SEPA 2024 National Pollution Prevention Training and Conference

State Actions Assisting Businesses Transitioning from Perchloroethylene (PCE) and Trichloroethylene (TCE)

December 10, 2024 2:15 – 3:30PM ET

Moderated by John Katz, EPA Region 9

Speakers:

- Greg Harris, California Air Resources Board
- Sean Smith, Washington State Department of Ecology
- Baskut Tuncak, Toxics Use Reduction Institute, University of Massachusetts Lowell
- Laura Sevcik, Minnesota Technical Assistance Program (MnTAP)



About the Environment... We Care About You

Cleaning Up, Cleaning Up Washington's Transition to Safe 2024 EPA Pollution Prevention Train Sean Smith, Product Replacement For an Manager

Agenda



- **Program History and Background**
- 2
- Ecology's PERC Replacement Program



What worked? What were the barriers?



What are the results?



History

- Historically regulatory focus downstream
- Small, widespread releases of toxic chemicals in consumer products pose one of the largest threats to public health and environment
- Chemical Action Plans developed to address these sources, but lacked funding to implement



What is the PRP?

Our mission is to safeguard the health of all Washingtonians and preserve their environment by providing financial resources and technical support to retailers, manufacturers, and industry to reduce the use of targeted toxic chemicals and heavy metals in consumer products and industrial processes.



Product Replacement PROGRAM





PERC Replacement

- Dry cleaner chemicals can harm public health and the environment
- In 2017, Ecology along with King County surveyed Washington's Dry Cleaners
- In 2018, King County piloted a dry cleaner replacement program
- Determine the factors these business consider when switching from PERC
- Determine what incentives would best facilitate switch



What Worked?





Multiple Alternatives or Incentives



Meaningful Technical Support



Motivated Partners and Vendors



What were the Barriers?









Results

- Nearly 100 vouchers issued.
- Helped 80 dry cleaners make the switch to safer technology or decommission their PERC machines.
- Reimbursed for more than \$1.7 million.





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Thank y

For more information on Ecology's product replacement work please visit:

ecology.wa.gov/productreplacement



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Dry Cleaning Program

2024 EPA Pollution Prevention Training and Conference

Greg Harris December 10, 2024

Background - Regulatory

- Perchloroethylene (Perc) identified as a Toxic Air Contaminant (1991)
- CARB adopted dry cleaning regulations (1993)
 - Dry Cleaning Air Toxics Control Measure (ATCM)
 - The Environmental Training Regulation
- CARB amends the Dry Cleaning ATCM (2007)
 - Phased out Perc by January 1, 2023
 - Added requirements for Perc manufacturers and distributors



Background - Dry Cleaning Solvents

The Type and Number of Dry Cleaning Machines in California

Statewide Estimates	Number of Machines (2003)	Number of Machines (2006)
Perc Machines	4,670	3,660
High Flash Point Hydrocarbon	460	1,100
GreenEarth	90	190
Water Based Cleaning Systems	150	170
Carbon Dioxide	3	10
Others (Rynex 3, PureDry, and Stoddard)	60	80



Background - Dry Cleaning Solvents

- Dry cleaning solvents used in California in 2015:
 - Perc
 - Hydrocarbon
 - GreenEarth
 - Water-based Systems
 - Rynex
- Emerging Solvents:
 - 1-Bromopropane (n-propyl bromide or nPB)
 - Solvair™ (dipropylene glycol normal butyl ether/ CO2)
 - SolvonK4 (formaldehyde dibutyl acetal)



Background - AB 998

AB 998 Program (Non-Toxic Dry Cleaning Incentive Program)

- Established by legislation in 2004
- Two Components: grants and demonstration
 - Grants \$10,000 to approved facilities
 - Demonstration statewide showcase
- Funded by Perc fees collected by CARB
 - From Perc sold into California for dry cleaning
 - Fee started at \$3 per gallon, increase \$1 each year
 - Fee remained at \$12 per gallon after 2013
 - Enforcement with Dry Cleaning ATCM provisions
- Ended on January 1, 2023



Background - Approved Clean Technologies

- Process for approval of technologies specified by AB998
 - Non-toxic and non-smog forming
 - CARB consults with other agencies (OEHHA)
- Professional wet cleaning and carbon dioxide systems approved since inception
- Several solvent representatives approached CARB for approval into the AB998 program; many asked about hydrocarbon solvents
 - After assessment, only water-based systems were approved



