Road Science®
BUILDING A NEW LEADER IN SPECIALTY SURFACTANTS

North American Product Portfolio

ASPHALT MIX
PERFORMANCE-IMPROVING
ADDITIVE CHEMISTRY

NOVAGRIP® | AD-HERE® | KO-HERE®
WARMGRIP® | COLDGRIP® | REVIVE® | DESCENT
CHEMISTRY FOR SUCCESS

Advanced Asphalt Additives Backed by Industry-Leading Support

Road Science develops and manufactures innovative asphalt additive chemistry which makes roads last longer and enables you to differentiate yourself from the competition. Our additives are designed to enhance asphalt mix quality, improve the ease of pavement construction on the grade, and boost pavement performance and durability. For more than 25 years, our AD-here asphalt additives product line has been the most trusted in the industry, earning us the reputation of being the North American additive leader.

We specialize in chemistry solutions to meet the most-challenging customer performance needs and excel in delivering responsive, comprehensive and dependable customer support focused on helping our customers succeed.

Through our experienced staff of professionals and world-class AASHTO accredited laboratory in Tulsa, Oklahoma, we work alongside our customers, helping them to:

- Improve product quality and consistency
- Optimize product performance on the grade
- Solve product problems
- Increase operational efficiency
- Bring new products to market
- Increase profitability
ADDITIVE CHEMISTRY
FOR ALL APPLICATIONS

ADHESION PROMOTERS

---

**NovaGrip®**
Next-generation, worker-friendly additives that work with all asphalts.

**AD-here®**
Industry's leading and most trusted line of additives for over 25 years.

**KO-here®**
Additives that address today’s challenge of building longer-lasting roads while minimizing cost.

COLD MIX ADHESION PROMOTER AND ECO-FRIENDLY SOLVENTS

---

**ColdGrip®**
Additives engineered to enable proper coating of damp stone, promote long-term cold patch durability and allow for eco-friendly cold mix.

REJUVENATORS

---

**Revive®**
Additives that improve the efficiency with which asphalt is removed from recycled asphalt pavement (RAP) and reintroduced back into the new mix.

ODOR NEUTRALIZERS

---

**deScent**
Additives that neutralize and suppress odorous volatile organic compounds (VOCs) in asphalt, including hydrogen sulfide.

COMPACTION AID AND WARM-MIX ASPHALT (WMA) ADDITIVES

---

**AD-here® ULTRA**
(United States)
Additives that allow for easier field compaction and lower paving temperatures, fortified with AD-here adhesion promoters.

**WarmGrip®**
(Canada)
Additives that allow for easier field compaction and lower paving temperatures, fortified with AD-here adhesion promoters.
THIS IS WHAT ADDITIVE INNOVATION LOOKS LIKE
ADHESION PROMOTERS
Longer-Lasting Roads
- Extends pavement life by protecting from moisture damage-caused distresses such as raveling, rutting and pothole formation
- Motorists enjoy better ride quality for longer

Improved Worker Safety and Comfort
- Poses fewer health hazards and risks to workers
- Odorless and smokeless for improved plant and paving crew comfort
- Eradicates need for vapor control equipment and diminishes worker and citizen complaints
- Non-hazardous and non-regulated transport option available for first-rate plant personnel and paving crew safety while reducing compliance and logistics costs

Increased Operational Flexibility and Efficiency
- The only adhesion-promoting additive needed at terminal or mix plant, covering all asphalt and aggregate circumstances
- Remains effective in asphalt stored at 300 °F (149 °C) for several weeks to months
- Improves mix workability for easier handwork

NovaGrip 1212 | NovaGrip 1016 | NovaGrip 975

With today's rapidly aging infrastructure, government agencies, asphalt producers and contractors are being challenged to build longer-lasting roads with technologies that not only perform well, but ensure worker comfort and safety. The NovaGrip line of adhesion promoters fully addresses today's challenges. NovaGrip's adhesion-promoting technology makes pavements last longer by creating powerful chemical bonding between asphalt and aggregate that resists the destructive forces of water. NovaGrip safeguards workers from the hazards of traditional adhesion promoters by using chemistries that are less hazardous and safer for workers. NovaGrip additives emit no smoke or odor in hot asphalt, eradicating the smoke, odor and dust problems typical of traditional additives which can be problematic from air pollution and environmental, health and safety perspectives.

