



Toxics Use Reduction Institute

# Hands-on Assistance Improves Services of the Toxics Use Reduction Institute's Laboratory

Jason Marshall, ScD  
Lab Director  
TURI Lab  
978-934-3133  
jason@turi.org



1 University Avenue  
University of Massachusetts Lowell  
Lowell, MA 01854-2866  
P: 978-934-3275  
F: 978-934-3050  
www.turi.org

# What Has Have We Done

- Providing technical assistance since 1993
  - TUR Lab has helped hundreds of companies find safer alternatives to hazardous cleaning solvents
    - Process specific testing
  - The implementation rate for clients of the lab is three times higher than the national average for technical assistant providers
    - Prior to 2007, 33% of the companies fully adopt the lab's recommendations
    - During past 2 years, near 80%

# Technical Assistance

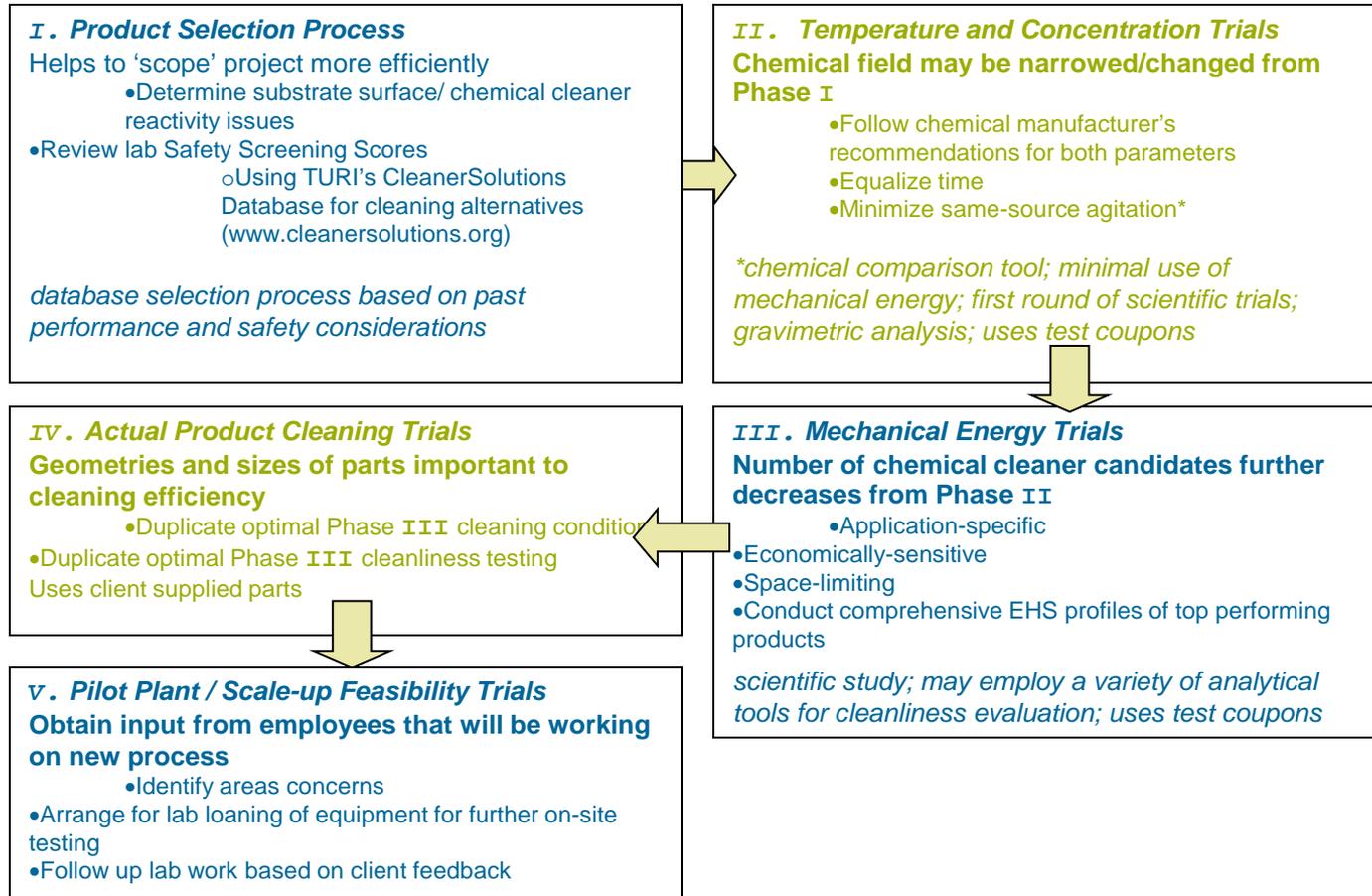
- The goal of the lab is to assist industry in the search for safer cleaning processes
  - By developing and promoting safer alternatives to hazardous solvents
- **Free Services to Massachusetts Companies**
  - On-site walk through
  - Laboratory Testing
  - Piloting
    - Lab
    - On-site
  - Follow Up Assistance

