

# Are you *STILL* using Trichloroethylene?

## A Guide for Metal Finishers

### Summary

This how-to guide is based on site visits conducted by EPA Region 1 to several small and medium sized metal finishers using trichloroethylene (TCE) in their metal finishing operations. The EPA worked in conjunction with The Toxics Use Reduction Institute (TURI), which has performed lab tests on dirty metal parts using alternative cleaning solutions to TCE for each of the facilities. The guide is designed to assist metal finishers in finding a safe alternative to using TCE in degreasing operations.

### About TURI

The mission of TURI is to research, test, and promote uses of alternatives to toxic chemicals; to provide resources that help make households and workplaces safer; and to promote economic competitiveness through reduced risk. In order to fulfill its mission, TURI provides communities in Massachusetts with research, technical assistance, training, grants and laboratory services.

TURI's scientists have performed hundreds of tests on alternatives for TCE. The results of TURI's research have been recorded in the *CleanerSolutions* Database, which is available at <http://www.cleansolutions.org>. This database can be used as a tool to help any metal finisher determine the best alternative for a particular metal finishing operation or polishing compound.

### Why should you stop using TCE?

Trichloroethylene is a hazard in the workplace and in the environment. In the workplace, TCE inhalation can result in symptoms such as sleepiness, fatigue, headache, confusion, and feelings of euphoria. Additionally, it can affect the kidneys, liver, gastrointestinal system, and the skin. In both the workplace and the environment, TCE can contaminate drinking water, which can result in exposure through consumption. While the cancerous properties of TCE are not certain, data suggests that TCE is a likely human carcinogen.<sup>1</sup> In addition to the health effects associated with using TCE, there are also many different regulatory requirements for facilities using TCE. Keep in mind that as you think about switching to an alternative, you may also be switching to a process that has fewer regulatory demands – which could save your facility both time and money.

### How to use this guide:

When using this guide, keep in mind that each facility is different, and needs will differ based on the product being manufactured. The 10 step process is designed to be general enough to apply to any metal finisher. Contact information has been included at the end of this document so that users can obtain additional information about the process of switching from using TCE.

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<sup>1</sup> <http://www.epa.gov/ttn/uatw/hlthef/tri-ethy.html>

## 10 Steps to Finding and Alternative to TCE

The following steps are based on recommendations made by the Toxics Use Reduction Institute and by the Environmental Protection Agency Region 1 office.

### 1) **Determine why you are cleaning with TCE.**

If the answer is “because we always have” or “it is the only thing I trust” then it may be time to re-address your cleaning methods. The first thing to do is inform your customers and supply chain that you are going to investigate how to eliminate TCE from your process.

### 2) **Get your workers involved.**

The people who run the cleaning process in your facility have valuable insight. Get them involved in the selection and testing process to ensure a successful transition.

### 3) **Know your process.**

How long does it take to clean parts? How many do you clean at a time? What equipment could you use (immersion baths, spray washing, or ultrasonics)? Are you willing to evaluate new equipment?

### 4) **Get help.**

There are many resources that you can use to help you find the right solution to clean your parts. The Toxics Use Reduction Institute at the University of Massachusetts, Lowell is a great resource.

- Contact TURI directly or use the *CleanerSolutions* Database to determine the most appropriate solvent for a particular metal or process: <http://www.cleanersolutions.org/>
- This will help determine the best solvent, concentration and temperature that are needed for the new process.
- Alternatively, you can send parts to TURI for testing or schedule an on-site visit from TURI.

### 5) **Test the alternatives.**

Use the TURI lab to find out how different cleaners and equipment perform on your parts and soils. Contact TURI to get more information about vendors. The testing of alternatives can be a long process. TURI begins the testing process by first putting some polishing compound onto a piece of scrap metal in order to test out several different aqueous solutions to determine just a few that work the best. Following this testing, TURI uses

actual parts from a shop to determine which solution, temperature, and concentration is optimal for your process.

**6) Pilot the alternative.**

Set up a separate cleaning line to clean parts in the new chemical solution and compare with your current practice.

- What about oil on parts, will an aqueous solution remove oil?
- How do costs for aqueous solutions compare to costs for TCE?
- Can you change the process just by retrofitting your current degreaser or do you need to invest in additional technology.
  - Do you need a spray (for antiquing)?
  - Do you need a steamer (for rapid drying)?

