

SOY-BASED ASPHALT PAVING PRODUCTS

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PAVING TRIALS DEMONSTRATE SOY-BASED SEALER'S VALUE IN PAVEMENT PROTECTION, EXTENDED PAVEMENT LIFE AND EASE AND COST OF APPLICATION.

PAVING INDUSTRY OVERVIEW

U.S. asphalt production in 2010 was about 24 million tons, with 85% used for road paving and 15% used for roofing (shingles). Asphalt is a viscous liquid bitumen residue of the petroleum oil refining process. Major asphalt producers are large crude oil refiners such as BP, ConocoPhillips, ExxonMobil and Shell. Some large plants have been shut down, and two former manufacturers exited by selling their asphalt businesses.

ASPHALT CEMENT

Petroleum-based asphalt cement is the black, bitumen binder that holds together aggregate in paving asphalts and crushed granite in shingles. It constitutes about 6% of a paving asphalt and 28% of a shingle composition.

PAVING PRODUCTS

Asphalt cement is used in four types of paving products.

1. Cutback Asphalt – 30% of the market as of 2012. Asphalt cement is diluted with petroleum solvents (kerosene, gasoline, naphtha) to control viscosity and reduce cost. Use is declining due to growing environmental regulation and escalating solvent costs. In 2005, petroleum use in cutback asphalt was 256 million pounds.
2. Foamed Asphalt – 10% of the market as of 2012. Hot asphalt cement with cold water forms a thin film coating for soil stabilization.
3. Emulsion Asphalt – 35% of the market as of 2012. Asphalt cement with water and emulsifier to lower viscosity for cold paving.
4. Superpave – 25% of the market as of 2012. Polymer-modified asphalt cement (PMAC) can provide superior product performance in controlling pavement rutting and cracking and asphalt oxidation. Conventional

PMAC is the primary competition for polymer-modified, soy-based asphalt cement.

Despite severe cost escalation, industry demand for asphalt cement in paving will continue to grow modestly as the nation's road system grows and maintenance paving and replacement needs continue.

As of 2012, it is estimated that the relative cost of paving one linear mile of highway is \$15 million for concrete and \$13 million for asphalt. The need for improved paving product performance technology is great, including the ability to cost-effectively recycle asphalt pavement.

SOY-BASED ASPHALT CEMENT (SBAC)

BioSpan Technologies, Inc. Washington, Missouri, has developed soy-based asphalt cement. It is a proprietary blend of biobased solvents in which many volumes of waste plastics can be dissolved. A typical formulation contains about 25% soy and 11% waste styrene-butadiene polymers from foam flotation billets and ground tire rubber — materials that are unwanted in landfills.

SBAC PAVING PRODUCTS

BioSpan has developed a line of road-paving, restoration and patching products based on this technology that contains the new soy solvents and other biosolvents.



RePlay™ - Pavement restorer and protective coating. It is a low-heat spray coating that dries quickly, reverses oxidation, extends pavement life and costs less than petroleum oil seal products.

Activate™ - Asphalt millings (RAP-reclaimed asphalt pavement) restorer. It can be sprayed on and mixed with millings then repaved cold.

C-Patch™ - Asphalt cement product with fiberglass and aggregate for concrete patching.

SBAC COST PERFORMANCE

The cost-effectiveness of BioSpan's soy-based asphalt cement is creating a growing market demand. Over 80,000 miles of paving trials in many states and Canada have demonstrated superior performance compared with conventional asphalt in pavement protection, extended pavement life and ease and cost of application. RePlay™ pavement restorer costs about one-seventh of the price of conventional asphalt to apply. Paving with SBAC requires much less heating — 250° F versus 350° F for conventional asphalt. RePlay™ also dries quickly in about 20 minutes without the tracking caused by conventional asphalt.

SBAC paving products cost less to produce. BioSpan estimates that manufacturing costs for SBAC are about one-third of that of conventional asphalt due to lower raw material costs and lower production-process heating. The environmental impact of SBAC paving products is very positive beyond the energy savings in manufacturing and application. An independent Life Cycle Assessment in December 2008 determined that the use of RePlay™ pavement restorer significantly reduced greenhouse gas, air pollutant and VOC emissions when compared with Reclamite®, the conventional petroleum-based asphalt cement product. For more information on BioSpan, visit www.biospantech.com.

ROOFING MATERIALS INDUSTRY OVERVIEW

Approximately 15% of primary asphalt cement production goes into the manufacture of shingles and roll roofing. Shingles contain 28% asphalt cement that binds together ground granite and fiberglass reinforcing. Polymer-modified asphalt cement is used primarily in shingles. Improved product performance technology is also needed in the roofing industry if it is cost-effective. A significant opportunity is available to recycle used shingles and replace asphalt cement in new and improved performance, soy-containing shingles.

SBAC ROOFING PRODUCTS

Soy solvents developed by BioSpan can be used to recycle roofing shingles and manufacture new shingles by utilizing the asphalt cement described above. As of 2012, about 15% of petroleum asphalt cement production goes into roofing shingles. BioSpan's asphalt cement contains about 25% soy. Conventional shingles have reduced asphalt content, which lowers costs but results in a shorter lifespan. There is, consequently, an excellent market opportunity to provide a longer-lasting shingle using BioSpan's asphalt cement binder that does not oxidize nor degrade as quickly.

ABOUT USB United Soybean Board's 73 farmer-directors work on behalf of all U.S. soybean farmers to achieve maximum value for their soy checkoff investments. These volunteers invest and leverage checkoff funds in programs and partnerships to drive soybean innovation beyond the bushel and increase preference for U.S. soy. That preference is based on U.S. soybean meal and oil quality and the sustainability of U.S. soybean farmers. As stipulated in the federal Soybean Promotion, Research and Consumer Information Act, the USDA Agricultural Marketing Service has oversight responsibilities for USB and the soy checkoff.