# Alternative Selection

- Process is challenging
  - Thousands of products
  - Different information from different vendors
  - What is right for some may not work for others
- Need for an easier selection method
  - Independent analysis of products
  - Objective operating conditions
  - Process specific final evaluations



# Keys to Success



# Product Selection Phase 1

- *CleanerSolutions*
- TURI Lab Database of Testing
  - Used to identify safer and effective products
    - Safety Screening Scores
      - VOC, ODP, GWP, HMIS/NFPA, pH
    - Matching Performance
      - Contaminant, substrate, equipment, current solvent

[www.cleanersolutions.org](http://www.cleanersolutions.org)

---

# Selecting an Alternative

- When choosing an alternative
    - Don't shift the risk
      - From worker to environment
      - OR**
      - From environment to worker
        - Ex. Replacing flammable solvent with a ozone depleting chemical
    - Want to select a product that is safer for one or the other
      - Would be best if safer for both
-

# Other Indicators

- Further analysis should be conducted to verify that the selected products are compatible with your process
- Determine if there are any health risks that the screening does not address
  - Aquatic Toxicity
  - Biodegradability
  - Carcinogens, Mutagens or Teratogens
  - Concentration
  - Disposal
  - Endocrine disruptors
  - Eutrophication
  - Fragrances and Dyes
  - Life Cycle Assessment
  - Neurotoxins/CNS Depressants
  - Packaging
  - Recyclability
  - Reproductive Toxicity

# Review Current System

- Contacted by company with cleaning related issue
- Gather background information on process
  - SSL Test Request form
    - Material of parts to be cleaned
    - Contaminants
    - Current Solvent or other alternatives tested
    - Available Equipment
    - Operating conditions (time, temp, conc.)

# Review Current System

- On-Site visit
  - Complete Test Request form
  - Gather samples and MSDS
    - Contaminants
    - Current Solvent
    - Dirty Parts
  - Identify possible adjustments to process



# Identifying an Alternative

- The cleaner must be assessed for
  - Ability to remove the contaminants
  - Compatibility with the surfaces to be cleaned
  - Works with equipment that will be used
- The alternative should be safe for the worker and the environment



# Testing an Alternative Phase 2

- Initial laboratory evaluation of alternatives
  - Using basic operating conditions
    - Minimal concentration
    - Short times
    - Little agitation
  - Using coupons matching part substrate
  - Using supplied contaminants
  - Compare with current solvent (if possible)



