



Tips for Green Cleaning

91st Annual Maine Safety & Health
Conference

Jason Marshall, ScD
Toxics Use Reduction Institute
University of Massachusetts Lowell



First, a Question...

- Have any of you had adverse reactions to cleaning chemicals used in the workplace or at home?

Health Impacts - Cleaning Product

- Headaches → All purpose cleaner
- Dizziness → Bleach
- Nausea or vomiting → Ammonia
- Trouble Breathing → Oven cleaner
- Fatigue → Kitchen counter cleaner
- Skin rashes or burns → Toilet bowl cleaner
- Allergic reaction → Tub and tile cleaner
- Watery eyes/eye irritation → Disinfectant
- Nose irritation → Window cleaner
- Throat irritation → Drain De-clogger
- Asthma attack → Air Freshener
- Other (please describe)

Surface Cleaning

- What “clean” means
 - Free from dirt, stain, or impurities
 - More simply, unsoiled
- Soils can be defined as
 - Extraneous or unwanted material deposited and/or attached to a surface
- Cleaning is the process of getting rid of these impurities

Why Clean

- May be required to prepare the surfaces of parts prior to use
- May be performed for aesthetic reasons as an aid for marketing and sales
- May be necessary to ensure that the finished product will perform without failure caused by contamination

How to Clean - TACT

- Cleaning systems depend on four parts
 - Thermal
 - Agitation
 - Mechanical – wipe, spray, scrub
 - Chemical
 - Time
- Balancing act
 - With a good chemical cleaner, the mechanical and thermal requirements can be lowered

With What to Clean

- Solvency can be defined as the ability to dissolve
 - Water is considered to be the ‘universal’ solvent
 - Capable of dissolving many inorganic and some organic contaminants or soils
 - But not all soils readily dissolve in water alone
 - Which is why additives were included to make the first soaps

Trouble with Cleaning

- Like dissolves like
 - Demonstrated by visual observation
- Natural soaps and detergents simply did not dissolve greases and oils on their own
- Synthetic Soaps
 - Halocarbon chemistry played an important role in development of more successful synthetic cleaners

Downside

- Negative Environmental and health effects
 - Atmospheric ozone depletion
 - Global warming
 - Acid rain formation
 - Carcinogenicity
 - Neurotoxicity
 - Reproductive toxicity
 - Cardiovascular system damage
 - Central nervous system damage

Why is Maintenance So Important to a Healthier Building?

- Dirty conditions attract insects, vermin, and irritants
 - Have a negative impact on occupants health and performance
 - Poor cleaning practices contribute to increased respiratory and asthma symptoms among children and adults
- Regular, thorough cleaning and building maintenance can
 - Prevent pest problems
 - Minimize irritants and allergens
 - Create healthier learning and working environments
- Improving everyday maintenance to keep facilities clean, running smoothly and safely

Cleaning Operational Activities Relate to Indoor Air Quality and Environmental Health

- Scheduling routine cleaning when the building is unoccupied- reduce exposure potential
- Ensure cleaning products are inaccessible to those not trained to use correctly
- Read and follow product labels
 - Use only the amount of product suggested on the label
- Use proper equipment to perform cleaning tasks
 - Vacuum using high-efficiency vacuums and filters (e.g., high efficiency particulate air filters)
 - Use walk-off mats at building entrances to reduce the amount of dust and soil tracked into school buildings
- Maintain an up-to-date inventory of all cleaning products used
 - Keep copies of Safety Data Sheets (SDSs) for all cleaning products in an accessible location.
- Ensure garbage is stored in appropriate containers
 - Dispose of properly at the end of each day
- Conduct thorough cleaning of kitchens, cafeterias, and other food use areas
- Reduce clutter, such as excess paper or plush toys, which collect dust and allergens and prevent thorough cleaning

Balance Keeping Some Hazards Out Without Subsequently Introducing Other Hazards

- Reduce the amount of hazardous chemicals being used
- Don't shift the risk
- Compare alternatives with existing chemicals/hazard to determine which one is safer
 - **Safer**, not without risk
 - TURI's Pollution Prevention Options Analysis System (P2OASys)

