

Hazardous Waste Reduction

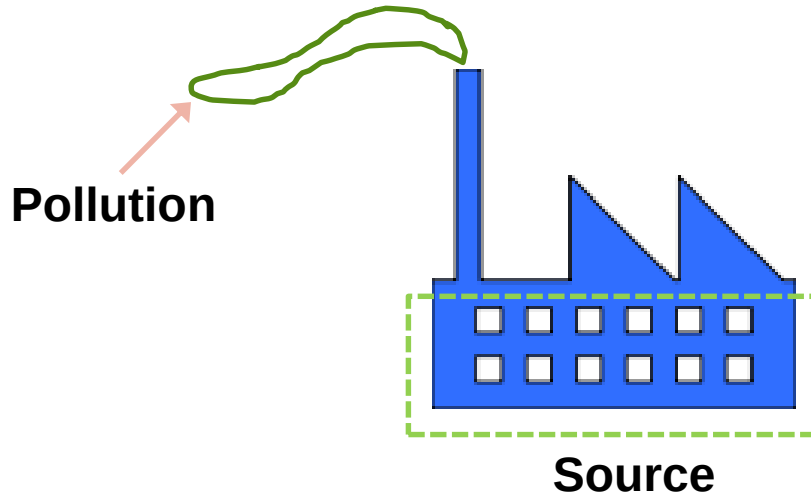
A Pollution Prevention Overview for Businesses

Focus Areas

- **Pollution Prevention vs Pollution Control**
- **Waste Management Hierarchy**
- **Waste Reduction Alternatives & Resources**
- **Technologies**
- **About NYSP2I and Waste Reduction Projects**

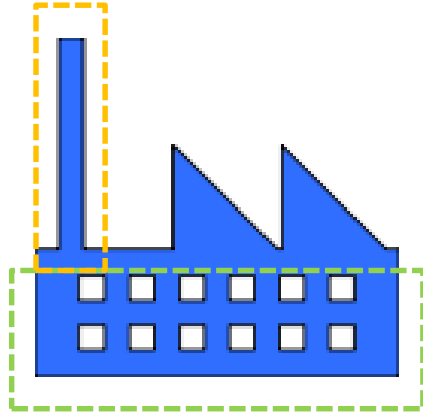
Pollution Prevention (P2)

- P2 is any practice that reduces, eliminates, or prevents pollution at its source (also called “Source Reduction”)
- Applied prior to recycling, treatment, or disposal (if those are necessary)



Pollution Control vs Pollution Prevention

Control



Prevention

Control

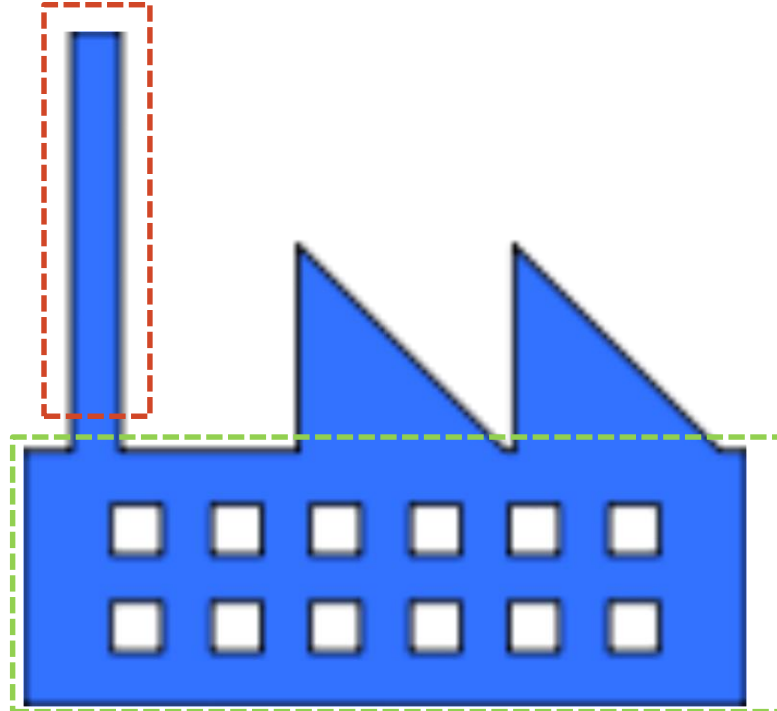
- End-of-Pipe
- Reactive
- Treatment, Disposal
- Allows release of some pollution