**7) Check in.**

During the piloting, keep your customers and your supply chain informed of the status of the project. Get their feedback about the quality of the results.

- Contact local POTW to notify of switch in processes and ask if any additional permits are required or if there are new reporting requirements.

**8) Phase in – Phase out.**

Introduce the new process to part of your production line in a step-wise manner. You can gradually phase out existing cleaning with TCE.

**9) Reevaluate the process.**

Once TCE has been eliminated, evaluate how well your new process is working. See if you can go further to eliminate more solvents and toxics in other phases of your business.

**10) Revisit the process.**

Congratulations on making the switch, but don't stop thinking about your cleaning process. New chemistries and equipment are being developed all the time so keep your eyes and ears open. Check other the free, online TURI CleanerSolutions database often and ask the TURI Lab to visit again to help you reevaluate.

## Case Study: Shop A\*

### About Shop A:

Shop A employs about 270 employees in its 120,000 square foot shop. The shop houses metal finishing operations inside of a much larger metal processing plant that processes metal from the beginning to end of production.

### Problem:

When the EPA contacted Shop A about finding an alternative to TCE, the facility was close to exceeding the permissible amount of TCE use for the permit that it had. Additionally, the company had enforcement actions brought against it in 2003 and 2004 as a result of inspections conducted by the state environmental agency.

### The Solution:

The EPA first collected parts from Shop A for TURI to test. The initial test, conducted on August 31, 2006, found that four out of eight compounds tested at 5% concentration and 120°F removed over 80% of the buffing compound from the metal parts. After several trials of different solutions at different concentrations and temperatures, TURI was able to determine on solution that worked best to remove residue from the



parts provided by Shop A. EPA then brought the testing to Shop A's facility, where they determined that the solution selected by TURI would work just as well as TCE. The company was able to utilize their existing ultrasonic equipment for some of their new processes but will have to purchase a large ultrasonic machine in order to process large batches of parts using the new solution.

### Outcome:

In 2004, Shop A used 12,500 pounds of TCE. While the facility is waiting for new ultrasonic equipment, they have temporarily switched to n-propyl bromide. With the installation of the new equipment, Shop A will have reduced TCE use by 100%.

\* The name has been changed to protect the privacy of the company.

## Case Study: Shop B\*

### About Shop B:

Shop B is a small family-owned business that employs just 4 people. The majority of the metal pieces that Shop B polishes are fine jewelry and statue figurines.

### The Problem:

The owner of the shop recently purchased a new degreaser but was concerned about the health related risks associated with using TCE. When the EPA contacted him about getting his parts tested with the different aqueous solutions at the TURI lab, he sent over several parts. The biggest obstacle for the shop was finding a solution that would keep the antique finish on his parts but also work as effectively as TCE.



### The Solution:

The TURI lab tested the parts with different cleaning solutions at different concentrations and temperatures. Even with the different temperatures and concentrations, TURI found that the solution to the problem was use a low concentration of the solution at a low temperature to protect the antique finish of the piece. In addition, this technique will also save money on chemicals and energy costs over time. In addition to the low

temperature, low concentration solution for antiquing parts, TURI also recommended that Shop B retrofit their existing vapor degreaser ultrasonics that can be used on parts that do not need to maintain an antique finish.

### Outcome:

Shop B decided they did not want to spend the money required to buy an ultrasonic system, even though it worked well. They bought a steam cleaner for \$475.00, and had it hard piped into their water system for a total cost of less than \$1000.00. Although the process of steam cleaning parts is slow, the steam dries completely and leaves no residue, eliminating the need for drying. This is an effective low cost alternative appropriate for a small polishing shop.

\* The name has been changed to protect the privacy of the company.

## **Potential Additional Costs**

The following are possible additional costs that your facility should take into consideration when looking for an alternative to TCE.

**1. Retrofitting a degreaser:**

Ultrasonics: (drop in probe, bar and energy source, or purchasing new unit)

**2. Purchase of smaller vapor degreaser if solvents are still occasionally needed**

**3. Aqueous chemical purchase**

**4. Increased water usage (with 80-90 percent dilution they will use more water and need to dispose of it)**

**a. Water disposal permits**

**b. Filtering system to increase bath life**

**5. Other cleaning options such as steam cleaner, spray washer**

**6. Drying equipment, if needed**

## Helpful Contact Information

### **EPA Region 1 (Boston, MA):**

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