AB 998 Grant Program

- Fee collection started in 2004
- Equipment replacement grant started in 2005
- Collected over \$3.6 million
- Provided 158 equipment replacement grants

Type and Number of Equipment Replacement Grants Given

Technology Type/Year	2005 - 2010	2011 - 2015	2016 - 2021
Water Based Systems	118	20	17
Carbon Dioxide	3		
Total	121	20	17



AB 998 Grant/Demonstration Program Barriers

Barriers Observed (initially):

- Differences in operating procedures
- Demonstration location and timing
- Grant amount
- Language and trust
- Clothing label
- Customer acceptance



AB 998 Grant/Demonstration Program Revisions

- Demonstration program revised to address the decline in participation of the Grant Program
 - Include other areas in California
 - Include demonstration site grants
 - Partnerships with local agencies
- Post 2015, cumulative incentivized grant amount up to \$24,000
 - Approximately 800 Perc machines remained
 - 80 percent in Southern California (2020 phase out)



AB 998 Demonstration Program

- Demonstration Program started in 2007
- Four grants to three non-profit organizations
 - Outreached to dry cleaning facilities
 - Provided opportunities to view the approved systems and operations by demonstrations
 - Provided information on the benefits, costs, and overall effectiveness of the systems
 - Provided technical assistance and training to facilities switching from Perc to an approved technology



AB 998 Demonstration Program

- The AB 998 Demonstration Program provided support that the dry cleaners needed to convert
- Conducted over 90 demonstrations (by non-profits and CARB/Districts)
- Established eight demonstration sites (funded)
- Produced material as resources for dry cleaners
 - List of vendors
 - Updates on alternative solvents
 - List of demonstration sites



Perc Program Effectiveness

- ATCM & AB998 Lowered Perc use and emissions at dry cleaners
- Monitored statewide ambient Perc levels decreased significantly





CARB Resources & Contacts

• Alternative Solvent Fact Sheet:

https://ww2.arb.ca.gov/sites/default/files/classic/toxics/dryclean/notice2015_alt_solvents.pdf

• AB 998 Program website:

https://ww2.arb.ca.gov/resources/documents/non-toxic-dry-cleaning-grant-program-ab998

- ladam website:
- <u>https://www.arb.ca.gov/adam</u>
- CARB Contact: <u>airtoxics@arb.ca.gov</u> Greg Harris, Manager, Toxics Control Section <u>Greg.Harris@arb.ca.gov</u>





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Driving to Zero

Finding safer alternatives to TCE and Perc

The Origins of Toxics Use Reduction Woburn, Massachusetts USA





d from http://classes.colgate.edu/dkeller/geol101/sums/wob.htm



MA Toxics Use Reduction Act (TURA) of 1989

- Created an interagency program to help businesses in MA reduce the use of toxics
- Does not ban or restrict the use of any substance
- List of "Toxics" updated regularly
- Requires facilities to:
 - Report on their use of Toxics,
 - Create TUR Plans, and
 - Pay an annual fee.





35 years of Reducing Toxics Data generated by TURA

THE BENEFITS OF TOXICS USE REDUCTION: EXAMPLES FROM MASSACHUSETTS





Source: TURAdata.org

* Core filers, production adjusted



How TURI Supports the Development of Safer Alternatives

Academic research leads to new solutions



Industry research develops viable options



Grants support implementation that demonstrates viability



Training professionals ("TUR Planners") builds capacity for change



Knowledge dissemination to expand adoption



Tools facilitate discovery and evaluation of options



TURI Laboratory Helping businesses find & adopt safer solutions



- Assesses safety and performance of alternatives and optimizes to fit business needs
- Works closely with businesses to understand their needs and processes
- Actively pursues both alternative chemistries and different equipment to avoid regrettable substitutes
- Collaborate with academic researchers in various disciplines
- Use computational tools and software to find additional alternatives

CleanerSolutions – publicly available database on alternatives
P2OASys – publicly available tool for comparing hazards

Learn more at <u>www.turi.org/lab</u>



Case study - TCE CD Aero

TURI Lab:

- Identified safer options using *CleanerSolutions* database
- Tested performance against various contaminants
- Compared hazards using *P2OASys*
- Evaluated numerous cost considerations, including equipment, productivity, space, energy/water, etc.