Prevention

- Front-End
- Proactive
- Minimization, Avoidance
- Prevents generation of pollution

Pollution Control vs Pollution Prevention

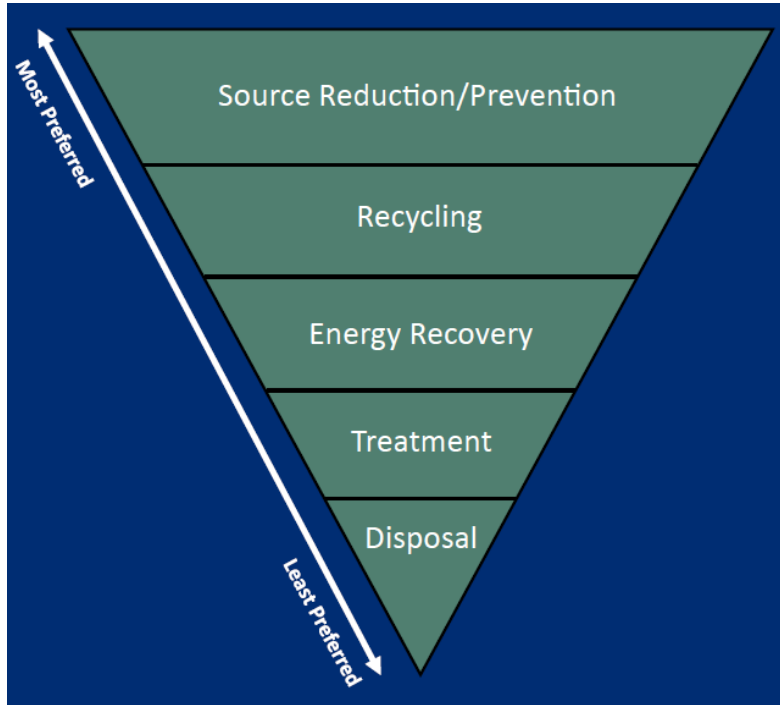
Control



Prevention



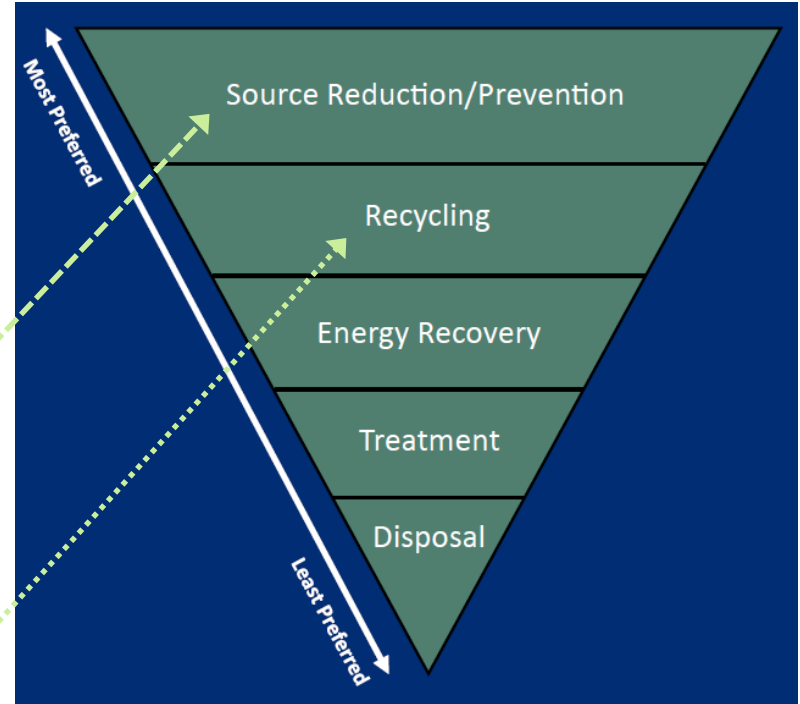
Waste Management Hierarchy



How can any of this be applied to reducing a facility's hazardous waste generation?