NovaGrip adds operational flexibility to the asphalt terminal or mix plant since it is compatible with all aggregates, asphalts and asphalt modifiers including polyphosphoric acid (PPA), and it will not adversely impact asphalt properties or performance grading.
**NovaGrip vs. Traditional Adhesion Promoters**

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>Traditional Adhesion Promoters</th>
<th>Hydrated Lime</th>
<th>NovaGrip 975</th>
<th>NovaGrip 1016</th>
<th>NovaGrip 1212</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved worker safety</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Odorless in hot asphalt</td>
<td>NA</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Smokeless in hot asphalt</td>
<td>NA</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Compatible with polymer and PPA-modified asphalt</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Protects against moisture damage</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Improves mix workability</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Efficacy with prolonged storage in asphalt</td>
<td>✓</td>
<td>NA</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>No heated storage required</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Passes adhesion tests with most challenging asphalt and aggregate combinations</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-hazardous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Non-regulated for transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
AD-DHERE®

Industry’s leading and most-trusted line of additives for over 25 years.

AD-dere LOF 65-00 | AD-dere HP Plus | AD-dere XL9000 | AD-dere 77-00 | AD-dere 62-40

For 25 years and counting, stakeholders have relied on AD-dere adhesion promoters more than any other to build longer-lasting roads. These additives extend pavement life by creating strong chemical adhesion of asphalt to aggregate, safeguarding pavements from destructive forces such as traffic loading, water intrusion and oxidation. Protection from these forces leads to fewer potholes and reduced rutting, creating safer, smoother and better roads for years to come.

The AD-dere line of additives offers many different feature options depending on specific customer needs. All products are cost-effective versus other adhesion-promoting technologies and are easy to work with. Low-odor options alleviate the odor and smoke problems typical of competing additives which can be problematic from air pollution and environmental, health and safety perspectives.

### AD-DHERE FEATURES

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>AD-dere LOF 65-00</th>
<th>AD-dere HP Plus</th>
<th>AD-dere XL9000</th>
<th>AD-dere 77-00</th>
<th>AD-dere 62-40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low odor in hot asphalt</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low smoke in hot asphalt</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compatible with polymer-modified asphalt</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Protects against moisture damage</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Improves mix workability</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Efficacy with prolonged storage in asphalt</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No heated storage required</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Passes adhesion tests with most challenging asphalt and aggregate combinations</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

### BENEFITS

**Longer-Lasting Roads**
- Extends pavement life by protecting from moisture damage-caused distresses such as raveling, rutting and pothole formation
- Motorists enjoy better ride quality for longer

**Longstanding, Proven Track Record**
- Market leading line of additives used to protect millions of pavement miles around the world
- Industry’s most-trusted brand for 25 years and counting

**Improved Worker Comfort**
- Low odor, low smoke options available

**Customized Solutions**
- Products available with chemistry engineered specifically for certain aggregates types and geographic regions

**Increased Operational Flexibility and Efficiency**
- Compatible with most asphalt modifiers and aggregate types
- Improves mix workability for easier handwork
- Remains effective in asphalt stored at 300 °F (149 °C) for up to several weeks
KO-HERE®

Additives for building longer-lasting roads while minimizing cost.

KO-here AS-1000 | KO-here AS-700

In today’s difficult environment of rapidly aging infrastructure and dwindling highway funding, government agencies, asphalt producers and contractors are being challenged to build longer-lasting roads at the absolute lowest cost. Some adhesion promoters can come with unnecessary features that drive up asphalt mix costs.

