



Product Descriptions

A. Asphalt Performance Modifiers

Chemistries based on renewable resources or derived from natural gas chemistries, provide options to improve asphalt binder quality and performance including PG grade, APA, Overlay and MSCR results, reduce asphalt viscosity or compound viscosity in paving and roofing formulations, expand supply options, save energy by reduced application temperatures, reduce emissions and achieve more durable pavement or roofing products:

- Hydrogreen® S (formerly marketed as BituTech RAP® & BituTech PER)
- Hydrogreen® HFP (formerly marketed as BituTech PER-HF)
- BituTech WA1
- BituTech VPW
- BituTech PAA
- BituTech BUR

These materials offer the ability to change the Penetration and Softening Point relationship or PG grade of any asphalt or asphalt compound, and they provide the means to reduce the amount of conventional polymer that may normally be required, thereby reducing your costs.

A small addition of our GREEN and 100% renewable chemistry offers significant improvement in m-Value for those binders with high asphaltene content, and at nominal cost to the refiner, terminal or the contractor. In other applications such as roofing, these modifiers allow the user to develop similar properties to that of oxidized asphalt without the cost, equipment or risks associated with oxidation.

B. Warm-Mix and High RAP Additives

Chemistry based on renewable resources or developed within our proprietary family of compounds will save substantial energy and material costs in producing a new or High RAP paving mix, significantly improve the handling and compaction characteristics of the mix and extend the pavement lay-down time with no adverse effects on compaction or voids:

- Hydrogreen® S (formerly marketed as BituTech RAP® & BituTech PER)
- BituTech WA1
- BituTech VPW

As Warm-Mix additives, these unique chemistries allow processing temperature reductions of 50° F or more in the mix drum and reductions of 50° F or more in pavement lay-down, allowing for immediate rolling compaction rather than being delayed as the freshly laid pavement cools. Each of these additives will yield significant energy savings at the mix plant and substantial time savings at the construction site. Less emissions and therefore less noxious fumes are released at these lower temperatures, resulting in a better working environment.

Use of Hydrogreen® S in Warm-mix paving formulations which also include RAP offers the dual benefit of achieving High RAP content and yielding full Warm-mix benefits with a single dose additive.



For more information, click on our presentation:

[Hydrogreen® S: High RAP and Warm-Mix Asphalt Solutions.](#)

The rejuvenating power of Hydrogreen® S, based on 100% renewable chemistries, supports the use of high and ultra-high RAP/RAS in a pavement mix, renewing the PG of the aged binder as a true useful component in the mix. Many recycling operations use this additive to generate up to 100% RAP/RAS mixes for pothole patch, utility trench repair and private paving applications.

C. Enhanced Water-Foaming

Chemistry based on renewable resources, with flash point over 425°F, will generate a more manageable virgin mix and allow more effective use of RAP (Recycled Asphalt Pavement) or RAS (Recovered Asphalt Shingles) in highway paving formulations generated with use of water-foaming technology:

- Hydrogreen® S (formerly marketed as BituTech RAP® & BituTech PER)

The #1 complaint with all water-foaming today is the rapidly stiffening of the mix as it's hauled to the job site. If the contractor cannot place and roll the mix quickly enough, it doesn't compact effectively. Many contractors will tell you that foamed asphalt can be hauled only about 75 miles from the plant before it becomes difficult to lay and compact. Long-haul paving has not been possible with water-foaming warm-mix...until now.

Hydrogreen® S, when added to the binder at 0.6%, prior to foaming, extends the half-life of the water foamed binder by 3.5 times, significantly extending hauling distance from the mix plant, improving compaction and laydown, and enabling early spring and late fall paving windows. The treated foamed binder consists of smaller; more stable and more consistent bubbles and results in substantially extended half-life of the untreated foamed binder and the resulting mix retains the proven rejuvenating benefits of the Hydrogreen® S chemistry for improved performance.

D. Polymer Compatibilizers

Chemistries based on renewable resources or developed within our proprietary family of compounds, improve the affinity of the asphalt system for the polymers you choose to use, potentially reducing the total quantity of polymer required:

- Hydrogreen® S (formerly marketed as BituTech RAP® & BituTech PER)
- Hydrogreen® HFP (formerly marketed as BituTech PER-HF)

Use of Hydrogreen® S allows the hot-mix contractor or roofing manufacturer an additional means to optimize the performance of the polymers in his Polymer Modified Asphalt (PMA) mix. When combined with SBS in a PMA mix, Hydrogreen® S will enable more efficient conversion of PG64-22 base asphalt to PG70-28 or PG76-28 and provide an effective conveying medium for use of cross-linkers for further savings opportunities.



E. Pavement Performance Modifiers

Chemistry developed within our proprietary family of compounds provides the ability to extend the high PG temperature range of given asphalt without need of high shear processing:

- BituTech WA1
- BituTech VPW

These chemistries enhance the stiffness modulus to improve the load bearing properties of the PG binder through improved adhesive strength. Once dispersed into the asphalt, it will not separate, even if the binder is cooled and reheated.

BituTech WA1 is a low-melt warm-mix additive that improves high temperature PG performance of the mix and at the same time, allows easier handling at lower lay-down temperatures. This is a special asphalt additive that has been specifically designed for high RAP and warm-mix applications. BituTech WA1 melts quickly and incorporates easily in a recycle mix of up to 100% RAP.