Waste Reduction Alternatives

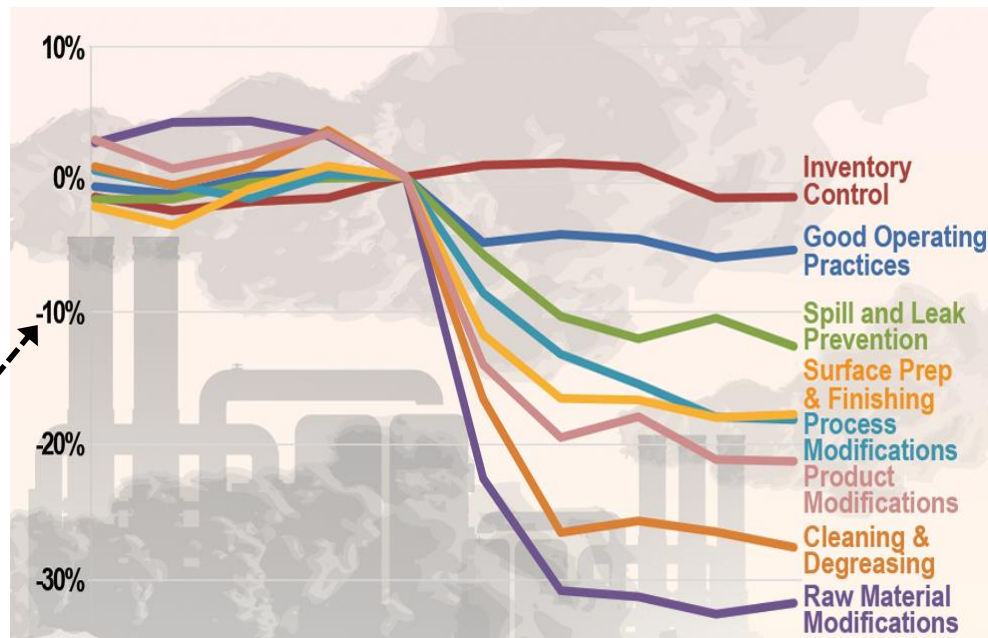
1. **Substitution of non-toxic or less toxic inputs** to the production process which result in a reduction in the volume or toxicity of such waste;
2. **Reformulation or redesign of end products** to eliminate production inputs or production processes that result in the generation of such waste;
3. **Modification or redesign of production processes**, technologies or equipment which result in a reduction in the volume or toxicity of the waste;
4. **Changes in materials usage, handling and storage practices**, including improved inventory control preventive maintenance, spill and leak prevention and waste segregation, which will reduce the volume or toxicity of such waste;
5. **Use of closed-loop reclamation, reuse or recycling** processes or technologies which directly recycle such wastes back into the production process; and
6. **Use of on-site or off-site recycling** technologies or processes that reduce the amount of such waste that must be treated or disposed.



Waste Reduction Alternatives

- 1 Substitution of non-toxic or less toxic inputs
- 2 Reformulation or redesign of end products
- 3 Modification or redesign of production processes
- 4 Changes in materials usage, handling and storage practices

% reduction in targeted release of chemical in the year of implementation



Source: Environmental Science and Technology, ACS Publications

Resources

On NYSDEC Website:

- [HWRP Guidance Document](#)
- [Fact Sheet on Solvent Reduction](#)

Other Resources:

- [Toxics Use Reduction Institute's \(TURI's\) CleanerSolutions Database](#)
- [EPA Safer Chemical Ingredients List](#)
- [EPA Guide to Cleaner Technologies for Organic Coating Removal](#)



Clear Options

Solvents

Note: When a functional use category is selected, the search above will only apply to the chemicals assigned to this functional use. To select a different functional use, please [scroll up](#).

