Evaluating Cold Cleaning Alternatives to TCE Case Study

Dr. Jason Marshall

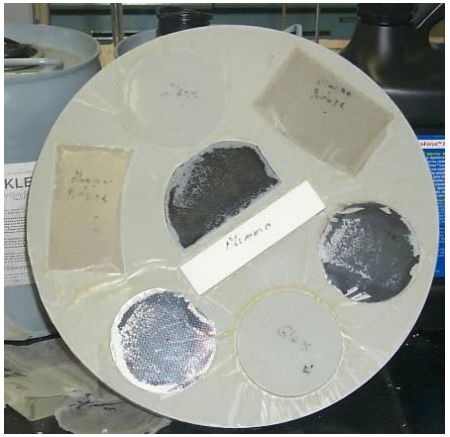
Lab Director

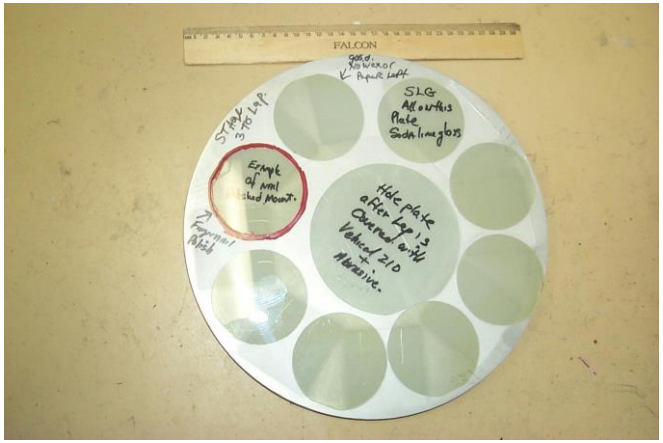
Toxics Use Reduction Institute

TURI
TOXICS USE REDUCTION INSTITUTE
UMASS LOWELL
Cleaning Laboratory

Cold Cleaning Case Study

- Most cleaning projects are not solved easily
- No single drop-in cleaning alternative exists
- The product selection process is one that must be tailored to each situation to ensure that alternative will be the best fit for the company





Elimination of TCE in production

- A semi conductor-electromagnetic and optical functions manufacturer
- Six step process
  - mounting the materials with wax
  - lapping process
  - cleaned to remove oil and abrasives
  - polished/cleaned
  - materials dismounted
  - final cleaning of wax using vapor degreasing

Mounting Materials

- Heating a twelve inch plate of glass to 200-300 F
- Wax is applied
- Lens paper is placed over the wax
- Another layer of wax is applied
- Materials mounted into this layer of wax

Lapping/Polishing

- Plate sent to be lapped or polished
  - uses lapping oil
  - one of two abrasives

Clean, Polish, Clean

- Remove oil and abrasives
  - involves wiping with TCE
- Cleaned materials are then polished and cleaned by hand with a wet paper towel
  - followed by an acetone wipe

Dismount and Final Cleaning

- Plate is reheated to the 200-300^{0}F range
- Materials are slid off the surface
- Final cleaning is focused on wax removal using TCE for up to 10 minutes
- Following the de-waxing, two 5 minute ultrasonic aqueous cleaning stages are performed
- Cleaning is finished off with a methanol bath rinse for up to 4 minutes

Lab Testing

- Identify alternatives for wax removal
- Oil and abrasive slurries cleaning
- Pilot cleaners on supplied client parts
- Parts made from
  - Alumina nitride
  - Alumina
  - fused silica
  - lithium fluoride
  - Glass
  - stainless steel.

What Was Cleaned

- Stage 1. Bees wax
- Stage 2. 98045 Wax from Roger Reed
- Stage 3. Roger Reed 93114 wax
- Stage 4. Roger Reed 98033 wax
- Stage 5. Aremco Crystalbond 509 wax
- Stage 6. Speed Fam Industrial Applications Vehicle 210 with Boron Carbide abrasive
- Stage 7. Speed Fam Industrial Applications Vehicle 210 with Aluminum Oxide abrasive
- Stage 8. Pilot Cleaning

Summary of Successful Products

Contaminant	Company Name	Product Name	Total	Effective	Ineffective
Waxes	AG Environmental Products	Canola Gold CE110	3	2	1
Waxes	Bio Chem Systems	Bio T 200 A	8	5	3
Waxes	Dynamold Solvents Inc	DS 108	4	3	1
Waxes	Florida Chemical Company	Citrus Burst 7	8	5	3
Waxes	National Diagnostic	Opti Clear	9	8	1
Waxes	Pentone Corporation	Citrikleen XPC	8	4	4
Waxes	Solvent Kleene Inc	D Greeze 500 LO	3	1	2
Abrasive	Amax Corporation	Safety First	2	2	
Abrasive	Brulin Corporation	Formula 815 GD	2	2	
Abrasive	Innovative Organics Inc	Amberclean L 12	2	2	
Abrasive	LPS Laboratories	LPS Precision Clean	2	2	
Abrasive	National Diagnostic	Opti Clear	1	1	
Abrasive	US Polychem Corporation	Polyspray Jet 790 XS	2	2	
Oil	Amax Corporation	Safety First	2	2	
Oil	Brulin Corporation	Formula 815 GD	2	2	
Oil	Innovative Organics Inc	Amberclean L 12	2	2	
Oil	LPS Laboratories	LPS Precision Clean	2	2	
Oil	National Diagnostic	Opti Clear	1	1	
Oil	US Polychem Corporation	Polyspray Jet 790 XS	2	2	

Outcome

- The facility only had 8 gallons of TCE remaining and were not intending on purchasing any more
  - The employees were all pleased to hear that TCE would not be used any more
- Upon contacting the company one month later, informed that alternative products were working well
  - Solvent Kleene D-Greeze 500

Success without Worker Buy-in not Likely

- Keys to success
  - Conducting systematic performance testing using the specific soils encountered at the facility
  - Pilot the potential product on actual parts by the personnel responsible for running the cleaning process
- By conducting the on-site work, questions or concerns can be met in real time