The KO-here line of adhesion promoter additives addresses today’s agency, producer and contractor challenges to build longer-lasting roads while minimizing costs. KO-here’s adhesion-promoting technology is based on specialized chemistries that most economically prolong pavement life by promoting chemical adhesion of asphalt to aggregate.

BENEFITS

Longer-Lasting Roads
- Extends pavement life by protecting from moisture damage-caused distresses such as raveling, rutting and pothole formation
- Motorists enjoy better ride quality for longer

Increased Operational Flexibility
- Compatible with most asphalt modifiers and aggregate types

Economical
- Most economical option available in industry
THIS IS WHAT BETTER CHEMISTRY LOOKS LIKE
COMPACTION AIDS / WARM MIX ADDITIVES
Additives that allow for easier field compaction and lower paving temperatures, fortified with AD-here adhesion promoters.

AD-here ULTRA 1 | AD-here ULTRA SE1 | AD-here ULTRA SE2 | AD-here ULTRA CA | AD-here ULTRA P
WarmGrip N1 | WarmGrip Z1

In order for pavements to last, they must be properly constructed. Achieving adequate density has often been considered the single, most important factor impacting the ultimate performance and durability of any pavement. Even the best-designed asphalt mixes are guaranteed to fail prematurely without proper compaction.

Road Science’s AD-here ULTRA and WarmGrip compaction aids and warm mix additives are combined with industry’s leading and most-trusted adhesion promoters. They enable asphalt mix to be produced and compacted more easily at lower temperatures while protecting the pavement from moisture damage-related distresses such as potholes and rutting. The AD-here ULTRA and WarmGrip additive lines provide a variety of different features based on specific customer needs, including PPA compatibility, low viscosity, non-hazardous, and no-odor, no-smoke emission options.

**Faster and Easier Paving**
- Makes field compaction easier enabling improved mat density with fewer roller passes, even with high-RAP mixes
- Improves mix workability enabling easier hand-work

**Improved Profitability**
- Extends paving season and lengthens haul distance
- Facilitates utilization of increased amounts of RAP and recycled asphalt shingles (RAS)
- Reduces time and labor required for field compaction

**Increased Operational Flexibility and Efficiency**
- Compatible with all aggregate types and asphalt modifiers including PPA
- Remains effective in asphalt stored at 300 °F (149 °C) for several weeks to months

**Improved Worker Safety and Comfort**
- Odorless and smokeless for plant personnel and paving crew comfort
- Eradicates need for vapor control equipment, and reduces worker and citizen complaints
- Non-hazardous and non-regulated transport option available for first-rate plant personnel and paving crew safety, and reduced compliance and logistics costs

**Customized Solutions**
- Products available with chemistry engineered specifically for certain aggregate types and geographic regions

---
### AD-HERE ULTRA FEATURES

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>AD-Here Ultra 1</th>
<th>AD-Here Ultra SE1</th>
<th>AD-Here Ultra SE2</th>
<th>AD-Here Ultra CA</th>
<th>AD-Here Ultra P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes compaction easier and improves workability</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Protects against moisture damage and stripping</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Passes adhesion tests with challenging asphalts and aggregates</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Compatible with PPA-modified asphalt</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficacy with prolonged storage in asphalt</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Low odor, low smoke</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Odorless, smokeless</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-hazardous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved worker comfort and safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No heated storage required</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineered for igneous and metamorphic aggregates of West. US</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Engineered for natural sand and gravel aggregates of the US</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### WARMGRIP FEATURES

#### Field Density, % of Maximum Theoretical

![Graph showing field density comparison]