Use Established Protocols for Healthier Cleaning

- Chemical purchasing policy
 - Consult with state green procurement initiatives to determine if safer, third-party certified chemicals and chemical products are available on state contracts
- Form a chemical management team
 - Team members should have direct involvement with or knowledge of chemical management at the facility, from the purchase of chemicals to their ultimate disposal
 - Conduct annual chemical inventories to ensure all unused, unneeded, and unknown chemicals are identified and disposed of properly

Customize to Meet Specific Needs

- Important to remember that each location has its own set of problems
 - A cookie cutter solution should not be adopted blindly
- Create a diverse team to help cover different viewpoints
- Collaborative effort will ensure adoption of new plan
- Final plan should be a living plan
 - Needs to be revisited, updated and improved

So Green Cleaning, What Do We Know?

- With Green Cleaning revolution
 - Work with Third Party Certifiers on the performance requirement for their certifications
- Work to make testing more reality based
 - How good are these green products?

Third Party Certification

- Green claims
 - How real are they, who do you trust?
- Independent verification of product safety and performance
 - Green Seal
 - www.green seal.org
 - EPA Safer Choice
 - www.epa.gov/saferchoice
 - Ecologo
 - www.ecologo.org/



EcoLogo[™]

Green Cleaner Evolution

- 10-15 Years ago - hit or miss if they worked
 - Created negative image for green products
 - Still persists today
- Green cleaners of today are much improved
 - On par or exceed traditional products
 - Still need to pilot test products to see if they work for you

So How Do You Go Green

- Environmentally Preferable Products Lists
 - State generated contract helps take the guess work out of product selection
 - Primary goal
 - Use the Commonwealth's purchasing power to reduce the environmental and public health impact of state government

Massachusetts Executive Order #515

- Establish Environmental Purchasing Policy
 - Requires all Executive Departments to reduce their impact on the environment and enhance public health by procuring EPPs:
 - Whenever such products and services are readily available
 - Perform to satisfactory standards
 - Represent best value to the Commonwealth

State Contract FAC 85

- Issued to offer a broad selection of environmentally preferable cleaning products and supplies
- Intended to replace the harsh chemical cleansers commonly used

Who Can Benefit

- Cities, towns, districts, counties and other political subdivisions
- Executive, Legislative and Judicial Branches, including all Departments and elected offices therein
- Local public libraries, public school districts and charter schools
- Public institutions of higher education
- Public hospitals owned by the Commonwealth
- Public purchasing cooperatives
- Independent public authorities, commissions and quasi-public agencies
- Non-profit, UFR certified organizations that are doing business with the Commonwealth
- Other states and territories with no prior approval by the State Purchasing Agent required
- Other entities when designated in writing by the State Purchasing Agent

Contact OSD for More



- **Julia Wolfe**
 - **Director, Environmental Purchasing**
- Operational Services Division
- One Ashburton Place, RM 1017
Boston, MA 02108
 - Phone: 617-502-8836
 - julia.wolfe@state.ma.us
 - mass.gov/osd
 - mass.gov/epp

What Can the TURI Lab Do to Help You?

- We work with OSD/EPP, MaFMA and others on janitorial focus areas
 - Cleaning chemicals, equipment & process
- We can be a resource and help you transition to Green cleaning
 - Utilize FAC 85
- We work with national companies & associations

As Mentioned

- We test cleaners for performance
 - So if yours doesn't work we can help you find something that will
- TURI Lab & Green Disinfection
 - Partnered with the Clinical Science Lab at UML to investigate the “greener”, less toxic disinfectant chemicals & equipment

It May Be **GREEN** but Does it Clean

- Reality based testing
 - Customers products are tested against industry standard products
 - Green and conventional
- Match end user's surfaces and cleaning practices
- Use soils that are real world soils based on ASTM & other standard soils

Lab Work and On-Site Evaluation

- Work with facility management & workers to verify performance in the field
 - Walk through
 - Chemical inventory
 - Assessments of product safety
 - Feedback from workers on performance and concerns

Tools for Comparing Cleaners

- TURI Created
- Pollution Prevention Options Analysis System
 - P2OASys
 - <https://p2oasys.turi.org/>
- CleanerSolutions
 - www.cleanersolutions.org

P2OASys - How to use it and how to interpret the results

- Allows user to assess potential impacts of alternative chemistries/technologies
 - Environmental
 - Worker
 - Public health
- Help users use a more comprehensive and systematic way of thinking about
 - Current and alternative processes
 - Based on quantitative and qualitative factors

Comparing Products

Welcome to the P2OASys Tool!

