AGENDA

• About Road Science, Who We Are
• Capabilities and Services
• Overview of Products that apply to Pennsylvania
• How Can We Help You?
ABOUT ROAD SCIENCE

THIS IS WHAT BETTER LOOKS LIKE
ARRMAZ

- Founded in 1967
- Global leader in specialty chemicals for the asphalt, mining, fertilizer, phosphate, and oil & gas industries
- Headquartered in Mulberry, Florida
- Over 400 employees worldwide
- Customers in over 70 countries
- Golden Gate Capital became our primary shareholder in 2012
GLOBAL PRESENCE, LOCAL SUPPORT
ARRMAZ HAS BEEN PRODUCING ASPHALT ADDITIVES AND EMULSIFIERS SINCE 1989

2011 ARRMAZ PURCHASES ROAD SCIENCE ASSETS, HIRES 40 OF STAFF

FORMERLY SEMMATERIALS AND KOCH MATERIALS

Production Assets in 2008
• >1.0 MM liquid tons of PMA yearly, >35% of US market
• Largest asphalt emulsion producer in the world
• >100 MM gallons produced per year in the US

Technology Assets
• Over 150 patents worldwide
• Major driver of performance specifications in the US
CAPABILITIES AND SERVICES
Road Science, a Division of ArrMaz, works closely with the asphalt industry to develop solutions for smarter paving and more effective pavement preservation and recycling.

The asphalt industry faces the following changes:
- Aging infrastructure in mediocre / poor condition
- Reduced funding and rising costs
- Increased competition from alternatives such as concrete
- The need for improved environmental stewardship and sustainability

To provide the asphalt paving industry with innovative, cost-effective solutions to build better-performing, longer-lasting and safer roads.
EXPERTISE

- Refining & Terminalling
- Emulsion Production
- Asphalt Mixture Production

MARKETS WE SERVE

- Paving
  - Largest supplier of asphalt additives in North America with significant positions in Europe and South America

- Four key product areas:
  - Chemical Technology – asphalt and refined tar (RT) additives and emulsifiers
  - Pavement Preservation and Maintenance Technology – bonded pavements, micro-surfacing, chip seal, pavement sealers and cold patching
  - Asphalt Pavement Recycling Technology – hot and cold recycling solutions
  - Binder Technology – strain tolerant pavement layers and crack relief interlayers

- Pavement Preventative Maintenance
- Pavement Recycling
- Roofing
CHEMISTRY FOR SUCCESS

• Manufacture chemistry to:
  ◦ Optimize product quality and performance
  ◦ Enable you to differentiate yourselves from the competition

• Lead the industry in delivering responsive, comprehensive and dependable customer support, focused on helping our customers succeed

• Specialize in customized chemistry solutions to meet the most challenging customer materials and performance needs

• Through our experienced staff of professionals and world-class, AASHTO Materials Reference Laboratory (AMRL) accredited laboratory, we work alongside our customers to:
  ◦ Improve emulsion quality and consistency
  ◦ Improve field performance
  ◦ Bring new products to market
  ◦ Solve product problems
  ◦ Increase profitability and efficiency
INNOVATION GROUP

COMPETITIVE ADVANTAGE:

• Worldwide asphalt and emulsion manufacturing experience

• Worldwide product application experience

• World class lab

• World class chemical production

• Significant product development success
WORLD CLASS LAB

State of the Art Equipment

- Dynamic Modulus
- Laser Scattering Particle Size Analyzer
- Interfacial Surface Tension
- Hydrocarbon Fractionation
- Analytical Testing
PRODUCT DEVELOPMENT SUCCESS

150 US and International Patents and Patent Pending

- Spain
- France
- United Kingdom
- Ireland
- Italy
- Germany
- Australia
- New Zealand
- Canada
- Mexico
- Brazil
- Vietnam
- China
- India
- The Russian Federation
- South Africa
CUSTOMER SUPPORT

• Emulsion Process Design Support and Best Practices Recommendations
• Quality Control Plan Development
• Assist Establishing Manufacturing Operating Procedures
• Product Formulation Work
• Chemical Development as needed
• Product and Manufacturing Troubleshooting
## Liquid Anti-Strip Products

