NAFCO work together to set product performance specifications for base and surface course.
  - NAFCO performs mix design lab work to establish necessary feedstock specifications required for consistent mix performance.
  - NAFCO provides capital to construct plants that will produce 100% RAP HMA for clients to sell into the market.
  - Clients provide RAP feedstock and crushing services to create reliable feedstock supply.
- **Plants are configurable for throughputs between 80 – 200 tons per hour, with lead times of 6 – 9 months from contract execution.**




For inquiries, please contact Kitty Shepherd at kshepherd@halftoneinvestors.com

# New Rubber Technologies' ReviveRite™ Asphalt Modifiers

## Introduction and Overview

ReviveRite™ asphalt modifiers are designed as a complete or partial substitute for linear or radial SBS in the binder portion of an asphalt mix. While derived from end-of-life tires, these materials differ substantially from GTR in chemical structure and as a result in technical and processing performance.

- ReviveRite™ has been formulated to improve AASHTO and PG grades at lower cost
- Provides similar physical property and processability characteristics as compared to SBS
- Exhibits weatherability and environmental advantages
- Paving applications are terminally blended

ReviveRite™ asphalt modifiers have been commercially deployed in road projects in the Midwestern United States. While quantifiable performance results are not yet available, third-party terminal, contractor and customer agency observations all indicate positive results to-date over multiple year installations.

## Illustrative Formulations

*Illustrative Formulation 1:*

Base binder: Seneca Petroleum 58-28
Polymers: ReviveRite™ 5% and LCY3501 2%
Resulting binder grades: PG 70-28 (AASHTO M320) and MSCR 58E-28 (AASHTO M332)
Lab: Asphalt Testing Laboratory

*Illustrative Formulation 2:*

Base binder: Marathon Refning 67-22
Polymers: ReviveRite™ 4% and LCY3501 1.6%
Resulting binder grades: PG 76-22 (AASHTO M320)
Lab: Asphalt Testing Laboratory

*Illustrative Formulation 3:*

Base binder: Marathon Refining 64-22
Polymers: ReviveRite™ 10% and Zero SBS
Resulting binder grade: PG 76-22 (AASHTO M320) and True Grade 81.2-24.1 (AASHTO M320)
Lab: Asphalt Paving and Recycling Technologies (APART)

# TerraSil

zydexgroup.com

## Product Overview & Performance Benefits

Organosilane-based technology that creates a **hydrophobic** soil matrix, **reducing moisture** ingress through capillary action.

Easily diluted with water and applied during compaction or as a surface treatment.



- Permanent Water Resistance
- Eliminates Capillary Rise
- Prevents Freeze Thaw
- Reduces Expansivity
- Improves Compaction Density
- Improves Load Bearing Capacity
- Water Dilutable & Easy to Apply
- Non Leaching
- Environmentally Friendly

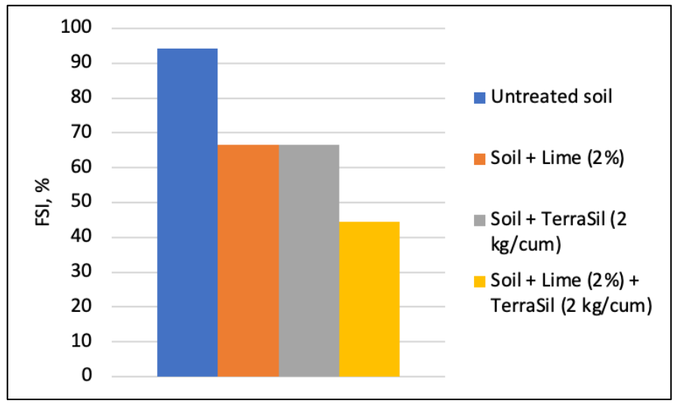
## Importance to DOTs

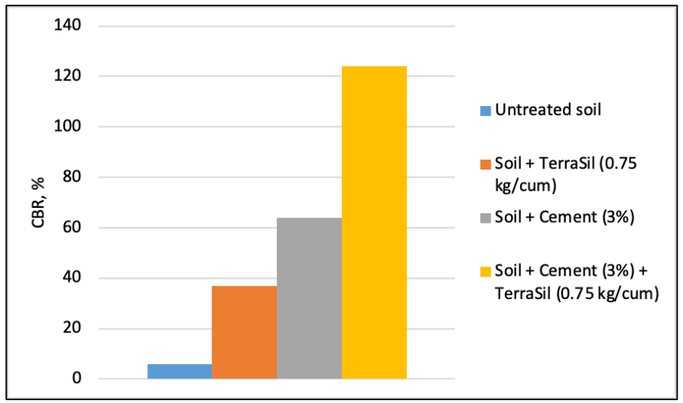
**Enhances** water resistance and helps keep subgrade and base layers dry