Information about P2OASys can be found on the TURI webpage [here](#).

Name	P2OASys Format	SDS Format	Remove
United 450 All Clear	<input type="button" value="Enter Data"/>	<input type="button" value="Enter Data"/>	<input type="button" value="Remove"/>
Turco 5948-DPM	<input type="button" value="Enter Data"/>	<input type="button" value="Enter Data"/>	<input type="button" value="Remove"/>
Super Citrus Cleaner N-46	<input type="button" value="Enter Data"/>	<input type="button" value="Enter Data"/>	<input type="button" value="Remove"/>

Categories	United 450 All Clear	Turco 5948-DPM	Super Citrus Cleaner N-46	
Acute Human Effects	4	9	5	<input type="button" value="1"/>
Chronic Human Effects	2	7	2	<input type="button" value="1"/>
Ecological Hazards	4	4	4	<input type="button" value="1"/>
Environmental Fate & Transport	4	8	4	<input type="button" value="1"/>
Atmospheric Hazard	2	2	2	<input type="button" value="1"/>
Physical Properties	2	8	4	<input type="button" value="1"/>
Process Factors	6	4	3	<input type="button" value="1"/>
Life Cycle Factors	3	7	3	<input type="button" value="1"/>
Product Score	3.4	6.1	3.4	
Final Score	3.4	6.1	3.4	

P2OASys Scores

- NOT a definitive value
 - Comparative purpose
 - Compare existing process to options
- Quality of SDS will have impact on data entry and final score
 - Try comparing one chemical using various SDS
- Expert judgement
 - Will vary from one user to the next


P2OASys Value

- Provides a numerical hazard score for the company's current process and identified options
 - Can be combined with other information sources and professional expertise to make decisions on adoption of alternatives
 - Users input both quantitative and qualitative data on the chemical toxicity, ecological effects, physical properties, and changes in work organization

CleanerSolutions

CleanerSolutions Database

Toxics Use Reduction Institute · Surface Solutions Laboratory



Laboratory Clients and Test

- Find a Cleaner
- Replace a Solvent
- Safety Screening Search
- Part Description Search
- Browse Clients and Trials

Vendor Supplied Information


- Vendor Search
- Browse Vendors and Products

Forms

- Vendor Forms
- Client Forms

CleanerSolutions Home

- About CleanerSolutions
- Database Demos
- Help Topics
- TURI Laboratory Home
- Contact the Lab



Simple Solutions for Surface Cleaning

[More about CleanerSolutions](#)

[Ask your cleaning questions today!](#)

TURI Laboratory Client and Test Results

Results are linked to testing information to help you select an alternative that matches your needs. Search information generated from TURI Lab testing.

- [Find a Cleaner](#) Identify alternatives that have cleaned your contaminant.
- [Replace a Solvent](#) Find alternatives to your current solvent cleaner.
- [Safety Screening Search](#) Find products based on safety and environmental criteria.
- [Browse Clients and Trials](#) Look through past lab clients by industry.
- [Part Description Search](#) Investigate cleaning trials based on part shape, size, complexity

Vendor Supplied Information

Search vendor-supplied information for an alternative cleaner. Testing performed by TURI Lab for listed products also are displayed.

- [Search Vendor Information](#) Search for products based on vendor recommended uses.
- [Browse Vendors and Products](#) Find vendors by name.

Material Safety Data Sheets and Technical Data Sheets for most products are available on Product Information pages.

Green Cleaning Lab

Toxics Use Reduction Institute Cleaning Lab offers housekeepers and janitorial service providers the knowledge and expertise it has gained from two decades of testing the performance of green cleaning products and equipment.