Show 25 entries

Code	Common Name	CAS Registry Number	Functional Use
⚠	(d)-Limonene *Yellow due to hazard concerns. Must meet section 5.5.2 of the Safer Choice Standard . Known sensitizer.	5989-27-5	Fragrances; Solvents
●	(R)-(-)-1,3-Butanediol	6290-03-5	Solvents
●	1,1'-Dimethyldiethylene glycol	110-98-5	Solvents
●	1,3-Butanediol	684-03-2	Solvents

Pollution Prevention (P2) Technologies

Approaches to implement P2 vary from “Low-Tech” to “High-Tech” innovative technologies

Low-Tech examples

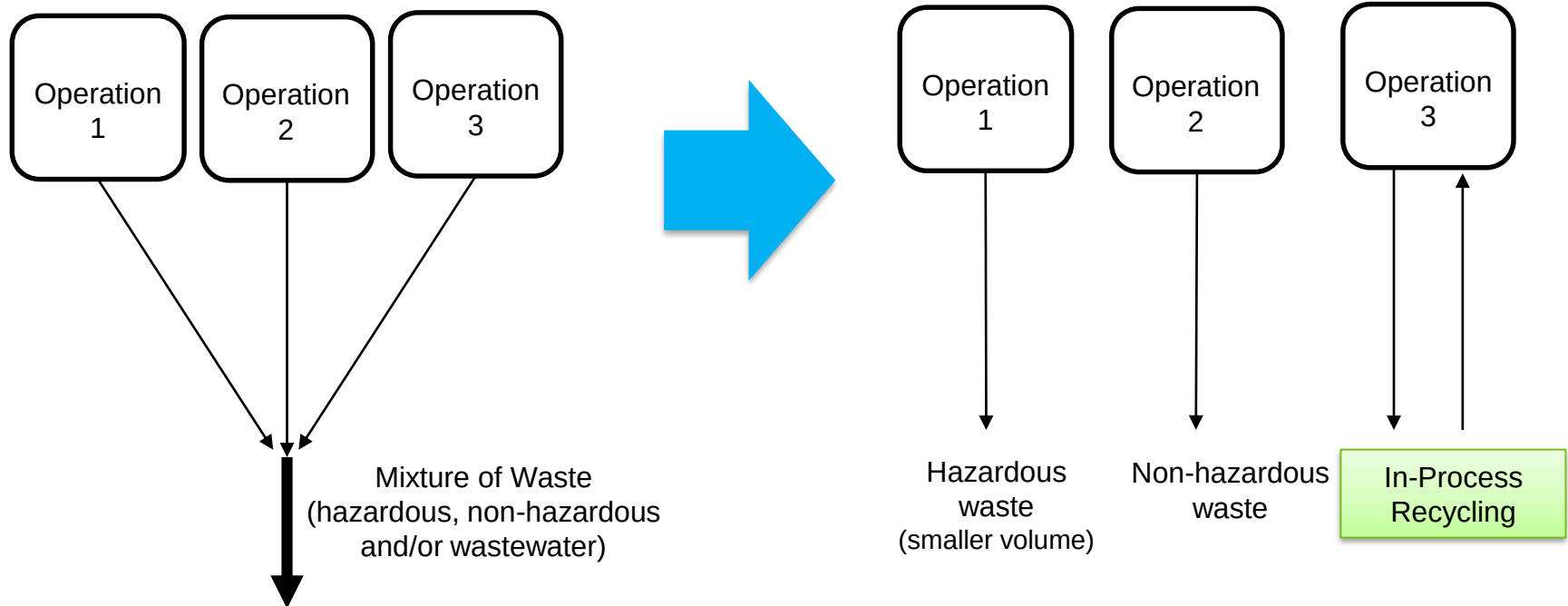
- Process stream segregation (Source Reduction)
- Improved housekeeping (Source Reduction)
- Screen filters (Recycling, Treatment)
- Inventory Control (ex: expired product prevention)

High-Tech examples

- Membrane filtration (In-Process Recycling, Treatment)
- Vacuum cycle nucleation (Source Reduction)
- Ultimo non-contact densitometer (Source Reduction)