BituTech VPW is a higher melting warm-mix additive that improves high temperature PG performance of the mix and at the same time, allows easier handling at lower lay-down temperatures.

When used at levels of 0.5% to 1.0%, in combination with conventional polymers such as SBS or SBR, BituTech WA1 or BituTech VPW will function as excellent dispersing aids, allowing the PMA plant operator to further optimize his polymer content.

F. Oxidation Enhancing Chemistries

Chemistries developed within our proprietary family of compounds which allow asphalt oxidation, at reduced processing temperatures and shorter cycle times, thereby reducing costs, increasing production rate and increasing process capacity:

- BituTech BUR
- Hydrogreen® S (formerly marketed as BituTech RAP® & BituTech PER)

These chemistries allow the user to expand the range of acceptable asphalt to generate his oxidized asphalt products, i.e. using harder (lower penetration) and less expensive asphalt to oxidize and achieve targeted results, reducing the need for expensive asphalt flux for shingle products. These materials are not catalysts, do not contain polyphosphoric acid and are miscible in all asphalts.

Use of BituTech BUR has been shown to yield one or more (combination) benefits such as (1) the ability to oxidize at a significantly lower processing temperature (i.e. 50 °F lower temperature) and reduce energy required, (2) more rapid oxidation of the base asphalt, resulting in less required energy and an immediate and significant increase in processing capacity and (3) the ability to start with harder asphalt(s) (i.e. PG64-22 or PG67-22 versus a more expensive asphalt roofing flux) to effectively generate an ASTM Type 3 & Type 4 Built-up Roofing Asphalt (BURA), thereby reducing the cost of the base asphalt and significantly expanding availability of feedstock.



A small amount (1-2%) of Hydrogreen® S added after oxidation will modify the Penetration of oxidized asphalt (1-3 Pen points) with limited impact on softening point, providing the processor with an additional tool to improve product consistency and reduce product cost.

G. Odor-Free Cross-linking Agents

Chemistries developed within our proprietary family of compounds are efficient cross-linkers that will improve effectiveness at lower costs over raw sulfur or conventional sulfur-based cross-linkers:

- ReactiBOND
- ReactiLINK
- ReactiLINK XP

These products are faster acting, less corrosive, free-flowing powders that are more effective than competitive cross-linkers. These materials offer the option for reducing polymer usage and at less cost than alternative cross-linkers and enables PMA production in containment areas with ease.

Our 3rd generation ReactiLINK XP is an even more efficient asphalt cross-linker, yielding very rapid conversion, with reaction with PMA batches being complete in as little as 1 hour and little or no sulfur emissions.

The unique and proprietary chemistry of these cross-linkers will scavenge hydrogen sulfide emissions which are characteristic of sulfur and sulfur based cross-linkers.

The use of sulfur and sulfur based cross-linking typically results in a continuing increase in PMA cross-linking density and change in modulus with time. ReactiBOND, ReactiLINK or ReactiLINK XP are typically exhausted at the end of the cross-linking reaction such that any such ongoing post reaction and changes in PMA properties are minimized.

A clear advantage of these cross-linkers over raw sulfur and other sulfur cross-linking agents is the threshold for the PMA to form a gel is much higher. A gross error (magnitudes) in the quantity of our cross-linker is required for gel to form, thereby making it safer to process as well as minimizing post reaction and gelatin in storage.

H. Unique Carrier Solvents, Release Agents & Process Aids

Chemistries based on renewable resources, with a flash point typically over 425°F, allow an effective means to convey liquid dispersible solids into an asphalt formulation:

- Hydrogreen® S (formerly marketed as BituTech RAP® & BituTech PER)
- Hydrogreen® HFP (formerly marketed as BituTech PER-HF)
- BituTech SEF

The effective dispersant characteristics of this renewable chemistry have been shown to be very effective in breaking and recovering gelled PMA. A little applied heat and some circulation will break down the gel and allow the contents to be fully recovered for reuse.



The emulsion version of this chemistry acts as an effective slip agent and anti-stick for use in hot-mix truck beds. Unlike using diesel or other petroleum solvents, there are no emissions, health or environmental hazards associated with this chemistry.

The dispersant characteristics of this base chemistry are very effective in re-dispersing and recovering of hardened binder-tank and truck heels and sediment. A little applied heat and some circulation will solvate the tank contents and allow the recovered asphalt to be predictably re-used into new binder.

These 100% renewable chemistries can be used as effective carrier oils in replacement of aromatic oils for agricultural applications such as pesticide or fungicide solvents or as crop adjuvants or fruit sprays.

These renewable chemistries can also be used as effective extender oils in in certain polymer resin diluent applications.

I. Pavement Sealers and Maintenance Products

Novel chemistry based on renewable resources or developed within our proprietary family of compounds, provides surface rejuvenation and sealing of pavement surfaces, sealing micro-cracks and protecting against moisture penetration, leading to extended life of the pavement:

- BituTech SEF

This product has been successfully used in road and parking lot applications, yielding a blacker pavement surface that lasts longer and resists cracking.

**Phone: (973) 216-3560 • Fax: (810) 277-7519 • Email: info@engineeredadditives.com
320 Commons Drive, Suite 313, Parkesburg, PA 19365
Offices in: Pennsylvania, New Jersey, Florida | **EA****