Tech Article

Maximize Profits and Productivity by Avoiding Inflexible Cleaning Processes

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Flexible cleaning processes help produce reliable products. Critical cleaning processes used in many industries from electronics to telecommunications to aerospace and medical devices. They all require different degrees of 'clean'. But one common characteristic that defines "critical cleaning" is that if the cleaning is not done properly, the product simply will not function reliably for the required life of the product. If the cost of a cleaning failure is high, then it's a mission-critical application.

But the landscape for cleaning processes has become more challenging. As a general trend across many industries, components are getting smaller, capabilities are getting greater, and tolerances are getting tighter.

Users of modern cleaning systems need to constantly improve their cleaning processes while juggling product upgrades, cost reductions and aggressive competition. If that's not tricky enough, there are further restrictions due to environmental concerns, new regulatory requirements and pressures for a healthy workplace. So, it becomes clear that these three conflicting trends — the continued miniaturization of components with the concomitant increase in performance; the unflagging need to protect people and the environment; and the economic drivers of reducing costs while boosting quality — combined make any cleaning decision difficult.

Which brings us to the key question: how do you adapt critical cleaning processes when some outside force — a technology change, a regulatory change, or a competitive threat — mandates a change from your current techniques?

Be Ready to Adapt

Implementing change in an operating factory is never easy. Regardless of the cause, it is never going to be simple. But change is coming. Today, many companies use water-based processes for the bulk of their cleaning applications. But there are a number of factors that suggest water cleaning is an increasingly troubled proposition. Solvent cleaning seems to be the future-forward choice.

Why? Because in an increasingly dynamic and complicated market the "prime directive" must be to select the most flexible, versatile option. Versatility and technological flexibility are a benefit in manufacturing. Rigid processes, however smart they may have been at the time of purchase, lock a factory into fixed answers. A factory may be the leader with today's products for today's customers, but when change arrives it is the small and nimble competitors that will survive.

So, vapor degreasing is a choice to consider. Because it is the "small and nimble" critical cleaning option. Many companies have renewed their interest in the benefits of vapor degreasing. In the electronics industry, ever-denser chip configurations make cleaning very difficult. For medical and pharmaceutical applications there is strong pressure to greatly minimize bioburden issues. In the hard disk drive industry, hydrocarbon contamination is being driven down to levels considered impossible. Every player in these advanced industries knows that better cleaning makes for better, faster and more reliable products.

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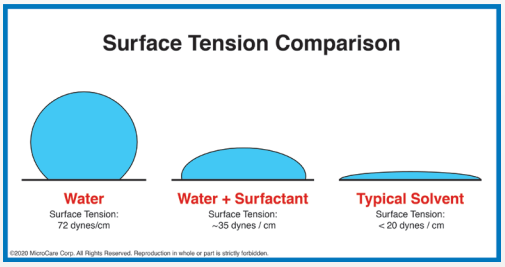
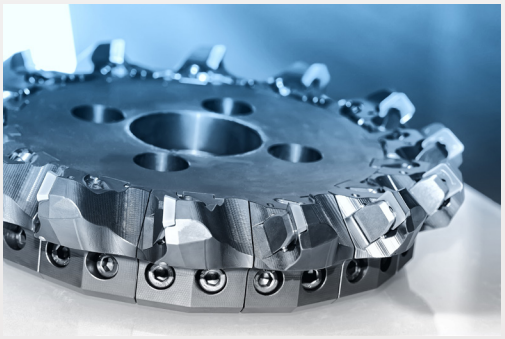


Unlike water, cleaning fluids have low surface tension and a very low viscosity.



Vapor degreasing gets all surfaces, inside and out, clean.

Vapor Degreasing

Vapor degreasing is a simple process that removes contamination using sophisticated, “low-boiling” cleaning fluids. These are closed-loop systems. Cleaning fluid recycling is inherent in the process. Vapor degreasers are small, fast, highly cost-effective and — most importantly — extremely flexible.

The concept behind vapor degreasing is simple. The system boils a cleaning liquid into a vapor, contains the vapors inside the system, cools the vapors back into a liquid, and collects this purified liquid for re-use. The cleaning fluid boils at a low temperature (usually slightly above room temperature) so it takes very little electricity.