Pollution Prevention (P2) Technologies

Process stream segregation

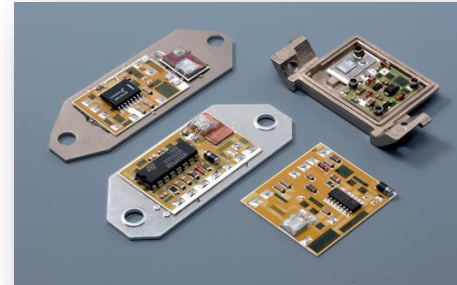


Innovative P2 Technologies

Vacuum Cycle Nucleation (VCN)

- Newer technology designed to replace or minimize use of chemicals in precision cleaning applications
- Applications where simple aqueous cleaning and ultrasonics ineffective
- Medical device, micro-electronics, any precision parts
- Lower boiling point of aqueous cleaning solution to nucleate bubbles under safe conditions

[Learn More](#)



Photos courtesy of www.hason-precision.com

Innovative P2 Technologies

Membrane Filtration

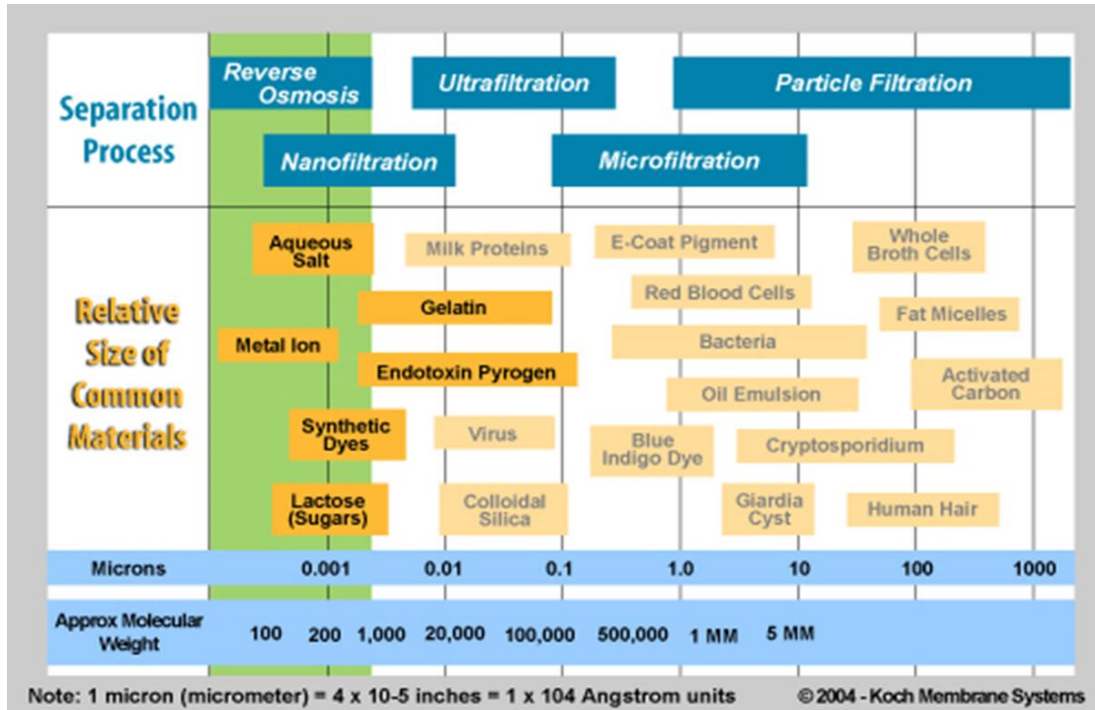


Figure and Membrane Info courtesy of Koch Membrane Systems

Low Pressure

- **Microfiltration** - Separation of large solids
- **Ultrafiltration** - Separation, concentration and purification of dissolved molecules

