

Soy-Based Parts Cleaning Solvent Summary



New Environmental Technology for Small Business (NETSB) Project Summary

NETSB, a program developed by the Iowa Waste Reduction Center (IWRC) at the University of Northern Iowa, strives to increase the use of new environmental pollution prevention technology by small business, resulting in measurable environmental and economic benefits.

When choosing which technologies to test, the IWRC recognized three key areas of consideration: environmental criteria, economic measures and small business use feasibility. The equipment should have a positive impact on the environment, such as pollution prevention or energy savings. The technology should be evaluated considering capital costs, operational costs and return on investment. And finally, the equipment should be applicable in a small business environment.

In 2006-2007, the IWRC placed several types of potential pollution prevention technologies at small businesses throughout Iowa including: soy-based solvent, RASERS heat reclamation equipment, Zerowaste wastewater treatment systems and Green Earth® dry-cleaning solvent alternative.

Small Business Placement Description

Soy solvent is appropriate for a wide variety of manufacturing, industrial and service-related industries.

In these NETSB placements, four Iowa businesses were supplied with Glysol PC™, a soy-based solvent suited for industrial parts cleaning supplied by Workcell Systems, Inc. (<http://www.workcellsystems.com/>). Three Iowa businesses received Glysol PC™ soy-based solvent and a sink-based parts washer in which to use it. One business received only the soy-based solvent. Two placements were in a manufacturing setting and the remaining two placements were in the automotive repair industry.

Technology Description

Awareness of the environmental and health issues surrounding industrial cleaners is becoming more widespread. Many manufacturers are incorporating 'green' products in their formulations. Doing so has proven to be healthier for the people making and using the products, as well as for the environment. Bio-based products, derived from crops like soy, are becoming more widely available.¹

Soy-based cleaners vary from products appropriate for general household cleaning to powerful industrial solvents. Soy-based

solvent can be used as a straight cleaner, or in more typical industrial settings such as a sink-based parts washer.

The major component of most soy-based solvents is methyl soyate, a methyl ester derived from soybean oil. Methyl soyate is a viable alternative to traditional petroleum-derived solvents, which cause considerable health and environmental concerns and are under increasing legislative pressure to be replaced by biodegradable substitutes.²

Methyl soyate has potential as an industrial solvent for uses varying from parts cleaning, paint, ink, grease and resin removal and carrier solvents to specialty consumer products. It is also useful for shoreline oil spill clean up.³

When compared to conventional petroleum-based solvents, methyl soyate-based cleaners offer many advantages including:

- Lower in cost and toxicity,
- Readily biodegradable,
- Higher flashpoint and boiling point,
- Lower ozone-depleting chemicals (ODCs), hazardous air pollutants (HAPs) and volatile organic compounds (VOCs),³
- Lasts longer, and
- No unpleasant odor or skin irritation.⁴

Environmental Background

Most industrial solvents are composed of regulated substances. Such products usually require special storage, use and disposal to

minimize harmful exposure to both people and the environment. Using industrial petroleum-based solvents often requires a business to pay more for insurance and disposal of contaminated or residual materials.

When compared to conventional petrochemical solvents, bio-based cleaners typically reduce upstream and downstream pollution. The use of plant material like soybeans in the manufacturing of cleaning products decreases the amount of pollution generated from the extraction and processing of crude oil into chemicals. Likewise, bio-based products are highly biodegradable and in most cases can be disposed of safely and inexpensively.⁵

Health & Safety Background

Millions of workers in the United States are exposed to petroleum-based solvents used in products such as paints, varnishes, lacquers, adhesives, glues, and degreasing/cleaning agents. Exposure also occurs in the production of dyes, polymers, plastics, textiles, printing inks, agricultural products and pharmaceuticals. NIOSH recognizes many petroleum-based solvents as carcinogens, reproductive hazards and neurotoxins⁶

Additionally, exposure to some petroleum-based solvents (methanes, ethanes and ethenes) has shown adverse health effects including central nervous system, reproductive, liver and kidney toxicity and carcinogenicity.⁷

Bio-based cleaners tend to be lower in toxicity, flammability and corrosivity than their petrochemical counterparts, thus alleviating regulatory burden and adverse working conditions.⁵

Outcomes

TECHNOLOGY ACCEPTANCE AND USE OUTCOMES

Two companies decided they would discontinue using the soy-based solvent. One thought it left an undesirable film on the parts being cleaned in addition to finding the odor unpleasant. The other company thought the soy-based solvent actually worked too well. In some instances removing paint from parts when such a thorough 'cleaning' was unwanted.

On the contrary, the other two facilities, both part of the automotive repair industry, reported they were very pleased with the performance of the soy-based solvent and would continue to use it. They were satisfied with the level of cleaning performance, and

were happy using a product derived from nature, which is perceived as better for their employees and the environment.

POLLUTANT REDUCTION OUTCOMES

The two companies still using the soy-based solvent may eventually see waste reduction in that the soy-based solvent tends to last longer, requiring fewer disposal events than conventional petroleum-based solvent. Soy-based solvent is also inherently less toxic, containing no regulated substances and exhibiting a higher flash point, when compared to conventional petroleum-based industrial solvents.

ECONOMIC OUTCOMES

Increased solvent life is the most significant economic benefit of this pollution prevention application. Two companies are still using the soy-based solvent and may eventually see a reduction in waste disposal and decreased purchasing costs.

CONCLUSIONS

As a result of these NETSB placements, clear-cut reasons or circumstances warranting conversion to soy-based solvent were not apparent. To obtain more detailed

results it would be necessary for more facilities to participate in future studies.

In this small study, half approved of the soy-based solvent and half disapproved. The two that didn't like the product were involved with metal parts production. The two facilities that are still using the product are in the automotive repair industry. The differing needs between these industries may be a beginning to understanding when soy-based solvent use is appropriate.

ACRONYMS USED IN THE CASE STUDY

HAP	Hazardous Air Pollutant
IWRC	Iowa Waste Reduction Center
NETSB	New Environmental Technology for Small Business
NIOSH	National Institute for Occupational Safety and Health
ODC	Ozone-Depleting Chemical
VOC	Volatile Organic Compound

References

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- ³ Market Opportunity Summary: Soy-Based Solvents. United Soybean Board. January 2004. <http://www.unitedsoybean.org/>. Summaries located at <http://www.unitedsoybean.org/Library/RecentLibraryItems.aspx>.
- ⁴ <http://www.workcellsystems.com/GlysolPC.pdf> located on the manufacturer's website at <http://www.workcellsystems.com/>. For the Material Safety Data Sheet see <http://www.workcellsystems.com/GlysolPC%20MSDS.pdf>.
- ⁵ Institute for Local Self-reliance website for The Carbohydrate Economy Clearinghouse at <http://www.carbohydrateconomy.org/html/biochem.htm#anchor2>.
- ⁶ NIOSH Safety & Health Topics: Organic Solvents. National Institute for Occupational Safety & Health. <http://cdc.gov/niosh/topics/organsolv/>.
- ⁷ Ruder, AM. Potential Health Effects of Occupational Chlorinated Solvent Exposure. Ann NY Acad Sci Living in a Chemical World: Framing the Future in Light of the Past 2006 Sep; 1076:207-227.