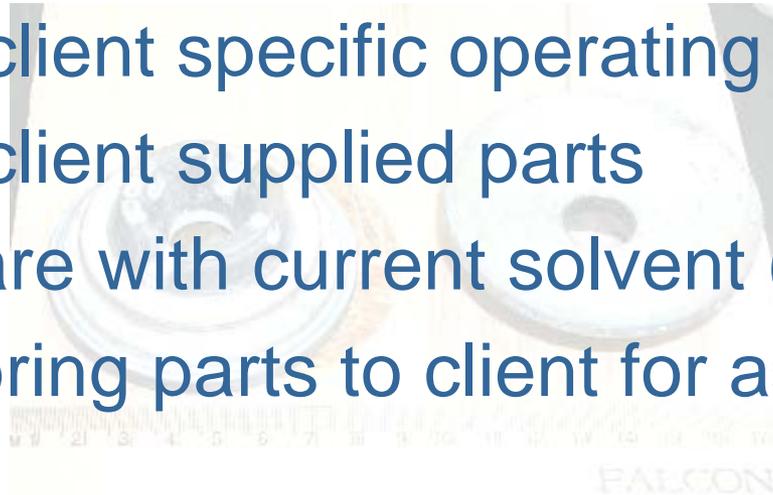
# Testing an Alternative Phase 3

- Advanced lab evaluation of alternatives
  - Using client specific operating conditions
    - Moderate concentration (if necessary)
    - Times
    - Appropriate agitation (match current equipment)
  - Using coupons matching part substrate
  - Using supplied contaminants
  - Compare with current solvent (if possible)



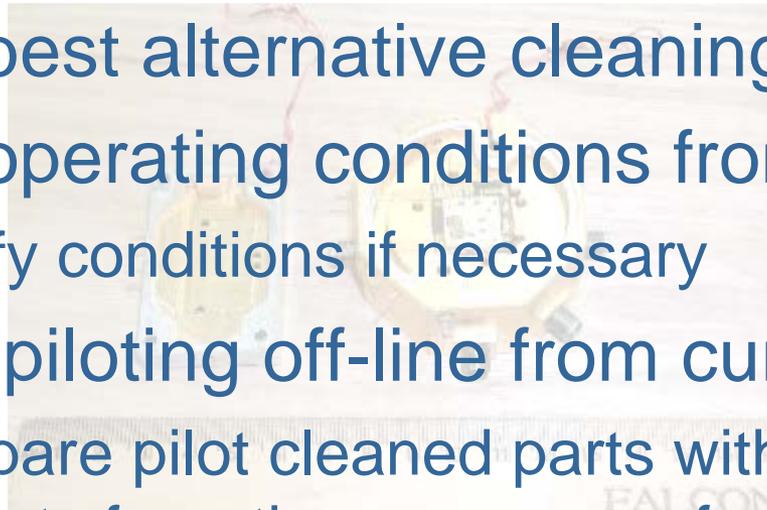
# Testing an Alternative Phase 4

- Pilot cleaning in lab setting
  - Using client specific operating conditions
  - Using client supplied parts
  - Compare with current solvent (if possible)
  - Send/bring parts to client for assessment



# Testing an Alternative Phase 5

- Pilot testing at facility
  - Using best alternative cleaning products
  - Using operating conditions from lab piloting
    - Modify conditions if necessary
  - Set up piloting off-line from current system
    - Compare pilot cleaned parts with current system for parts from the same manufacturing lot
    - Get end user input for performance



# TURA Work in MA

## SSL Testing (1993-2003)

- Worked with 21 companies trying to replace TCE in cleaning applications
- A wide range of industries were represented
  - Aircraft
  - Electronics
  - General Mfr
  - Metal working
  - Optical
  - Plating
- Conducted over 100 experiments
- 11 Contaminant types
  - Abrasives
  - Buffing Compounds
  - Coatings
  - Fluxes
  - Grease
  - Inks
  - Paints
  - Cutting Fluids
  - Lubricants
  - Oils
  - Waxes

# Summary of Alternatives Testing to TCE

- 21 Vendors
- 44 Products
- 11 Product Types

Class	# of Products
Alkaline Aqueous	23
Caustic	1
Ester	3
HCFC	1
Neutral Aqueous	2
Organic	1
Petroleum Distillate	3
Semi-Aqueous	2
Terpene	5
Terpene-Organic	1
Terpene-Semi-Aqueous	2

