



Information Release

Mirachem, LLC

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Switching to Aqueous Cleaning - FAQ



Approved for Release to: All Mirachem Customers, sales agents, distributors, and team members

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Since its beginnings in the late 1960's, the effort to reduce pollution and improve environmental compatibility has been a topic of increasing awareness. In recent years, worker safety and social responsibility initiatives have become intertwined with these environmental issues. Combined, these areas of concern have become a top priority for stakeholders across all business segments, but nowhere more so than in the area of industrial cleaning applications.

Since their introduction in the late 1970's, water-based cleaners have come a long way. From the early days of high cost and poor performance, through the years of development and validation in the 1990's and 2000's, aqueous cleaning chemistries have now proven themselves as safe, productive, and cost-effective alternatives to traditional cleaning processes.

As part of this trend toward safer alternatives, Mirachem is frequently consulted by customers looking to replace hydrocarbon-based solvents with our advanced aqueous technologies. To assist customers interested in meaning the change from solvent to water-based cleaning we've prepared this collection of Frequently Asked Questions (FAQ's).

For further information about switching to aqueous, or for details on any of our products, please contact our Customer Support desk at Support@Mirachem.com or contact us by phone at 800-847-3527.

Q: *Why would I want to switch to aqueous?*

A: Most people hate change, and disrupting an operation to modify a cleaning process is rarely high on anybody's To Do list. There's usually some force external to the cleaning application that prompts companies to start evaluating change. The four most common drivers are:

1. Response to a new environmental safety regulation
2. Address an actual or potential worker safety concern
3. React to a serious safety incident, such a fire or injury
4. Support a process improvement initiative

Once the decision is made to start looking, people quickly find that aqueous cleaning really does make the workplace safer. But beyond that, they begin to understand that water-based cleaning can be a powerful tool in improving productivity and lowering the cost of cleaning tasks.

So, regardless of how or why aqueous becomes a topic of discussion, it winds up being about improving the safety profile of your business and saving time and money.

Q: *What's the difference between hydrocarbon solvents and water-based products?*

A: At the most basic level of description, solvents use oil as the ultimate cleaning agent, while aqueous chemistries use water.

Many materials are made by refining crude oil, with cleaning solvents being one type of these products. In some cases, these chemistries are simply a direct output of the distillation process, such as mineral spirits. In other cases, additives are blended with the base hydrocarbon to make more specialized products, such as Stoddard solvent.

Hydrocarbon solvents work by using oil to dissolve other oils. Think of using paint thinner to clean a brush and you've got the right idea.

Water-based products are made by blending ingredients into the formula to impart additional capabilities to the water. The most common additives are surfactants (often called detergents or soaps) and pH builders. Water-based cleaners will also frequently include rust preventatives and/or foam control ingredients.

Water-based chemistries work by either disrupting the bonds of soils, in the case of detergent systems or "eating through" soils when cleaning capability is delivered by high pH, with residuals being washed away with the water.

One widely used category of solvents are chlorinated solvents, a family of hydrocarbon products that include chlorine in their formulations. Examples of chlorinated solvents include carbon tetrachloride (carbon tet) and trichloroethylene (TCE). These products are the most widely used petrochemical formulas in industrial parts cleaning equipment and probably the most common point of comparison with aqueous cleaners.

Q: *Doesn't sound like there's much difference in how solvent and aqueous products work. What's the big deal?*

A: That depends on your point of view.

From the user's perspective, there probably isn't a difference. All a line operator really cares about is that the product works and helps them to do their job with minimal complications. Switching chemistries means going through change, which can lead to users preferring existing processes just to avoid disruption. While solvent systems have been used effectively for over 100 years, water-based processes are often more flexible and can frequently be customized to provide better performance and higher productivity.

If you're a process or material engineer the difference can be huge. Some substrate materials are more or less compatible with one chemistry or the other, and depending on the steps that come before or after cleaning, changing the cleaning product can significantly impact these other process steps.

For people in purchasing and cost accounting roles, how the dollars move around is important. Solvent products typically cost less per gallon to purchase but carry higher disposal, compliance and risk management costs. Aqueous products are generally more expensive to purchase upfront, with dilution needing to be factored into the overall cost calculation, but also generally reduce the expense of waste and risk management.

The biggest difference is usually seen by the people responsible for managing worker safety and environmental compliance. By their nature, solvent products can carry certain risks including fire or explosion danger, affects to the skin, eyes, throat, or nervous system, and environmental concerns including air and water pollution. Water-based chemistries can also pose risks, including skin and eye irritation or toxicity, and can also be bad for the water or air. However, these risks tend to be lower than those associated with solvent products, and the cost and effort of managing these risks are usually less.

Q: *What makes Mirachem's products different from traditional water-based chemistries?*

A: Performance, safety, and material compatibility.