Low-boiling cleaning fluids have multiple chemical properties that are advantageous to critical cleaning. For example, they usually have a very low surface tension and a very low viscosity, so the fluids easily clean even the tightest of spaces and under the smallest of parts. Most vapor degreasing fluids also are very heavy and dense, typically 20-40% heavier than water, which aids in dislodging particulate from the components.

Recycle and Save

Vapor degreasing systems usually work vertically, with the rinsing and drying processes taking place above the cleaning tanks. This consumes very little floor space and cuts energy usage. This is a substantial leasing costs and utility bill savings.

Vapor degreasing systems are cost-effective because the cleaning fluid recycles indefinitely. In effect, each vapor degreaser is a recycling system. This is in contrast with the resource-intensive processes of many water-based cleaners.

Choosing Options

There are many manufacturers of vapor degreasers world-wide. Numerous equipment options make vapor degreasing even simpler and faster. The fluid tanks can be fitted with filtration systems to remove insoluble contamination (particulate). Another option is to add ultrasonics to enhance cleaning. Automated hoists free technicians from the tedium of lifting parts in and out of the system. “Super heat” and external distillation are other money-saving, performance-enhancing choices. Depending on the application and process requirements, the technology exists to handle the largest parts and highest volumes. These machines, when properly designed, equipped and configured, out-perform the cleaning efficiency of any other cleaning technology.

Aqueous Allure

The most common alternative to cleaning fluid cleaning is water. Water cleaning is ideal for non-critical cleaning applications. Water cleaning uses the kinetic energy of pumps and sprays to “power-wash” contamination from surfaces. Intuitively, water also seems like it would be an environmentally-friendly option. However, there are a number of reasons why the advantages do not always materialize as expected.

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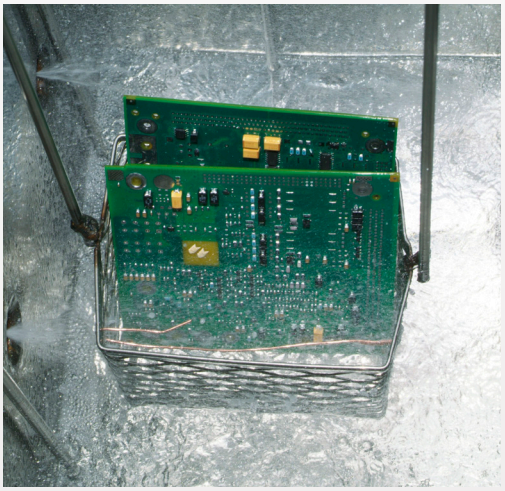

Cleaning fluid cleans tight spaces and under low mounted electrical components

Energy Usage

Every aqueous system needs heat to clean. While it takes 8,340 BTUs to boil a gallon of water it takes only 1,000 BTUs to boil a gallon of cleaning fluid solvent. So, as a general rule, aqueous cleaners consume eight times more energy than a vapor degreaser cleaning the same quantity of parts. Plus, burning fossil fuels to generate the electricity to heat the water is one of the primary sources of global warming.

Effective Cleaning

Another issue is the difficulty of miniature parts. Small, delicate parts are a challenge to clean in an aqueous system that uses agitation to clean. Plus, because of the nature of the water molecule, water often cannot get into the tightest spaces or smallest apertures. This mean those hard-to-reach locations are not wetted and so they are not cleaned.

Staying Clean and Dry

Filtration is problematic with water-based cleaning systems as well, because water does not easily traverse 2- or 3-micron filters. The only way to deliver micron-grade filtration is with big, energy-hungry pumps to force the water through the filter. Drying is another complexity. After water cleaning, drying requires additional steps and additional energy (heaters, blowers and air knives). If bacterial growth is a problem, the process controls needed for eliminating bioburden add significantly to the complexity and costs of an aqueous cleaner.

Managing Waste

In terms of waste treatment, most aqueous systems require pre-treatment of their incoming water, which uses more electricity. Aqueous systems also produce a waste stream that requires treatment before discharge, further exacerbating the electrical issue. Lastly, aqueous systems add humidity and heat to the rooms in which they operate, placing a burden on the air conditioning system of the facility and increasing energy consumption.

