

## Aqueous Cleaning: A Toolkit for Resilient Business

# THE NUTS & BOLTS OF CONVERTING TO AQUEOUS

Is an aqueous cleaning system the right choice? Like a lot of things in business, it depends. Financial costs will obviously play a role in the decision, but there are many other operational functions to consider as well.

Aqueous cleaning systems rely on four factors, all of which can be adjusted to reach the level of clean required: Time, Agitation, Concentration, and Temperature (TACT). Cleaning suppliers and other cleaning experts will often perform tests with sample parts to identify the most effective cleaner and process.



***“MnTAP connected us to a service they use, which did all the analysis, all the testing. It was very thorough and in depth. Their extremely detailed report made us very comfortable in the decision to switch to aqueous.”***

TIM CARLSON, VICE PRESIDENT OF OPERATIONS  
HIAWATHA RUBBER

## Key Operational Considerations

### FIRST REVISIT THE BUSINESS PLAN

How will aqueous cleaning support future business needs? What regulatory changes are on the horizon? These are important questions to answer before looking at aqueous cleaners, equipment purchases, and other technical specifications.

### NOW, CONSIDER THE NUTS AND BOLTS

#### ***Parts to be cleaned***

Cleaning processes will vary depending on the material, size, geometry, and surface texture of the parts.

#### ***Soils being removed***

These might include heavy oils, lighter cutting fluids, fingerprints, shavings, or debris from machining, and will help determine the best cleaner and process option.

## Level of clean

How clean is clean? Are there tests to verify effective cleaning? Do the parts need to be completely residue-free, or just visually clean?



## Throughput

How long is the cleaning cycle? Will large parts be cleaned individually, or will many smaller parts be bulk cleaned? Spray systems work well for individual or racked parts. Immersion systems can be used for baskets of parts.

## Steps before cleaning

What happens before cleaning? Machining, grinding, and greasing will affect the cleaner, equipment, time, and labor needed.

## Steps after cleaning

What happens after cleaning? If the step involves an oven, a separate drying process may not be needed. If painting comes next, some cleaners can provide a pretreatment for paint adhesion.

## Oxidation

Prompt and thorough drying can prevent oxidation for many processes where there is a concern. Many aqueous cleaners are also available with rust inhibiting additives.

## Equipment footprint

In many cases, companies switching to an aqueous system gain floor space. In one instance, the business cut its equipment footprint by 87%. Another gained 1,920 sq. ft. of floor space.

## New equipment

Aqueous systems often require the purchase of new equipment. In many cases, this up-front cost can be recovered over time.

### Common equipment options include:

- **A sink on a drum for manual cleaning.** This may be a good approach for low-volume applications.
- **An immersion tank.** This equipment may include heating, agitation, and/or ultrasonics to help loosen contaminants from small parts and complex geometries. It may also include automated rinse cycles.
- **A spray system.** High pressure spray can help remove contaminants. Parts can be washed on a conveyor belt or racked before cleaning.

***“The new equipment takes up about an eighth of the square footage of our old equipment for degreasing and the trichloroethylene—and it’s mobile.”***

TIM CARLSON, VICE PRESIDENT OF OPERATIONS  
HIAWATHA RUBBER

## Water treatment

Depending on the existing water quality, water softening, reverse osmosis, or deionization treatment may be required. In some applications, city water is adequate.

## **Waste disposal**

Disposal will depend on the cleaner and any contaminants picked up during the cleaning processes. Some cleaners may be able to go down the drain, while others may need to be shipped offsite as non-hazardous or hazardous waste. Acid or caustic cleaners may need to be neutralized or treated before disposal. Enzymatic-microbial cleaners can break down contaminants to prolong cleaner life, reducing wastewater.

## **Regulatory**

Businesses should be aware of regulations for their industry and state, and plan to meet them. This could include requirements for safety, air permits, wastewater discharge, and hazardous waste.

### **HOW TO GET STARTED**

The considerations for conversion to an aqueous cleaning system can be complex. Fortunately, MnTAP, cleaning chemical suppliers, and other experts are here to help.

### **Additional Resources:**

- MnTAP ([MnTAP.umn.edu/AqueousToolkit](https://MnTAP.umn.edu/AqueousToolkit))
- Minnesota Pollution Control Agency ([pca.state.mn.us](https://pca.state.mn.us))
- National Small Business Environmental Assistance Program ([nationalsbeap.org](https://nationalsbeap.org))
- Technical Assistance in Your State ([epa.gov/p2](https://epa.gov/p2))

## **ABOUT MnTAP**

The Minnesota Technical Assistance Program (MnTAP) is part of the University of Minnesota School of Public Health. Our mission is to strengthen Minnesota businesses by helping them improve efficiency while saving money through energy, water, and waste reduction. Our services are confidential, no-cost, and non-regulatory.

## **WHY WE CREATED THIS TOOLKIT**

In 2022, Minnesota became the first state to ban the use of Trichloroethylene (TCE) for all businesses requiring an air permit. Known as a powerhouse cleaning agent, TCE is also used in other industrial processes and as an ingredient in some consumer products—but its hazards are now well recognized.

MnTAP, in partnership with the Minnesota Pollution Control Agency (MPCA), the Toxics Use Reduction Institute (TURI) at the University of Massachusetts Lowell, and funded with a grant from the U.S. Environmental Protection Agency Region 5 (U.S. EPA R5), launched the TCE Alternatives Project to help Minnesota businesses make the switch from TCE to effective, safer alternatives.

What we discovered was a need in our business community: a third-party perspective on mitigating the risks associated with cleaning solvents and degreasers, and clear information about alternatives. We hope you'll find this toolkit useful.