CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2005

DateRun: 01/02/2005

Experimenters: Jason Marshall

ClientType: Recycling

ProjectNumber: Project #1

Substrates: Other

PartType: Part

Contaminants: Resins/Rosins

Cleaning Methods: Immersion/Soak

Analytical Methods: Visual

Purpose: To identify alternatives for dissolving poly styrene.

Experimental Procedure: Five alternative solvents were selected from the laboratory's database of test results based on client supplied information. Each product was used at full strength at room temperature. One polystyrene pellet was placed into each solution and the amount of time required for dissolving the styrene was recorded. Results from the alternatives were compared directly with one of the current solvents (Toluene).

Results: Three of the five alternatives dissolved the poly styrene in less than one minute. A fourth product started to dissolve the styrene but did not complete the process after 30 minutes. The fifth alternative showed no signs of dissolving the material. The effective alternatives were all slower than toluene. Toluene dissolved the material in under 5 seconds.

Summary:

Substrates:	Other				
Contaminants:	Resins/Rosins				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
EM Science	Toluene	100	0.00	☑	Less than 5 seconds. Current solvent
Transene Company, Inc.	D Greeze 500 LO	100	0.00	☐	More than 20 minutes
Dow Chemical Company	OS 30	100	0.00	☐	No dissolving
Bio Chem Systems	Bio T Max	100	0.00	☑	10 seconds
Invista S.a.r.l	Flexisolv DBE 6 ester	100	0.00	☑	30-40 seconds
Florida Chemical Company	D-Limonene	100	0.00	☑	30-40 seconds. Slightly faster than DBE 6

Conclusion: DBE is a relatively safe environmentally friendly solvent that dissolves a number of resins and plastics such as polystyrene. This makes the use of DBE attractive as a solvent for many plastics recycling applications. Partial solubility in water can lead to precipitation options for polymer recovery in an aqueous phase, and DBE itself can be recovered by vacuum distillation. DuPont is currently supporting several polymer-recycling projects (http://dbe.invista.com/).

Florida Chemical’s technical grade d-Limonene has been found to be an effective solvent for dissolving and compacting expanded polystyrene (EPS). D-Limonene (also know as orange terrenes) is a biodegradable solvent and degreaser occurring in nature as the main component in citrus peel oil. D-Limonene resembles the chemical structure of polystyrene and can rapidly break down the chemical bonds of EPS. The EPS pieces are floated on the surface of the d-Limonene until dissolved. The process can be accelerated by spraying d-Limonene directly onto the EPS. Florida Chemical has determined that between 300 kilograms and 400 kilograms of EPS can be dissolved in 100 kilograms of technical grade d-Limonene. (http://www.floridachemical.com/d-limonenestyrofoamrecycling.htm)

Bio Chem Systems Bio T Max is another d-limonene solvent and can be used in the same method as mentioned above (http://www.biochemsys.com/).