Medium Pressure

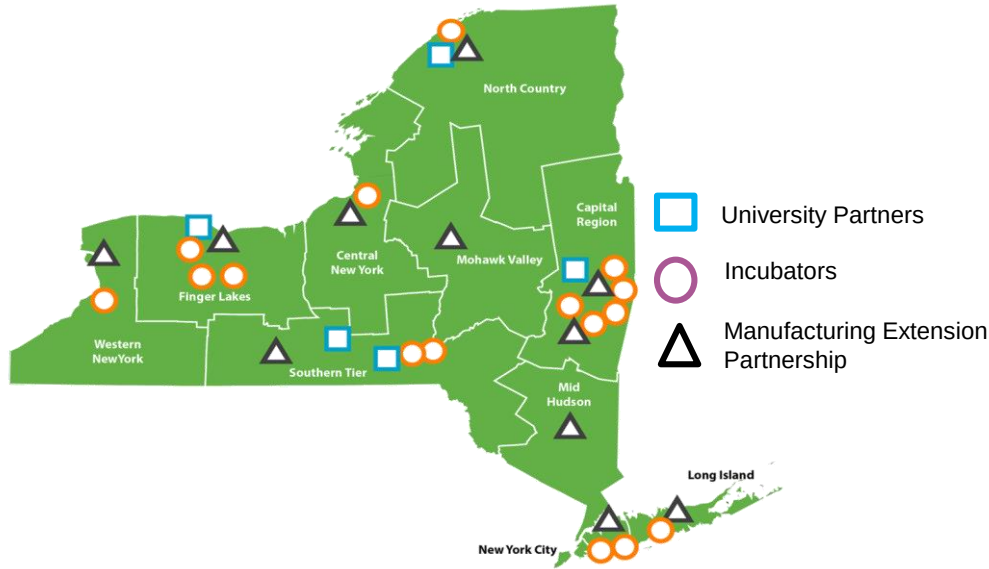
- **Nanofiltration** - Separation, concentration and demineralization of liquids

Medium to High Pressure

- **Reverse Osmosis** - Water purification and product concentration

[Learn More](#)

New York State Pollution Prevention Institute



- Established in **2008**
- Headquartered at **RIT** within Golisano Institute for Sustainability (GIS)
- \$4M** in annual NYS funding
- 35+** businesses assisted each year
- Focus on **reduction** of natural resource consumption (water, raw material, energy) and elimination of waste and toxics
- P2** research, technical assistance, education and outreach
- 15+** full-time staff



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NYSP2I Waste Reduction Project



Objective

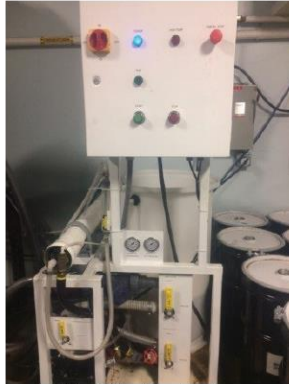
- There are significant costs related to hazardous waste disposal and the labor associated with the management of it. Optimax wanted to evaluate opportunities to improve their waste coolant management program and reduce the amount of hazardous waste generated.

Outcome

- Provided assistance with designing a system that incorporates both centrifugation and ultrafiltration, which more effectively separates clean water from the waste coolant.
- Implemented system resulted in less hazardous waste, leading to less labor for waste management, and a savings of \$30k per year.



Centrifuge/Tanks

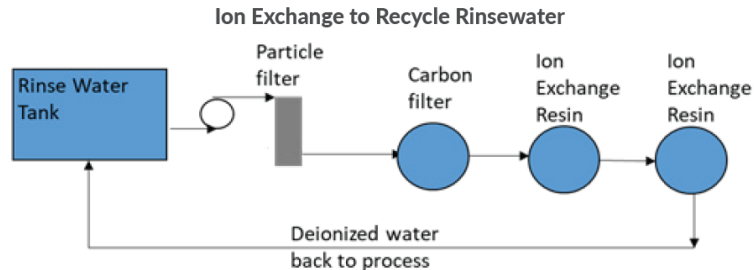


Ultrafiltration System

NYS P2I Waste Reduction Project



E. C. Sumereau & Sons



Objective

- E.C Sumereau & Son wanted to identify opportunities to reduce the amount of hazardous waste generated in their plating operations and the costs associated with managing/disposing of the waste.