# EPA Grant to Replace TCE & Chlorinated Solvents

- Two year grant - 2003-2005
  - Conducted with MA Office of Technical Assistance
  - Help small companies move away from TCE & chlorinated solvents in vapor degreasing
- Work focused on drop-in substitutes
  - Due to capital investment of large closed looped systems
  - Gathered EH&S data for
    - TCE and other chlorinated solvents
    - The chemical classes of the substitutes for comparisons
  - Article in Process Cleaning Magazine on Drop In Alternatives
    - Sept/Oct issue
    - <http://www.processcleaning.com/>

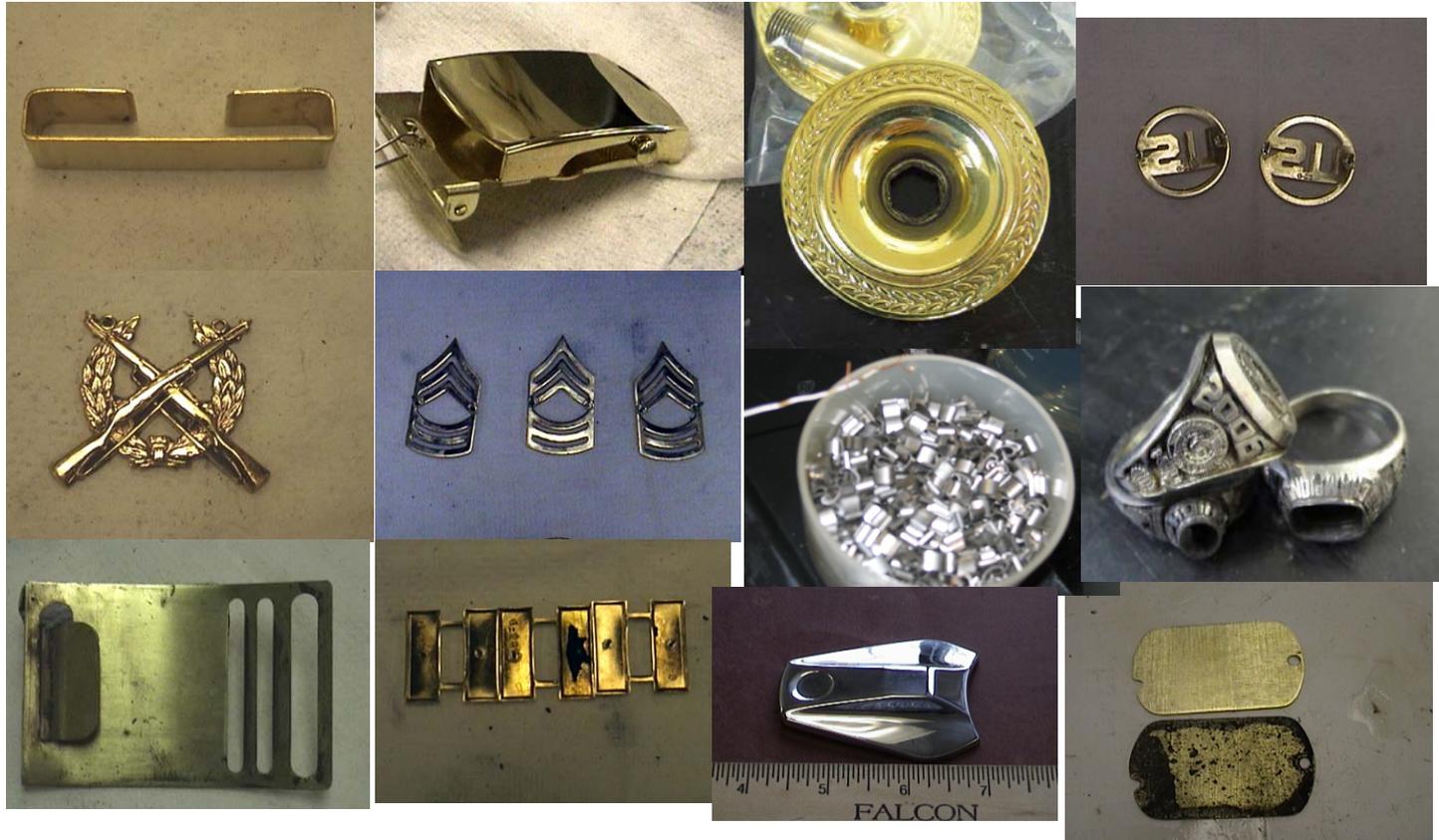
# SSL Testing (2003-2005)