- **Easier compaction with less roller passes at cooler paving temperature**

#### 3-inch lift 19.0 mm Superpave mix, 30% RAP

**ULTRA WMA, field compaction 235 °F**

**HMA, field compaction 290 °F**

### WARMGRIP FEATURES

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>WarmGrip N1</th>
<th>WarmGrip Z1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makes compaction easier and improves workability</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Protects against moisture damage and stripping</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Passes adhesion tests with challenging asphalts and aggregates</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Compatible with PPA-modified asphalt</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Efficacy with prolonged storage in hot asphalt</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Low odor, low smoke</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Odorless, smokeless</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>No heated storage required</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Improved worker comfort and safety</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Engineered for performance with Canadian siliceous aggregate types, including natural gravel</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
COLD MIX ADHESION PROMOTERS & ECO-FRIENDLY SOLVENTS
Pavement patching is one of the most widespread maintenance activities undertaken by highway agencies. Most patching repair activities are conducted in less than ideal conditions when potholes are wet and temperature conditions are cold, thus requiring a high-performance adhesion promoter to ensure the patching adheres to the bottom and walls of the pothole so that the patch will endure permanently.

Road Science has raised the performance bar with the development of ColdGrip chemistry for cold patch stockpile mix and cold mix paving applications. ColdGrip IQ adhesion promoter technology makes cold mix production with any aggregate possible by enabling thick film coating of wet, cool and dusty aggregates of any mineralogical type. ColdGrip thick film coating enables strong chemical adhesion to the aggregate, which protects against stockpile stripping and preserves mix workability. Moreover, ColdGrip IQ promotes extended patch life by ensuring the patch chemically bonds to the bottom and walls of the pothole, even in the presence of water, guarding the patch against aggregate dislodgement and premature failure.

ColdGrip CM-4IQ is a combination product of ColdGrip IQ and an eco-friendly, low volatile organic compound (VOC) rejuvenating solvent. It is added to virgin asphalt to produce low-VOC asphalt cutback, replacing both the petroleum-based solvents and adhesion promoters typically used. When using RAP in cold mix, ColdGrip CM-4IQ improves the efficiency with which the highly oxidized asphalt is incorporated from the RAP and reintroduced back into the new mix, while maintaining mix workability and storage life. The result is a safer and environmentally friendly alternative to traditional cold mix.

**BENEFITS**

**Increased Operational Efficiency**
- Diminishes wasted production time due to coating challenges
- Reduces reprocessing operations by guarding stockpiles against rain event induced stripping
- Preserves workability of the mix for a longer period of time, extending shelf-life of stockpiles and bags
- No heat required to handle, even in freezing temperatures

**Saves Money**
- Decreases added operational and material costs due to coating problems and stockpile stripping
- Broadens the range of aggregates that can be used including more cost-effective aggregates previously not utilized due to coating difficulties
- Reduces material costs by enabling higher RAP utilization, allowing for less virgin aggregate and asphalt usage

**Safer and Eco-Friendly**
- Used to produce low-VOC, environmentally friendly cold mix
- Cutback is non-hazardous, non-flammable and contains no polyaromatic hydrocarbons (PAHs)

**Promotes Permanent Patch Life**
- Prevents premature failures and extends patch life
ASPHALT REJUVENATORS
REVIVE®

Asphalt rejuvenator additives that improve the efficiency with which asphalt is incorporated from RAP and reintroduced back into the new mix.

Revive 1114

Asphalt pavement is one of America’s most recycled materials. Recycled asphalt pavement (RAP) contains high-quality aggregates as well as valuable asphalt binder. The U.S. Department of Transportation Federal Highway Administration (FHWA) has established a policy stating that “recycling and reuse of asphalt pavement can offer engineering, economic and environmental benefits and should get first consideration in materials selection. Any restrictions that prohibit the use of recycled materials without technical basis should be removed from specifications.”

RAP can be extremely valuable to the taxpaying public. Recycling and reusing this valuable resource significantly reduces the cost of asphalt mix and promotes the concept of “sustainable construction,” a key FHWA initiative. For example, adding an additional 20% RAP to a 15% RAP mix could allow a reduction of total mix virgin asphalt demand by almost 40%. However, the oxidized asphalt binder in RAP has a stiffening effect on the mix and reduces pavement strain tolerance. In sufficient quantities, RAP can lead to reduced pavement flexibility, early cracking and premature failure. For higher RAP content mixes, a rejuvenator is needed to correct the stiffness problem by adding flexibility and resiliency back to the pavement.