[Green Cleaning Lab home](#)

Explore: [DIY Cleaner Recipes](#) | [Retail Product Testing](#) | [Professional Product Testing](#)

The Lab vigorously takes testing to a higher level through application of realistic soils or contaminants on surface materials likely to be found in actual homes or facilities (e.g., white boards, stainless steel, textured or composite countertops, etc.) This provides consumers and professional end-users with practical test outcomes they can use to improve their specific cleaning situation. Tests can also be customized to focus on surfaces and soils most likely to be encountered in specific environments such as bathrooms, kitchens, nurseries, schools, gymnasiums, theatres, and more. The results from these projects will be available in a different searching interface.

Forms

- [Client Test Request Form](#) Forms to arrange testing for your company. Or complete an [online version](#).
- [Vendor Forms](#) Forms for submitting product information to the lab.

Basic Search

Find a Cleaner

Search for a cleaner that has successfully removed a contaminant similar to your own. Chances are that the alternative will also work for you. Optionally, you can add substrate and equipment criteria to help narrow your search.

Required Field You must select one or more contaminants.	Optional Fields Filter your search by substrate or equipment type, or leave these fields set to <i>Any</i> to include all results for a given contaminant.	
<p>Contaminant</p> <ul style="list-style-type: none">AbrasiveAbrasivesAdhesiveAlcoholBuffing/Polishing CompCalcium/limeCarbon DepositsClayCoatingsCutting/Tapping FluidsDirtFilms	<p>Substrate</p> <ul style="list-style-type: none">AnyAlloysAluminaAluminumBrassCarbon FiberCarbon SteelCeramicsChromeCold Rolled SteelCopperElectronics	<p>Equipment</p> <ul style="list-style-type: none">AnyHigh Pressure SprayImmersion/SoakLow Pressure SprayManual WipeMechanical AgitationMedia BlastingPlasmaSteamSupercritical ExtractionUltrasonicsVapor Degreasing
<p>All Fields Hold down the <i>shift</i> or <i>ctrl</i> keys to select multiple values.</p>		
Optional Search Filters		
Product Cleaning Type:	<input type="text" value="Any"/>	
Return only effective results:	<input type="checkbox"/>	
		<input type="button" value="Reset"/> <input type="button" value="Submit"/>

Vendor Provided Information

Product information cited in this section is supplied directly by the vendors. The Institute has not verified the accuracy of any of this information and is not liable for any claims made by the vendors. TURI is likewise not responsible for any typographical errors.

United 450 All Clear [x]	Turco 5948 DPM [x]	Super Citrus Clean RTU [x]
<p>Vendor Name: United Laboratories International</p> <p>Classification: Enzymatic/Microbial</p> <p>Recommended Contaminants: Cutting/Tapping Fluids, Greases, Lubricating/Lapping Oils, Oil</p> <p>Recommended Equipment: Immersion/Soak, Mechanical Agitation, Ultrasonics</p> <p>Recommended Substrates: Aluminum, Brass, Carbon Steel, Galvanized Steel, Nickel, Plastic, Stainless Steel, Steel</p> <p>MSDS / TDS: None available.</p>	<p>Vendor Name: Turco Products Inc</p> <p>Classification: Alkaline Aqueous</p> <p>Recommended Contaminants: Carbon Deposits, Cutting/Tapping Fluids, Films, Greases, Lubricating/Lapping Oils, Oil</p> <p>Recommended Equipment: Immersion/Soak, Low Pressure Spray, Manual Wipe, Mechanical Agitation</p> <p>Recommended Substrates: Aluminum, Copper, Fiberglass, Plastic, Stainless Steel</p> <p>MSDS / TDS: 5948 DPM Tech Data Sheet, Turco 5948 DPM MSDS</p>	<p>Vendor Name: The Clean Environment Co</p> <p>Classification: Biobased</p> <p>Recommended Contaminants: Dirt, Films, Fingerprints, Hucker's Soil, Soaps</p> <p>Recommended Equipment: Cold Solvent, Immersion/Soak, Low Pressure Spray, Manual Wipe</p> <p>Recommended Substrates: Aluminum, Ceramics, Chrome, Fiberglass, Glass/Quartz, Plastic, Rubber, Stainless Steel</p> <p>MSDS / TDS: Super Citrus Clean MSDS, Super Citrus Clean TDS</p>

