

# Aqueous or Solvent Cleaning Comparison eGuide

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# Aqueous & Solvent Cleaning

## A Quick Sustainability Comparison

Aqueous cleaning has been used as a method for precision cleaning for a long time, but its energy efficiency and environmental sustainability are being debated and some are turning to solvent-based cleaning alternatives.

### Aqueous or Solvent Cleaning - a Quick Comparison

|                      | AQUEOUS CLEANING   | SOLVENT CLEANING  |
|----------------------|--|---|
| Cleaning Advantages  | Aqueous cleaning, or water-based cleaning, is useful when combining the cleaning process with other procedures like depositing rust preventers and brightener coatings. But water-only cleaning is weak. A variety of detergents, surfactants, builders, emulsifiers, saponifiers, sequestering agents and chelating agents are often added to boost water's cleaning ability. | Solvent-based cleaning fluids are engineered with high density, low surface tension and low viscosity to clean every surface. Solvents penetrate complex shapes to completely dissolve contaminants and remove particulate. Parts come out of a vapor degreaser clean, dry, spot-free and cool enough for immediate further processing. |
| Environmental Impact | The cleaning agents added to the water can be toxic and non-biodegradable. Aqueous systems produce a waste stream that may require water treatment like filtering, distillation, deionizing or osmosis before disposal. Plus, water is scarce in some parts of the world. It is a precious non-renewable resource that should be conserved whenever possible.                  | A vapor degreaser is not only a parts cleaner but also a continuous recovery and recycling system. The cleaning fluid recycles and purifies for reuse inside the vapor degreaser many times. It also concentrates the soil and contaminants, minimizing hazardous waste removal costs and improving your environmental footprint.       |
| Energy Usage         | Aqueous cleaning machines need high temperatures to clean effectively. They also need air knives, blowers or other energy hungry equipment to dry parts. This translates to higher energy use and costs.   | Low boiling solvents (below 100°C) thoroughly clean parts but allow the vapor degreaser to run efficiently. Vapor degreasing also cleans and dries in one step, eliminating other drying methods that use more power.   |

[More About Sustainability](#)

# Choosing Your Cleaning Method

## A Cost Comparison

Deciding what cleaning method to use is more than just the cost of the fluid. This chart outlines some of the other factors to consider when making your decision.

### Comparison of Aqueous vs. Solvent Cleaning

*Comparing an aqueous in-line system & an open-top vapor degreaser, both using a 1600in basket*

|                                      | AQUEOUS                   | SOLVENT                 |
|--------------------------------------|---------------------------|-------------------------|
| <b>Cleaning Performance</b>          | Excellent                 | Excellent               |
| <b>Contaminant Type</b>              | Polar, inorganic          | Nonpolar, organic       |
| <b>Parts Geometry</b>                | Simple                    | Complex                 |
| <b>Substrate Compatibility</b>       | May leave spots or stains | No spots or stains      |
| <b>Process Steps</b>                 | Multiple wash, rinse, dry | Single wash, rinse, dry |
| <b>Capital Investment</b>            | Over \$100,000            | Under \$100,000         |
| <b>Power</b>                         | ~20 kW/hour               | ~7 kW/hour              |
| <b>Footprint</b>                     | ~40 sq. feet              | ~20 sq. feet            |
| <b>Cleaning Cycle</b>                | 20-25 minutes             | 6-20 minutes            |
| <b>DI Water</b>                      | 30-40 gallons/hour        | None                    |
| <b>Waste Treatment</b>               | 100,000 gallons/year      | 10 gallons/year         |
| <b>Boiling Point/Temperature</b>     | Higher                    | Lower                   |
| <b>Detergent/Cleaning Fluid</b>      | \$50/gallon               | \$160/gallon            |
| <b>Maintenance &amp; Labor Costs</b> | Higher                    | Lower                   |
| <b>Fluid Density</b>                 | Lower                     | Higher                  |
| <b>Fluid Surface Tension</b>         | Higher                    | Lower                   |

[More About the Cleaning Costs](#)

# The Proof is in the Numbers

Need more proof? This infographic outlines the benefits of using Opteon™ SF80 Specialty Fluid instead of water.

Download Infographic



## THE PROOF IS IN THE NUMBERS: Opteon™ Specialty Fluids Outperform Water-Based Cleaners

**71%**  
**REDUCTION IN CYCLE TIME**  
for Added Efficiency



Opteon™ Specialty Fluids



Aqueous Degreaser

**52%**  
**SMALLER EQUIPMENT FOOTPRINT**  
Saves Valuable Space

12 sq ft



Vapor Solvent Equipment

25 sq ft



Aqueous Degreaser Equipment

\*Branson B352R vs Crest OC5-1014-HE

**67%**  
**LESS ENERGY USED**  
to Cut Down on Costs and CO<sub>2</sub> Usage



Opteon™ Specialty Fluids



Aqueous Degreaser

**71%**  
**LOWER SURFACE TENSION**  
for Precision Cleaning in Tight Spaces

21 dyn/cm



Opteon™ Specialty Fluids

72 dyn/cm



Aqueous Degreaser

### PLUS, OPTEON™ SPECIALTY FLUIDS:

- Generate very little waste and are more easily recycled
- Leave no residue, rust, or tarnish in wash and rinse tanks
- Are safer to use than some caustic aqueous detergents

