

# SOY-BASED SOLVENTS



**Soy means less VOCs, less flammability and less toxicity.**

## 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-VOC, 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 that 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 2008 U.S. market demand for methyl soyate solvents was estimated to be 45 million pounds.

### U.S. Solvent Demand 2008 (competing solvents)

SOLVENT	MILLION LBS.
MeCl (methylene chloride)	185
TCE (trichloroethylene)	240
Perc (perchloroethylene)	375
MEK (methyl ethyl ketone)	440
d-Limonene	120
Mineral spirits	130
<b>TOTAL</b>	<b>1,490</b>

## MARKET SEGMENTS THAT USE SOY SOLVENTS

### Cleaning Products

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



#### Types of 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 and coatings and in adhesives to replace hydrocarbon solvents (mineral spirits), MEK and MeCl to lower VOCs, flammability and toxicity to workers. Soybean oil is a major 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





# SOY-BASED SOLVENTS

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 industrial use of TCE vapor degreasing and mineral spirits (solvent 140) for parts cleaning. Both of these solvents are under increasing regulatory control due to flammability and high VOCs (mineral spirits) and TCE's 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.

## 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 on 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 mg/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 and residual film formation upon drying. These properties can be improved and modified by formulating methyl soyate with polar cosolvents and surfactants and with a secondary wipe or rinse to remove the film residue. Materials compatibility is safe with most metals, plastics and elastomers.

## ENVIRONMENTAL REGULATIONS

Methyl soyate is not classified by the U.S. Environmental Protection Agency (EPA) as a HAP or ODC.

## AVAILABILITY

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 November 2009, methyl soyate pricing was \$0.65/lb.

## SOLVENT

Mineral spirits	\$0.50/lb.
MEK	\$0.66/lb.
MeCl	\$0.40/lb.
TCE	\$0.60/lb.
d-Limonene	\$0.75/lb.

## PRICE

With rapidly escalating prices of petrochemicals that are made from natural gas and crude oil, most of these industrial solvent prices have escalated, 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.

## ABOUT USB

USB is made up of 68 U.S. farmer-directors who oversee the investments of the soybean checkoff, a U.S. soybean research and promotion program, 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.

For more information, visit: [soynewuses.org](http://soynewuses.org)



©2010 United Soybean Board [38508-MOSS-3/10]