Safety Screening Information

United 450 All Clear [x]	Turco 5948 DPM [x]	Super Citrus Clean RTU [x]																																																																																	
<p>Safety Score Help</p> <table border="1"> <thead> <tr> <th>Indicator</th> <th>Value</th> <th>Points</th> </tr> </thead> <tbody> <tr><td>VOC:</td><td>0</td><td>10</td></tr> <tr><td>GWP:</td><td>0</td><td>10</td></tr> <tr><td>ODP:</td><td>0</td><td>10</td></tr> <tr><td>HMIS H:</td><td>0</td><td></td></tr> <tr><td>HMIS F:</td><td>0</td><td>10</td></tr> <tr><td>HMIS R:</td><td>0</td><td></td></tr> <tr><td>pH:</td><td>10</td><td>7</td></tr> <tr><td>Total:</td><td>47</td><td></td></tr> </tbody> </table>	Indicator	Value	Points	VOC:	0	10	GWP:	0	10	ODP:	0	10	HMIS H:	0		HMIS F:	0	10	HMIS R:	0		pH:	10	7	Total:	47		<p>Safety Score Help</p> <table border="1"> <thead> <tr> <th>Indicator</th> <th>Value</th> <th>Points</th> </tr> </thead> <tbody> <tr><td>VOC:</td><td>85</td><td>5</td></tr> <tr><td>GWP:</td><td>0</td><td>10</td></tr> <tr><td>ODP:</td><td>0</td><td>10</td></tr> <tr><td>HMIS H:</td><td>1</td><td></td></tr> <tr><td>HMIS F:</td><td>1</td><td>8</td></tr> <tr><td>HMIS R:</td><td>0</td><td></td></tr> <tr><td>pH:</td><td>12</td><td>4</td></tr> <tr><td>Total:</td><td>37</td><td></td></tr> </tbody> </table>	Indicator	Value	Points	VOC:	85	5	GWP:	0	10	ODP:	0	10	HMIS H:	1		HMIS F:	1	8	HMIS R:	0		pH:	12	4	Total:	37		<p>Safety Score Help</p> <table border="1"> <thead> <tr> <th>Indicator</th> <th>Value</th> <th>Points</th> </tr> </thead> <tbody> <tr><td>VOC:</td><td>100</td><td>5</td></tr> <tr><td>GWP:</td><td>0</td><td>10</td></tr> <tr><td>ODP:</td><td>0</td><td>10</td></tr> <tr><td>NFPA H:</td><td>0</td><td></td></tr> <tr><td>NFPA F:</td><td>0</td><td>10</td></tr> <tr><td>NFPA R:</td><td>0</td><td></td></tr> <tr><td>pH:</td><td>7.6</td><td>9</td></tr> <tr><td>Total:</td><td>44</td><td></td></tr> </tbody> </table>	Indicator	Value	Points	VOC:	100	5	GWP:	0	10	ODP:	0	10	NFPA H:	0		NFPA F:	0	10	NFPA R:	0		pH:	7.6	9	Total:	44	
Indicator	Value	Points																																																																																	
VOC:	0	10																																																																																	
GWP:	0	10																																																																																	
ODP:	0	10																																																																																	
HMIS H:	0																																																																																		
HMIS F:	0	10																																																																																	
HMIS R:	0																																																																																		
pH:	10	7																																																																																	
Total:	47																																																																																		
Indicator	Value	Points																																																																																	
VOC:	85	5																																																																																	
GWP:	0	10																																																																																	
ODP:	0	10																																																																																	
HMIS H:	1																																																																																		
HMIS F:	1	8																																																																																	
HMIS R:	0																																																																																		
pH:	12	4																																																																																	
Total:	37																																																																																		
Indicator	Value	Points																																																																																	
VOC:	100	5																																																																																	
GWP:	0	10																																																																																	
ODP:	0	10																																																																																	
NFPA H:	0																																																																																		
NFPA F:	0	10																																																																																	
NFPA R:	0																																																																																		
pH:	7.6	9																																																																																	
Total:	44																																																																																		