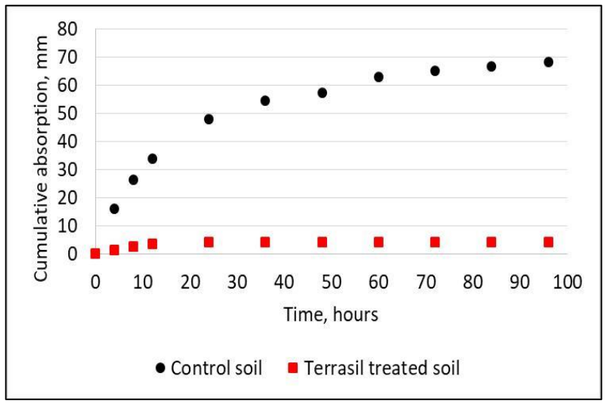
**Improves** long-term performance and **extends** pavement service life

**Complements** and is fully compatible with traditional stabilizers

**Potentially reduces swelling** of expansive soils while lowering content of stabilizing agent (e.g. lime)




Control soil Treated soil



# Tensar HX-AE

## Tensar’s most advanced high performing asphalt interlayer product



- A composite, comprising a stiff high-profile 3D multiaxial grid thermally-bonded to a non-woven paving fabric,  providing three interlayer functions:
  - reinforcement,
  - stress absorption (SAMI),
  - interlayer barrier (waterproofing), once saturated with asphalt during installation.
- Enhance fatigue performance, increasing the life of reconstructed pavements or reducing asphalt layer thickness in new pavements.
- Designed to provide optimal performance for controlling reflective cracking in asphalt overlays and longitudinal cracking during longitudinal cracking in road widening.

Tensar
CMC

# BONDTEKK®

## Stronger Interlayer Bonding for Longer-Lasting Pavement




**US-36, Nemaha Co., KS – Year 9**



Spray Paver – 0.34 gal/yd²



Conventional Paving - .05 gal/yd²

## Performance Highlights

- Improved bond between layers enhances cracking and rutting performance
- Tack rate increased ~4-6x
- Significant crack reduction during service life
- Minimal cost increase (~3%) adds 3+ years of service life

| 4-6x | ~3% | 3+ years |
|---|---|---|
| Tack rate increase | Minimal cost increase | Additional service life |

# ARMI™ — Flexible Reflective Crack Relief Interlayer

SURFACE TECH™



## FLEXIBLE REFLECTIVE CRACK RELIEF INTERLAYER

ARMI™ is a 1-inch-thick Flexible Reflective Crack Relief Interlayer (FRCRI) — plant made, paver laid using locally sourced ACE XP™ aramid fiber. It stops bottom-up reflective cracking and is placed directly over deteriorated asphalt or concrete.

## TEST-VERIFIED PERFORMANCE

**2,000 με → 40,000+ cycles**
Fatigue cycle range, lab tested

**700 IDEAL-CT**
at 7% air voids

**HWT Compliant**
Qualified paving platform

**Same-Day Pave-Over**
Fast return to service

**Razor-Edge, Local Materials**
Field-friendly placement

ARMI™

ACE XP™ POLYMER

| 7× | Up to 50% | 1 inch | 0.67 kg |
|---|---|---|---|
| Crack resistance improvement | Pavement life extension | FRCRI layer thickness | $CO_2$ / US mix ton (EPD) |

## PERFORMANCE

- Stops bottom-up reflective cracking
- Works over asphalt or concrete
- Restores ride quality & life

## EASE OF ADOPTION

- Plant made, paver laid
- Locally sourced materials
- No third-party contractors

## SUSTAINABILITY

- Fully recyclable pavement
- EPD-certified low carbon
- ESG reporting compliant

## COST SAVINGS

- Lower cost vs. FDR / R&R
- No third-party contractor cost
- Reduced long-term maintenance