Result:

- \rightarrow Adopted safer, healthier water-based cleaning system
- → Savings = \$46,000 per year

Read more at - <u>https://bit.ly/3Zt4bbt</u>



The new owners of CD Aero established replacing nPB with an aqueous alternative as a priority in

The new water-based sy

its regulatory obligations

Performance Testing of CD Aero's Alternatives to nPB

Product (% Dilution)	Contaminant	Overall Effectiveness: Aluminum	Overall Effectiveness: Ceramic
Aquaease PL 732 (100%)	Canola Oil	34%	96%
	Epoxidized Soybean Oil	6%	77%
	SAS-60E	96%	88%
SC Aircraft & Metal Cleaner (10%)	Canola Oil	90%	93%
	Epoxidized Soybean Oil	83%	94%
	SAS-60E	91%	96%
LF 2100 (5%)	Canola Oil	93%	97%
	Epoxidized Soybean Oil	55%	97%
	SAS-60E	90%	96%
Aquavantage 3800 GD (5%)	Canola Oil	76%	73%
	Epoxidized Soybean Oil	56%	71%
	SAS-60E	97%	89%

Environmental Health and Safety Comparison of nPB and Alternatives

Category	Original Solvent: n-propyl bromide	Identified Alternative: Aquaease PL 732	SC Aircraft & Metal Cleaner	LF 2100	Aquavantage 3800 GD
Acute Human Effects	VH	н	н	м	н
Chronic Human Effects	VH	L	м	м	L
Ecological Hazards	н	М	м	L	м
Environmental Fate & Transport	VH	М	L	м	М
Atmospheric Hazard	н	L	L	м	М

Operating and Maintenance Cost Comparison of CD Aero's Old and New Systems

Item	Old nPB System: Annual Costs	New JenFab/Aquaease System: Annual Costs	Cost Savings
Cleaning solution	\$15,000	\$15,000	_
Electricity	*\$56,500	\$35,500	\$21,000
Steam	\$25,500	\$11,250	\$14,250
Water	\$0	\$1,000	(\$1,000)
Impregnation oil disposal	\$600	\$600	-
Regulatory reporting (TURA fee)	\$1,200	\$0	\$1,200
Maintenance Costs	\$11,000	\$0	\$11,000
Total	\$109,800	\$63,350	\$46,450

* Electricity costs of equipment, carbon absorption, and chiller.

Productivity Increases Between CD Aero's Old and New Systems

Item	Old nPB System	New JenFab/Aquaease System	Comments
Training	Several weeks of training many years ago	Approximately 30 minutes for each of 3 operators	Minimal training was needed to learn the new system
Throughput	Up to 40.5 baskets per hour	Over 68 baskets per hour	68% increase in throughput
Maintenance Labor	Approx. 3 hours per week	Under 2 hours per week to wash down tanks and replenish system	33% reduction in aim name labor TOXICS USE REDUCTION INSTITU

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TURI Vacuum Vapor Degreasing Hub

- Enable the use of safer solvents instead of TCE, Perc and other toxic chemicals for cleaning
- Designed for precision and critical parts cleaning applications
- EPA P2 Grant enabling TURI to establish a Vacuum Vapor Degreasing Hub (VVD Hub)
- VVD Hub will work with users of TCE and other toxics to:
 - ✓ Identify safer solutions
 - ✓Optimize conditions for effectiveness
 - ✓Validate performance, evaluate feasibility
- TURI will work with companies to showcase successful examples







Lessons Learned



Alternatives to Halogenated Solvents Used in Surface Cleaning



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What has worked:

- TURA program's approach (slide 5)
 - Collaboration w/ industry & academia
 - Grants
 - Free or affordable technical support
 - Training experts and creating tools
- Evidence of adequate performance
- Technical assistance for adoption
- Documenting results
- Amplification of successes through demonstration events and reports
- Thinking outside the box and longterm

Barriers:

- Cost of alternatives
- Lack of legislation
- Military specifications
- Data gaps





Reducing Toxics

Adopting Solutions

Resource Hub

About

Contact Us

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BUILDING A FUTURE FREE OF TOXIC CHEMICALS.