Lab Evaluation Summary

United 450 All Clear [x]	Turco 5948 DPM [x]	Super Citrus Clean RTU [x]
<p>Number of Trials: 90 79 effective/11 ineffective</p> <p>Tested Contaminants: Greases, Lubricating/Lapping Oils, Oil, Resins/Rosins, Cutting/Tapping Fluids, Waxes, Latex binder, Inks, Mold Releases, Abrasives, Hucker's Soil</p> <p>Tested Substrates: Aluminum, Brass, Stainless Steel, Steel, Plastic</p> <p>Tested Equipment: Immersion/Soak, Ultrasonics, Mechanical Agitation</p>	<p>Number of Trials: 110 105 effective/5 ineffective</p> <p>Tested Contaminants: Carbon Deposits, Adhesive, Inks, Coatings, Oil, Greases, Paints, Waxes</p> <p>Tested Substrates: Liquid, Stainless Steel, Nickel, Plastic, Copper, Brass, Ceramics, Aluminum</p> <p>Tested Equipment: Immersion/Soak</p>	<p>Super Citrus Clean RTU has not been tested.</p>

Product profiles on CleanerSolutions

Product Information

United 450 All Clear
[Add to Comparison List](#)

Vendor Provided Information

Product information cited in this section is supplied directly by the vendors. The Institute has not verified the accuracy of any of this information and is not liable for any claims made by the vendors. TURI is likewise not responsible for any typographical errors.

Vendor Name: [United Laboratories International](#)

Product Classification: Enzymatic/Microbial

Recommended Contaminants: Cutting/Tapping Fluids, Greases, Lubricating/Lapping Oils, Oil

Recommended Equipment: Immersion/Soak, Mechanical Agitation, Ultrasonics

Recommended Substrates: Aluminum, Brass, Carbon Steel, Galvanized Steel, Nickel, Plastic, Stainless Steel, Steel

MSDS / TDS: None.

Safety Screen | [Help](#)

Indicator	Value	Points
VOC:	0	10
GWP:	0	10
ODP:	0	10
HMIS	0	
H:		
HMIS F:	0	10
HMIS	0	
R:		
pH:	10	7
Total: 47/50 (higher is better)		

P20ASys Summary Scores | [Help](#)

Indicator	Score
Acute Human Effect:	4
Chronic Human Effects:	2
Atmospheric Hazard:	2
Chemical Hazard:	5
Energy/Resource Use:	4
Total: 3.40/10 (lower is better)	

[Details](#)

Laboratory Evaluation of United 450 All Clear | [Field Definitions](#)

Client #	Project #	Trial #	Contaminant	Substrate	Equipment	Effective
103	1	5	Greases	Aluminum	Immersion/Soak	Y
103	1	5	Greases	Brass	Immersion/Soak	Y
103	1	5	Greases	Stainless Steel	Immersion/Soak	Y
103	1	5	Greases	Steel	Immersion/Soak	Y
103	1	5	Lubricating/Lapping Oils	Aluminum	Immersion/Soak	Y
103	1	5	Lubricating/Lapping Oils	Brass	Immersion/Soak	Y
103	1	5	Lubricating/Lapping Oils	Stainless Steel	Immersion/Soak	Y
103	1	5	Lubricating/Lapping Oils	Steel	Immersion/Soak	Y
103	1	5	Oil	Aluminum	Immersion/Soak	Y
103	1	5	Oil	Brass	Immersion/Soak	Y
103	1	5	Oil	Stainless Steel	Immersion/Soak	Y

Selecting Safer Cleaning Alternatives

- Three things to consider
 - Safety
 - Effective
 - Cost
- TURI tools cover Safety and Effective

Ask Questions – Find Answers

- Why are you cleaning
- How do you clean
- What do you clean with
- Who does the cleaning
- When do you clean
- Where do you clean

- Rinse and repeat

Contact Us for Assistance

Jason Marshall, ScD
Cleaning Lab Director

Toxics Use Reduction Institute - UMass Lowell

The Offices at Boott Mills West

126 John Street, Suite 14 (2nd Floor)

Lowell, MA 01852

978-934-3133