- 8 companies trying to replace TCE/ Chlorinated Solvents in cleaning applications
  - Six joint site visits by OTA and TURI
  - Two site visits by TURI
- A wide range of industries are represented by these companies
  - Aircraft
  - Electronics-Ceramic
  - Jewelry
  - Metal working job shops
  - Tool
  - Capacitors
  - Wire & Cable
- Conducted over 70 experiments
- 8 Contaminant types
  - Buffing
  - Coating
  - Grease
  - Ink/Paint
  - Mold Release/Silicone
  - Oil
  - Resin/Rosin
  - Waxes

## EPA Funding in RI 2006-8

- Workshop Fall 2006
  - Worked with 13 companies
  - On-site testing for 6
- Second Grant 2007-8
  - Worked with 8 companies

# RI Parts Cleaned



# Ira Green - Background



- 270 employees - Products consist of metal pieces for the DoD
  - Military unaware of TCE use in metal finishing operations
- Used 12,500 pounds of TCE in 2004
- When EPA contacted Ira Green, the company was very close to exceeding permit limitations
- Already had enforcement action against them by the RI DEM 2003 and 2004



# Ira Green – Finding an Alternative

- EPA collected parts for TURI to test
- Set up a test tank in Ira Green's facility
  - Determined that alternative solution works as well as TCE
  - TURI provided free gallon of alternative solution

# Ira Green Summary

- One product line completely converted to aqueous cleaning
- Installed additional soap cleaning tanks in plating area
- Have done enough hands on shop floor testing to know they can effectively clean 95-100% of all products
- Now working through the logistics, material handling, and queue/work in process issues to make a total conversion
- Critical to process
  - Clean as soon as possible after polishing
  - Very concerned about drying, watermarks or staining

# Three A's - Background

- Small, family-owned job shop – 4 employees
- Owner wanted to stop using TCE because of associated health risks
- Used approximately 55 gallons (~690 pounds)/year at a cost of about \$1000



## Three A's – Finding an Alternative

- EPA collected parts for TURI to test
- Needed to find an alternative process that would maintain an antique finish on metal parts
- An alternative was found that will allow Three A's to retrofit current degreaser with an immersible transducer, saving money on equipment costs
- Switched to a Steam Cleaner
  - Eliminating TCE from their plant

# Overall TCE Reduction

- All Companies from 1993-2008
  - 46 companies
  - Used 297,300 lbs
  - Reduced 195,200 lbs
  - 66% reduction
- RI 2006-7
  - Used 24,500 lbs
  - Estimated reduction 12,500 lbs
  - 51% reduction
- RI 2007-8
  - Used 26,000 pounds/year
  - Reduction to less than 7000 pounds/year
  - 75% of the reported TCE usage

# Summary

- Lack of adoption by companies receiving lab testing only shows the importance of providing on-site assistance
    - 30% adoption rate
  - By conducting the on-site work, questions or concerns can be met in real time, facilitating a successful adoption of safer cleaning practices
    - 80% adoption rate
  - Lessons learned from RI project can easily be applied to other areas with concentrated industry regions
-