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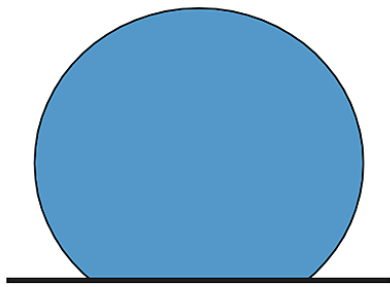
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# How Surface Tension Affects Cleaning

## Surface Tension Comparison

The surface tension of a cleaning fluid affects its cleaning performance. Many vapor degreasing cleaning fluids have a lower surface tension than water. This allows them to easily penetrate and clean inside compact and complex spaces like internal blind holes, awkward shapes or other intricate geometries. The fluid removes contaminants and then quickly evaporates without leaving spots or residue.



### Water

Surface Tension:  
72 dynes/cm



### Water + Surfactant

Surface Tension:  
~35 dynes / cm



### Typical Solvent

Surface Tension:  
< 20 dynes / cm

# Vapor Degreasing Fluid Evolution

Vapor degreasing fluids continue to evolve in order to not only meet emerging regulatory requirements but to also provide safer options for people and the planet.

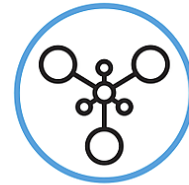


Discover Perfectly Clean

## From Harmful Solvents to Modern Sustainable Cleaning Fluids

### Pre 1990s

CFC-113, 1-1-1 trichloroethane and HCFC-141b were commonly used as vapor degreasing solvents. By 1997 all were banned as ozone depleting substances.



### 2000s

In the 2000s, other high-performing cleaning solvents were used. Trichloroethylene (TCE), Perchloroethylene (Perc), methylene chloride, benzene and n-Propyl bromide (nPB) served the industry for years. However, due to toxicity issues, many are already banned in some countries. Some are also on the U.S. EPA watch list and may be phased out as early as 2022.



### Present Day

HFO-based (Hydrofluoroolefin) cleaning fluids are today's modern alternative. They score high marks for worker safety and are better for our environment. Most have a very low GWP (Global Warming Potential) and a low or zero ODP (Ozone Depleting Potential) to help protect air quality.



### Future

MicroCare chemists are engineering new, sustainable cleaning fluids to meet not only today's global environmental regulatory demands, but also emerging "green" rules for the future.



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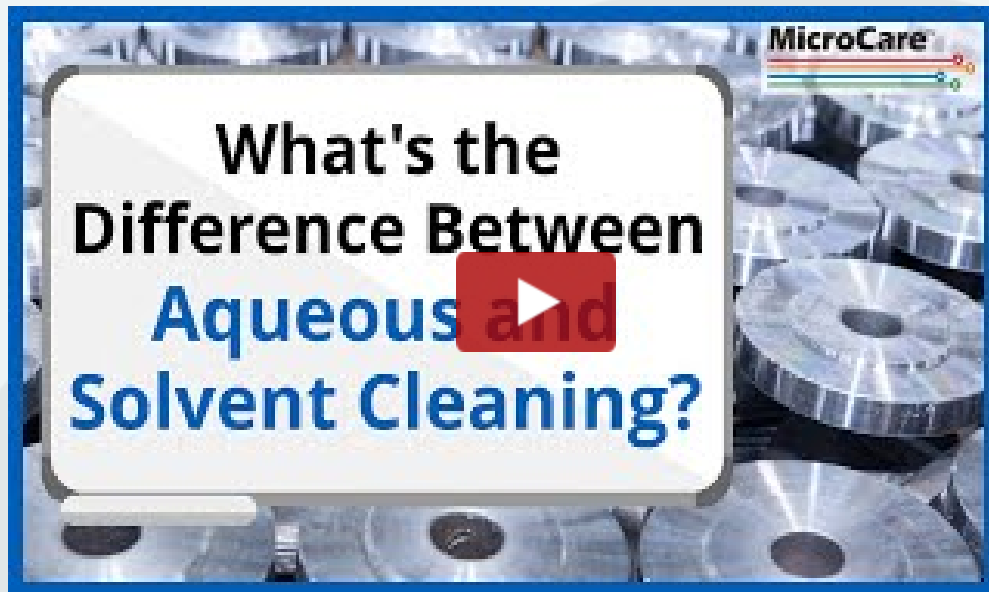
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How to Cost Justify the Vapor Degreasing Cleaning Process:



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Switching from Water to Solvents When Degreasing Engine Valves:



How to Be more Environmentally-Friendly than Water in Parts Cleaning:



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## FAQs:

How Can Cleaning with Vapor Degreasers Save Electricity?

Why is Vapor Degreasing Better for Critical Cleaning Than Other Technologies?

What's the Difference Between an Aqueous Ultrasonic Cleaner and a Vapor Degreaser?

## Further Reading:

Choosing a Metal Parts Cleaning Method: What You Need to Know

Maximize Profits and Productivity by Avoiding Inflexible Cleaning Processes

Develop Your Cleaning Scorecard – Criteria in Selecting Cleaning Equipment

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