Road Science has developed the Revive line of asphalt rejuvenators specifically to address these issues. Revive rejuvenators facilitate increased RAP usage while maintaining mix flexibility and controlling stiffness. They work in two distinct ways:

1. Revive rejuvenators have high affinity and solvency power for the aged and oxidized asphalt binder. This allows for a very high percentage of the RAP binder to be quickly recovered and brought into the RAP-virgin asphalt binder / mastic continuum.

2. Revive rejuvenators reduce the complex shear modulus of the resulting RAP-virgin asphalt binder mixture. This reduces the risk of undesired pavement performance such as early cracking and enables use of higher RAP percentages.

BENEFITS

Increased Operational Flexibility and Efficiency
• Makes RAP asphalt and virgin asphalt compatible and homogeneous resulting in consistent PG grading
• Increases mix workability, yielding better mat smoothness with fewer roller passes

Increased RAP Utilization
• Improves the low temperature crack resistance of high-RAP mixes to levels found in low-RAP mixes
• Does not impact high temperature rutting resistance

Improved Profitability
• Reduces mix cost by enabling higher RAP utilization
• Compared to using softer asphalts and fluxes, ensures more consistent supply, and obviates need for additional storage tanks and associated heating costs, as well as additional working capital for asphalt inventory

Improved Worker Safety
• Non-hazardous, no polyaromatic hydrocarbons (PAHs) and high flash point
DESCENT

Additives that neutralize and suppress odorous VOCs in asphalt, including hydrogen sulfide.

Asphalt binders used in paving and roofing applications often emit unpleasant odors during heating, mixing, transfer and application which can cause problems for asphalt producers and contractors. Odorous volatile organic compounds (VOCs) compromise worker safety, degrade air quality, and generate adverse reactions and complaints from residents in nearby communities. Oftentimes this applies pressure on asphalt terminals and plants to restrict or relocate operations. Contractors may be inconvenienced and forced to incur additional costs if required to perform work during irregular hours or only seasonally due to odor concerns.

deScent offers industry a convenient and cost-effective solution to the asphalt binder odor emission problem. When deScent is added in small amounts to asphalt, significant reductions in VOC emissions occur at asphalt temperatures commonly used in the roofing and paving industries. Using gas chromatography, deScent has been proven to reduce total odorous VOC emissions in excess of 90%. Unique to deScent is its effectiveness in reducing hydrogen sulfide emissions by up to 85%, significantly exceeding the performance of competing products.

Improved Worker Safety
- Reduces dangerous hydrogen sulfide (H₂S) gas emissions by more than 84%
- Reduces butanethiol, dimethyl disulfide, methylbenzenethiol and other odor-causing VOCs by up to 89%

Better Air Quality
- Easier compliance with Environmental Protection Agency (EPA) air quality standards
- Improved comfort for workers and community residents
- Suppresses unpleasant odor rather than masking with other scents

Improved Public Perception
- Eliminates public odor complaints
- Reduces pressure on refineries, terminals and plants to restrict or relocate operations due to odor complaints

Saves Money
- Allows roofing contractors to eliminate additional costs of performing institutional and commercial work at irregular hours or only seasonally to avoid unpleasant odors for building occupants
- Eradicates the need for vapor control equipment

![deScent VOC Change for Improved Worker Safety](chart.png)
CONTACT ROAD SCIENCE

Learn more about our asphalt additives, emulsifier products and industry-leading support services.

Reach a representative today at +1-918-960-3800 or email customerservice@roadscience.net. You can also visit our website for more information at www.roadscience.net or scan the code below.

Road Science
6502 South Yale Avenue, Suite 100
Tulsa, OK 74136

© 2019 ArrMaz Products, LP. All rights reserved. This material may not be reproduced, displayed, modified or distributed without the express prior written permission of the copyright holder.