Outcome

- Identified simple and cost effective option of purchasing fine mists spray nozzles that utilize less water, but clean the parts as effectively as their current spray rinse process.
- Improvement option with highest projected saving was installation of separate ion exchange system, which could potentially reduce hazardous waste by 50%, with an estimated payback of 1 year.

NYSP2I Waste Reduction Project



AMES GOLDSMITH™



Electrochemical Test Cell

Objective

- Identify sustainable approaches to reduce nitrate levels in Ames Goldsmith's wastewater that is used in their chemical processes.

Outcome

- Investigated the feasibility of electrochemistry to reduce nitrates. Successful use of this technology has potential to reduce treatment costs without creating sludge and an additional waste stream.

NYSP2I Waste Reduction Project



Objective

- Identify technically and economically feasible options to reduce costs and hazardous waste within the aerospace company's operation.

Outcome

- Conducted on-site assessment that provided analytical support in the form of characterization for both hazardous sludge and recycled water.
- Installation of a sludge dryer would potentially reduce hazardous waste by 60%, which would result in savings of about \$50k per year and a ROI of just over one year.

NYSP2I Waste Reduction Project



Objective

- This industrial manufacturer wanted to develop a screening tool that could predict carbon performance, to help with decreasing their waste and operation costs.

Outcome

- Developed tool to identify reliable activated carbon use in the industrial manufacturer's process chemical recovery system.
- Tool led to increased carbon useful lifetime to 9 months, saving them \$645k annually and reducing their carbon waste by 360k lbs. annually.

NYSP2I Waste Reduction Project



Objective

- Improve acid use efficiency to reduce acid purchase & treatment costs, and hazardous waste quantities in Control Electropolishing Corporation's electrochemical process that removes material from a metallic work piece.

Outcome

- Completed an acid control and recovery assessment to identify cost-effective options to reduce acid purchases and acid waste, along with sludge waste.

NYSP2I Waste Reduction Project



Objective

- Research the beneficial and alternative uses for painted gypsum drywall.

Outcome

- Analyzed drywall samples, identified and assessed potential pathways for beneficial reuse of painted gypsum drywall based on the balance of physical, economic, and regulatory limits of its constituent materials.



NYS P2I Waste Reduction Project



Objective

- Explore alternative solvent cleaners and potential reduction opportunities for the usage of non-compliant solvent cleaners.

Outcome

- Technical evaluation of the solvents was performed to identify reduction opportunities for the usage of non-compliant solvent cleaners.
- Four products were determined to be feasible options for potential replacement of the current solvents used as well as a list of best practices when solvent cleaning.

NYSP2I Waste Reduction Project

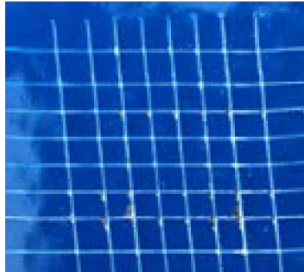
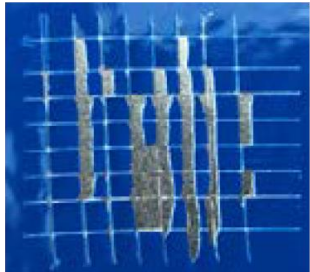


Objective

- Identify alternate cleaning approaches that are less hazardous and provide similar paint adhesion performance as lacquer thinner.

Outcome

- Performed baseline analysis on Bartell's cleaning operation, conducted experiment using potential lacquer thinner alternatives to test for adhesion performance, and a basic economic analysis was done for best potential alternatives.



Left photo: is typical paint adhesion with Cosmoline contamination and cleaning.
Right photo: is typical paint adhesion with machining coolant contamination and cleaning.

NYSP2I Waste Reduction Project



Objective

- Identify sustainable alternative methods to vapor degreasing that would eliminate the use of trichloroethylene (TCE) – industrial solvent.

Outcome

- Evaluated chemical alternatives to TCE as well as aqueous cleaning methods such as vacuum cycle nucleation (VCN) and ultrasonic.
- VCN and ultrasonic were identified as feasible alternatives and verified the capabilities for cleanliness and rust resistance on the parts, and operating costs have the potential to be reduced by 85%.

Interested?

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