Aqueous cleaning processes usually operate horizontally so the systems have a large footprint, require more overall space and using more electricity.

Selection Guidelines

Advances in cleaning fluid technology are rapidly entering the market. Chemours™, 3M™, Honeywell™, MicroCare™, Solvay™ and others all are commercializing environmentally sustainable cleaning fluids that perform very well. In fact, many companies are rediscovering that a properly configured vapor degreaser using these new fluids is very gentle on the planet. Plus, it delivers consistent and reliable cleaning, often with the lowest overall costs.

Making the Best Choice

It is essential that the cleaning system decision be based on a thorough understanding of the inputs and outputs. The first and most important input is the contamination. Engineers must completely understand the source, characteristics and behavior of the contamination they are trying to remove. For example, traditional rosin fluxes used on circuit boards require very different cleaning chemistries than today's new lead-free fluxes and pastes.

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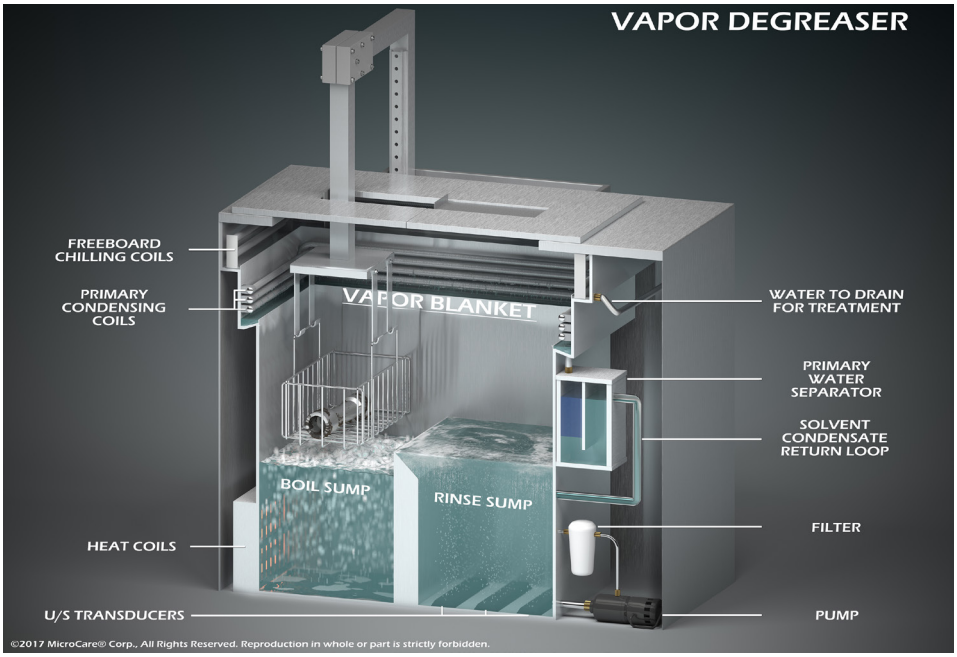
Companies today make it easy to test new cleaning fluids. These tests usually involve collecting a standardized sample of contaminated parts and sending them to the chemical company's lab. They will suggest the optimal cleaning process. Any quality vendor should be willing and able to perform a modest amount of testing. The vendor should provide a detailed written report and often will perform these services free of charge.

Pre-plan for Success

Decisions involving cleaning chemistry, equipment and processes all need to be made concurrently. These decisions cannot be made separately. Trying to fix a cleaning process after an inappropriate selection will be daunting, slow and expensive. The contaminant, chemistry, equipment and processes must all be considered early in the process to ensure cleaning success.

Summary

Three significant trends are at work across most industries: the continued miniaturization of components, the need to protect people and the environment, and the need to minimize production costs while boosting quality. To adapt to this changing world, the most versatile, flexible, low-risk option that meets all the critical cleaning requirements is vapor degreasing process with a modern cleaning fluid.



Vapor degreasers are small, fast and extremely flexible.

About the Author:

Mike Jones, retired Vice President of International Sales for MicroCare, has over 30 years of experience in the critical cleaning industry. He is a prolific writer and educator focusing on critical cleaning in general and vapor degreasing and benchtop cleaning in particular. For more information, visit www.microcare.com.

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