- Performance

Performance has always been a primary consideration for Mirachem. Founded in 1978, the pioneer days of water-based technology for industrial cleaning applications, we've always understood that while safety is a worthy objective, it can only be helpful if it also gets the job done.

All of our advanced aqueous technologies are engineered from the ground up to perform at least as well as traditional chemistries. As part of our ISO 9001:2015 certified product development process, we conduct rigorous laboratory testing to verify product performance during the design stage, followed by field verification during product realization.

Of course, only our customers can make the ultimate determination that our products work in their specific processes. However, with over 40 years of practical experience in some of the most demanding industrial cleaning applications in the world, you can have confidence in our products and their ability to perform.

- Safety

Mirachem got its start not as a business opportunity, but as an effort to make cleaning safer. Originally developed for personal use, the first Mirachem technologies were an experiment to see if a water-based product could eliminate the hazards of cleaning with solvent and still effectively remove oil and grease. Starting with the simple notion that if you start with safer ingredients you'll wind up with a safer product, Mirachem set out to provide the safer alternative.

Over four decades later we're still committed to this mission. We're always looking for ways to improve environmental responsibility, reduce employee hazards, and improve workplace safety. You can be assured that our products are designed to be as possible and still perform in their intended applications.

- Material Compatibility

Material compatibility is about making sure that the products and processes used in your cleaning applications do not cause damage to substrate materials or create issues in downstream production tasks. Water-based cleaners can present a material compatibility challenge, especially on ferrous metals. Corrosion, surface abrasion, flash rust, and substrate leaching are all potential sources of trouble when using a water-based cleaner.

Mirachem has over four decades of experience in maximizing material compatibility with our aqueous technologies. Our formulations include advanced corrosion protection packages that help protect aluminum, steel, and other sensitive metals. Our design process ensures compliance with many OEM and third-party

standards for specific applications, and our internal test protocols evaluate for compatibility in a number of categories including natural and synthetic elastomers, plastics and plexiglass, and painted or coated surfaces.

But perhaps what most sets Mirachem apart from other products is our world-class service and support. We're committed to the principles of quality management and getting our customers what they need when they need it, is our priority every day. Our application and technical support professionals have the knowledge and experience to understand any cleaning application and know-how to help customers make smart choices to create the best solution. And whether your need is a simple maintenance task, or a complex, multi-step critical cleaning application, we can help you get the job done faster, safer, and more efficiently.

Q: *If water-based cleaners are that good, why are people still using solvent?*

A: For two reasons.

First, it's hard to change. There's wisdom in the old adage "if it's not broke, don't fix it", and nobody gets excited about disrupting operations if they don't have to. So unless there's a pressing reason to consider water-based cleaning, many people just keep doing things the same way. Being too resistant to change can stifle innovation and lead to missed opportunities. When it's time to consider change, evaluating aqueous products versus solvents is a great way to implement continuous improvement.

Second, many people are still making decisions about industrial cleaning without good information. "Safer" products still have a bad reputation in many cases. There are persistent myths that get in the way of decision making including performance issues, pricing comparisons, material compatibility facts, and perhaps worst of all, misplaced loyalty to petrochemical solvents because "that's the way it's always been done". We understand how important effective communication and education are in the industrial marketplace and that's why superior support is one of Mirachem's core objectives.

Q: *Can water-based cleaners REALLY replace hydrocarbon solvents?*

A: Yes, they can, and they can do it in almost all cases.

Early aqueous chemistries often provided inferior performance when compared to Stoddard solvent, mineral spirits, and other petrochemical solvents. Environmentally friendly products were great, but they didn't work. But water-based cleaning for industrial applications has come a long way since then.

Water-based cleaning is effective, and there's plenty of proof in the marketplace. In 1998, Southern California's South Coast Air Quality Management District (SCAQMD) implemented its Rule 1171 targeting VOC emissions from parts washers to improve air quality. The rule came about after years of testing and field study to validate that safer alternatives could deliver cleaning performance. Over 20 years later, Rule 1171 is still the law in Southern California because aqueous cleaning works.

Mirachem has been manufacturing our advanced aqueous technologies since 1978. For over 40 years, we've worked with businesses large and small to find water-based alternatives to cleaning processes that use hazardous chemistries. Water really can get the job done and we can help you see for yourself.

Q: *Isn't converting to water-based cleaning difficult?*

A: That's more a matter of application than it is of chemistry.

In general repair and maintenance applications making the change is usually pretty simple. It's easy enough to conduct side-by-side comparisons between aqueous and solvent processes to verify performance, and actually implementing the change shouldn't require any disruption to production. These conversions can typically happen pretty quickly.

Production or critical cleaning applications are another matter, however. It's usually not possible to establish dual production processes to conduct a side-by-side comparison and validation frequently demands testing in the actual production environment. Even before this stage, it's common that engineering analysis or qualification verification be completed before validation testing can even occur. These applications usually demand several steps in the conversion process and take an extended period of time.

