

Soy-Based Solvents



The Product - Methyl Soyate

Methyl soyate, a methyl ester derived from soybean oil is an excellent “green” alternative industrial solvent for use in various I&I (industrial and institutional) cleaners, paint strippers, adhesive and graffiti removers, parts cleaners and degreasers and as a carrier solvent for coatings and adhesives. It is a cost-competitive, low VOCs, low-toxicity, high-flash, effective and readily biodegradable replacement for conventional chlorinated and hydrocarbon solvents under increasing regulatory pressure on ozone-depleting chemicals (ODCs), hazardous air pollutants (HAPs) and VOCs.

U.S. Solvents Market Potential for Methyl Soyate

The industries and market applications that utilize solvents vary widely, but most manufacturing and non-manufacturing uses involve solvents to dissolve, suspend, carry or remove other materials. Methyl soyate’s properties offer opportunities to compete in many niche-market uses, which typically involve formulated specialty products. Conventional solvents with which methyl soyate usually competes represent about 12 percent of the total U.S. solvents market (11.9 billion pounds). The 2007 U.S. market demand for methyl soyate solvents is estimated to be 40 million pounds.

U.S. Solvent Demand 2006

SOLVENT	MILLION LBS.
MeCl (methylene chloride)	185
TCE (trichloroethylene)	230
Perc (perchloroethylene)	385
MEK (methyl ethyl ketone)	430
d’Limonene	120
Mineral spirits	140
TOTAL	1,490

Market Segments that use Soy Solvents

I&I Cleaning Products

This market has emerged as the largest use segment for methyl soyate-based formulated cleaners used in institutional (building maintenance), restaurants and households replacing hydrocarbon, citrus and chlorinated solvents to provide improved product safety.

Other Cleaners:

- Hard surface cleaners
- Household cleaners
- Glass cleaners
- Floor cleaners
- Waterless hand cleaners
- Bathroom cleaners
- Stainless steel cleaners
- Graffiti removers

Coatings, Inks and Adhesives

Solvents are used as resin carriers and diluents in alkyd and waterborne paints, coatings and adhesives to replace hydrocarbon solvents (mineral spirits), MEK and MeCl to lower VOCs, flammability and toxicity. Soybean oil is a major and growing component of printing inks, especially colored inks replacing hydrocarbon (petroleum) solvents. It provides many property improvements in addition to environmental benefits.

Paint Strippers

Methyl soyate-based paint strippers are a small but growing market niche replacing conventional MeCl-based strippers. MeCl regulatory pressure is growing because of worker safety and ozone-depletion properties. Methyl soyate can be formulated with other organic cosolvents and surfactants to design dwell times, drying rates and water rinsability for the desired performance properties.

Parts Cleaners & Degreasers

This is a very large but fragmented market that has relied on the primary use of TCE vapor degreasing and mineral spirits (solvent 140) for cold parts cleaning. Both of these solvents are under increasing regulatory control due to flammability and high VOCs (mineral spirits) and TCEs’ potential carcinogenicity. Methyl soyate cosolvent blends with other biosolvents such as ethyl lactate (Vertec Gold) and d’limonene (CitruSoy) provides a very cost-effective replacement for these solvents.

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Other Removers – Adhesives, Mastics, Resins, Inks, Asphalt, Rust

Methyl-soyate-formulated cleaners are successfully used to remove many types of polymeric and petroleum-based materials from processing equipment and fabricated parts. They are also used for safely removing floor tile mastics, cleaning asphalt paving equipment and cleaning up oil and fuel spills from shoreline beaches and stream beds. Conventional solvents replaced in these applications include MEK, MeCl, toluene, mineral spirits and other hydrocarbon solvents.

Physical Properties

Methyl soyate provides good solvency with a Kauri-butanol (KB) value of 58. It is a low-VOC solvent (<25 gm/l), has a high flash point of >360° F and is low in toxicity relative to most conventional solvents. The only difficult physical properties can be a slow evaporation rate, water insolubility and residual film formation upon drying. These properties can be improved and modified by formulating methyl soyate with polar cosolvents and surfactants or with a secondary wipe or rinse to remove the film residue. Materials compatibility is safe with most metals, plastics and elastomers.

Environmental Regulatons

Methyl soyate is not classified by the U.S. Environmental Protection Agency as a HAP, ODC or VOC.

Avalilability

The product is commercially available from many manufacturers in the United States.

Solvent Pricing

The competitive economics of methyl soyate as an industrial cleaning solvent are very favorable. As of December 2007, price for methyl soyate is typically \$.75/lb., and this compares to the following:

SOLVENT	PRICE
Mineral spirits	\$0.60/lb.
MEK	\$0.69/lb.
MeCl	\$0.45/lb.
TCE	\$0.75/lb.
d-limonene	\$1.28/lb.
NMP	\$2.00/lb.

With rapidly escalating prices of petrochemicals that are made from natural gas and crude oil, most of these industrial solvent prices have risen beyond that of methyl soyate, creating additional market opportunities for soy-based products.

Emerging New Uses and Applications

Solvent market potential for soy solvents is not limited to the replacement of conventional solvents by methyl soyate. New applications and product opportunities are being developed by creative entrepreneurs that utilize the flexibility of soy chemistry.

Methyl soyate can be used as a shoreline cleaner to remove and recover spilled oil and petroleum products from beaches and streams. It is listed by the U.S. EPA on the National Contingency Plan product schedule for oil spills, and it is the only shoreline cleaner licensed by the state of California.

Another creative new use for soy solvents is the safe disposal of waste plastic products. Methyl soyate can dissolve 20 to 25 times its own volume of plastic waste such as Styrofoam flotation billets or shredded tire rubber. Dissolved scrap plastics have many use potentials, such as paving product sealers and binders.

Other new emerging applications for soy-based solvent products and processes include paper pulp cleaning and recycling, bioremediation, highway paving and patching materials, and crude oil solvent extraction and processing.

USB is made up of 68 farmer-directors who oversee the investments of the soybean checkoff on behalf of all U.S. soybean farmers. Checkoff funds are invested in the areas of animal utilization, human utilization, industrial utilization, industry relations, market access and supply. As stipulated in the Soybean Promotion, Research and Consumer Information Act, USDA's Agricultural Marketing Service has oversight responsibilities for USB and the soybean checkoff.