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>APPLICATION</th>
<th>FEATURES</th>
<th>BENEFITS</th>
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<tbody>
<tr>
<td>Kohere Products</td>
<td>Good Anti-strip</td>
<td>Cost effective LAS</td>
<td>Provides passing TSR’s with most aggregates</td>
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<td>Good fit for customers with minimal stripping problems</td>
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<td>AD-Here Products</td>
<td>Better Anti-strip</td>
<td>Flagship brand</td>
<td>Most product offerings to cover broadest range of aggregates</td>
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<td>All products offer workability aid features</td>
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<td>Long standing reputation of quality and consistency.</td>
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<tr>
<td>NovaGrip Products</td>
<td>Best Anti-strip</td>
<td>Newest brand with top of line features</td>
<td>Next generation of additives</td>
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<td>Most worker friendly line of additives</td>
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<td>No odor, No smoke, Safer chemistry</td>
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<td>Works with any mix, including PPA</td>
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</table>
| AD-here ULTRA 1 | Warm Mix Anti-strip | MAKES FIELD COMPACTION EASIER  
Enables increased mat density with less roller passes, even with high recycled asphalt pavement (RAP) mixes  
RELIABLE ANTI-STRIPPING EFFECTIVENESS  
Passes tensile strength ratio (TSR) and Hamburg Wheel-Track tests with wide variety of asphalt and aggregate combinations  
LOW ODOR AND LOW SMOKE  
Promotes plant personnel and paving crew comfort  
BETTER MIX WORKABILITY  
Enables easier hand-work in paving applications  
HEAT STABILITY  
Remains effective several weeks in hot asphalt  | • Makes field compaction easier enabling improved mat density with less roller passes, even with high recycled asphalt pavement (RAP) mixes  
• Extended paving season and lengthens haul distance  
• Allows the utilization of increased amounts of RAP and RAS  
• Improves mix workability, enables easier hand-work  
• Extends pavement life by promoting stronger chemical adhesion of asphalt to aggregate  
• Protects pavement from stripping and moisture damage caused distresses  
• Allows for safer pavements by safeguarding against rutting and pothole formation |
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| AD-here ULTRA TS | Warm Mix Anti-strip | MAKES FIELD COMPACTION EASIER  
Enables increased mat density with less roller passes, even with high recycled asphalt pavement (RAP) mixes  
RELIABLE ANTI-STRIPPING EFFECTIVENESS  
Passes tensile strength ratio (TSR) tests  
BETTER MIX WORKABILITY  
Enables easier hand-work  
HEAT STABILITY  
Remains effective several weeks in hot asphalt  
NO HEATED STORAGE REQUIRED  
Easy to handle and pump in cold temperatures | • Makes field compaction easier enabling improved mat density with less roller passes, even with high recycled asphalt pavement (RAP) mixes  
• Extended paving season and lengthens haul distance  
• Allows the utilization of increased amounts of RAP and RAS  
• Improves mix workability, enables easier hand-work  
• Extends pavement life by promoting stronger chemical adhesion of asphalt to aggregate  
• Protects pavement from stripping and moisture damage caused distresses  
• Allows for safer pavements by safeguarding against rutting and pothole formation  
• Promotes smoother pavements for improved ride quality |
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<td>AD-here ULTRA SE2</td>
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<td>Makes field compaction easier enabling improved mat density with less roller passes, even with high recycled asphalt pavement (RAP) mixes</td>
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<td>ODORLESS, SMOKELESS</td>
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<td>NON HAZARDOUS. THE SAFEST ADDITIVE FOR WORKER EXPOSURE</td>
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<td>COMPATABLE WITH PPA MODIFIED ASPHALT</td>
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<td>PROTECTS AGAINST MOISTRUE DAMAGE AND STRIPPING</td>
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<td>Pending PennDot Approval</td>
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## Asphalt Emulsifier Products

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<tbody>
<tr>
<td>ArrMuls 1315</td>
<td>Asphalt Sealer, Tack Coat, Fog Seal</td>
<td>Yields emulsions with smaller particle size</td>
<td>Better long-term emulsion stability vs competing products</td>
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<td>Emulsion Shear Stability at Increased Temperature</td>
<td>Easy compounding, less waiting for emulsion to cool, faster production</td>
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<td>Non-lignin based</td>
<td>Better sealer odor, better protection against biological growth in sealer vs competing products</td>
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<td>Fast Emulsion Drying and Curing for quick return of traffic</td>
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<td>PRODUCT</td>
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<td>ColdGrip IQ</td>
<td>Adhesion Promoter Cutback Cold Patch</td>
<td>Easy coating of cool, damp, dusty aggregate</td>
<td><strong>Saves money, easier production</strong> by 1) eliminating wasted time and materials due to coating challenges 2) eliminating need to dry damp aggregates 3) broadens range of cost-effective aggregates that can be utilized</td>
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<td>Chemically bonds AC to aggregate in thicker film</td>
<td><strong>Longer patch life</strong> through 1) stronger bonding of patch to pothole substrate, even in presence of water 2) protects against raveling, moisture damage and premature failures</td>
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<td>Surface Tension Modifier</td>
<td>Low viscosity</td>
<td><strong>Extends stockpile life</strong> by 1) guarding stockpiles against rain-induced stockpile stripping 2) preserves stockpile workability Both minimize reprocessing and wasted material costs</td>
</tr>
<tr>
<td>AD-here SC-901</td>
<td>Adhesion Promoter Emulsion Cold Patch</td>
<td>Easy coating of cool, damp and dusty aggregate</td>
<td><strong>Saves money, easier production</strong> by 1) eliminating wasted time and materials due to coating challenges 2) eliminating need to dry damp aggregates 3) broadens range of cost-effective aggregates that can be utilized</td>
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<tr>
<td>Road Science Tack</td>
<td>Tack Coat</td>
<td>Reduced-tracking</td>
<td><strong>Pave faster</strong>, wait less time for drying, <strong>Eliminate costs</strong> of replacing traffic paint and tracked tack removal</td>
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<tr>
<td>Technology</td>
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<td><strong>Increased pavement strength, improved crack resistance</strong> vs hard pen tacks</td>
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<td>Easy to make</td>
<td><strong>Operational convenience</strong>, uses paving grade asphalt and only 2 chemicals</td>
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HOW CAN WE HELP YOU SUCCEED?
THANK-YOU

DENNIS COOPER

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E-MAIL:  DCOOPER@ROADSCIENCE.NET