Whatever the application, there are things you can do to make the process faster and easier. Mirachem can help you evaluate your applications and make recommendations based on over 40 years of practical experience. We can even conduct a Cleaning Process Evaluation in our test lab to help you establish the best protocols for field validation.

If you're interested in more comprehensive support or a complete service program, our partner, Heritage-Crystal Clean offers a full range of environmental services. This includes not only Mirachem aqueous technologies, but also parts washing equipment, waste disposal, and professional expertise at the local level.

Q: *Can't I just swap an aqueous cleaner with a solvent product?*

A: Probably not.

Because of the differences in the basic chemistry between aqueous and solvent products, there are different use and handling considerations that usually require changes to process or equipment. The following table lists some of the things that have to be taken into account when using the different product types.

CONSIDERATION	SOLVENT	AQUEOUS
Changeout frequency	Eventually, the solvent will become saturated and stop working. However, bacterial growth and cross-contamination are generally not a concern.	Theoretically, the product will keep working forever. However, bacterial growth and cross-contamination can be a concern and changeout should occur at least every 12 weeks.
Dilution management	Solvent cannot be diluted. Rapid evaporation is a concern due to volatility.	Proper concentration must be maintained to deliver performance and cost benefits. Low volatility and less evaporation.
Drag out	Solvent left on parts can exaggerate bath depletion and can contribute to high VOC emissions.	Product left on parts can exaggerate bath depletion but typically does not contribute to high VOC emissions.
Drying	Solvents typically flash dry at ambient temperature.	Parts typically remain wet after cleaning. Flash rust a potential concern.
Employee health hazards	Risks with inhalation of vapor, ingestion, eye and skin contact. Effects can be serious to severe.	Depending on the formulation, risks with ingestion, eye or skin contact. Effects generally mild to moderate.
Equipment compatibility	Compatible with carbon or stainless steel dip tanks and manual parts cleaners. Incompatible with thermoplastic	Compatible with stainless steel and thermoplastic construction, as well as heated parts cleaners, spray washers, and ultrasonic equipment. Long-term

	construction, heated parts cleaners, spray washers, or ultrasonic equipment.	incompatibility with carbon or mild steel construction.
Flexibility	Few options for customizing process to boost performance or productivity.	Extensive options for customizing process to boost performance or productivity, including equipment variety, control of temperature, spray cleaning, and multi-stage automation.
Foaming	Foaming not a consideration.	Foaming is a consideration for product choice in spray or high turbulence applications.
Material compatibility	Good compatibility with ferrous and yellow metals, but not suitable for use on plastics and many elastomers. Solvent residue can serve as a post-cleaning corrosion barrier.	Material compatibility subject to the effectiveness of product formulation. Corrosion management is a consideration with ferrous and yellow metals. Usually excellent compatibility with plastics and many elastomers.
Residue	Solvent residue can be a concern in subsequent production steps, particularly painting or coating tasks.	Subject to the specifics to the formulation, generally less issue with residue.
VOC Emissions	Typically 100% VOC formulations and categorized as high VOC products.	Subject to the specifics to the formulation, generally lower VOC content, often meeting low VOC regulatory limits.
Soils	Effective in removing organic soils.	Depending on the formulation, able to remove either organic or inorganic soils.
Transport/waste disposal	Generally categorized as hazardous at the state and federal level, both as purchased and after used.	Generally not categorized as hazardous at the state or federal level as purchased. Waste classification dependant on suspended soils after use, but often categorized as "oily water".
Wastewater concerns	Not sewer disposable. Must be transported as hazardous waste.	Subject to suspended soils from an application, may be sewer disposable. If not, generally treatable on-site before discharge or able to be transported as a safer category of waste.
Fire or Explosion	Fire or explosion danger in both liquid and vapor states.	Virtually no fire or explosion danger in either liquid or vapor states.

Q: What does 'changeout frequency' mean?

A: The term 'changeout frequency' refers to how often parts washing equipment should be drained, cleaned, and refilled to maintain optimal performance in a particular application.

There are several factors that go into creating an effective maintenance schedule for a parts cleaning process, including:

1. Equipment type:
2. Unit capacity
3. Type of soil being removed
4. Workload
5. New or used parts
6. In-process maintenance (filters, weir systems, particulate removal, add-back fluid, etc.)
7. Internal servicing versus contract program

About Mirachem, LLC

Mirachem, LLC, a Heritage-Crystal Clean company, is a manufacturer and marketer of environmentally and worker-safe cleaning technologies, and provides advanced customer and technical support for users in a variety of applications, across many industries and business segments. Headquartered in Phoenix, AZ, Mirachem was founded in 1978 as The Mirachem Corporation, and has been offering superior alternatives to traditional, hazardous cleaning chemistries for over 40 years. For more information, visit [Mirachem.com/AboutUs](https://www.mirachem.com/AboutUs).

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