TURI has helped businesses adopt safer chemicals and prevent pollution for more than 30 years.

Established by the Commonwealth of Massachusetts in 1989, the Toxics Use Reduction Institute (TURI) is an independent government agency with a mandate to help protect workers, communities and the environment from toxic chemicals and pollution. Working in close collaboration with businesses of all sizes, as well as government agencies, local communities and international organizations, TURI helps identify actions companies and communities can take to protect workers and public health.



info@turi.org + 1 (978) 934-3275

Learn more at **www.turi.org**



HOW WE'RE DOING IT

SEARCH BY CHEMICAL

MnTAP TCE Alternatives Project

Laura Sevcik MnTAP Engineer

Minnesota Technical Assistance Program

UNIVERSITY OF MINNESOTA Driven to Discover®





Minnesota Technical Assistance Program - MnTAP

- University of Minnesota
- Confidential, no cost, non-regulatory
- Engineering technical assistance for MN organizations
- Minnesota Materials Exchange
- Intern program
- Special projects





TCE Alternatives Project (2018-2023)



Funding from EPA Region 5 Pollution Prevention Grant and a TCE-focused Supplemental Environmental Project



Minnesota TCE Ban

- Statewide TCE ban for businesses with an air permit passed in May 2020
- Effective June 1, 2022
- Media coverage about TCE led businesses to engage with project





Outreach to Businesses

- Developed list of potential users
 - TRI data
 - Air permits
 - Hazardous waste information
 - Other sources
- Contacted organizations directly about project
 - Phone calls
 - Emails





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Process





Met with business to learn about cleaning needs



2

Submitted final recommendation to business

3

Followed up to check on progress and any challenges

4

Collect Information

- Toured site and observed process
- Collected information about parts and process
 - Parts
 - Contaminants
 - Process
 - Costs
 - Performance tests







Met with business to learn about cleaning needs



Submitted final recommendation to business

3

Followed up to check on progress and any challenges

4



Identify Alternatives

Worked with TURI or chemical vendors

- Collaborated with businesses to select parts for testing
- Screened for options based on information about cleaning process
- Tested different chemistries/processes on parts businesses sent in







Met with business to learn about cleaning needs



2

Submitted final recommendation to business

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Followed up to check on progress and any challenges

4





Met with business to learn about cleaning needs



2

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Followed up to check on progress and any challenges



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Common Alternatives

Chemistries

- Aqueous cleaners
 - Acidic
 - Alkaline
 - Enzymatic/microbial
- Glycol ethers
- Esters
- Modified alcohols

Equipment

- Sink-on-a-drum
- Ultrasonic tank
- Spray cabinet
- Vacuum degreaser



Lessons Learned

• MN TCE ban

- Short timelines to change meant some businesses chose regrettable substitutions (tDCE, nPB)
- Some businesses required client qualification
- Outreach
 - Recommend working with organizations with connections to businesses
- Financial
 - Annual cost savings for aqueous cleaning
 - Funding opportunities grants are preferred over loans



Lessons Learned

- Important to have vendors as part of process even if not doing testing
- Businesses have concerns about aqueous cleaning
 - Effectiveness Testing is key
 - Rust Rust inhibitors available, sometimes built into formula for aqueous cleaners



Aqueous Cleaning Toolkit

- Resources for technical assistance providers and businesses
- Topics:
 - Mitigating Business Risks
 - Costs and Benefits
 - Converting to Aqueous
- Resources:
 - Videos
 - E-guides
 - Slideshows
 - Infographics
 - Email and social media templates



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Resources

MnTAP

- Aqueous Cleaning Toolkit <u>http://www.mntap.umn.edu/aqueoustoolkit/</u>
- TCE Alternatives webinar series and TCE Alternatives Training with TURI - <u>http://www.mntap.umn.edu/industries/facility/machine/tcealternatives/webinar</u> <u>-and-training/</u>

TURI

- P2OASys <u>https://p2oasys.turi.org/</u>
- Alternatives to Halogenated Solvents Used in Surface Cleaning - <u>https://www.turi.org/publications/alternatives-to-halogenated-solvents-used-in-</u> <u>surface-cleaning/</u>





Minnesota Technical Assistance Program

www.mntap.umn.edu

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