MAGNAFLUX®

AQUEOUS CLEANERS

The Essential Guide to Aqueous Cleaners

- Neutral
- Alkaline
- Heavy-Duty

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Selecting Your Cleaning Solution

When selecting an aqueous cleaner for a specific application, the amount of choices can be overwhelming. There are many different methods of cleaning, types of equipment, and cleaner solutions which organizations can leverage for their specific needs.

How can you be sure that you're choosing the right method to clean your parts? Or the right equipment to clean the parts as efficiently as possible? Or the right cleaner so that the whole process is safe and effective?

To ensure your cleaning solution meets your unique needs, Magnaflux has put together a list of questions to consider.

Why choose aqueous cleaning over other options?

Parts are soiled at many points during production such as when they are milled or forged, when they are being finished, or when they are being transported between work areas. This contamination can have a significant impact on the effectiveness of quality processes and inspections. If there is grime or dirt on a part, a penetrant may be less effective, and critical flaws may be missed. For that reason, having clean parts and a defined and effective cleaning process is essential.

But what is the best way to get parts clean? One of the common cleaning methods deployed in manufacturing is the vapor degreasing method. Vapor degreasing is a process where parts are cleaned using the vapors of boiling solvents within a cleaning cabinet without the need for scrubbing or water.

There are several reasons why vapor degreasing has become prevalent. The first is economic concerns. Commonly used solvents needed for the cleaning processes have historically been naturally non-flammable and very cheap. This means that once start-up costs have been addressed, operating costs can be very low. Additionally, the vapor degreasing cleaning process was recognized as an effective cleaning process and adopted as an industry standard.

However, while vapor degreasing seems to offer an economic option, there are several issues that an organization needs to consider. First, those commonly used solvents in the vapor degreasing process have been found to be both harmful to the environment and to humans.

Due to changing regulations, many solvents have or will be banned in the near future. If an organization wants to leverage vapor degreasing as a cleaning technique, they will need to operate it within a closed system. This means that organizations will need specialized equipment and even specialized rooms (for large volume cleaning) which is both cost-prohibitive and limits throughput.

Another consideration in regard to throughput is, given that vapor degreasing requires a large amount of heat within a cabinet to be effective, parts need time to both dwell and then cool which limits throughput for large volume production lines. Additionally, because parts are heated and cleaned within an enclosed space, part size is limited unless the cleaning equipment is customized for larger parts.

Finally, vapor degreasing is a very intense process involving heat which could present a risk for parts with sensitive surfaces or parts made of heat reactive materials. For this reason, those parts might have to be cleaned a different way or the time they spend in the vapor degreasing process might have to be limited which could result in parts not being completely cleaned.

So, what other options are there? The cleaning process that provides the most economical and effective solution is aqueous cleaning. Aqueous cleaning leverages water-based solutions which can be applied to parts in different methods depending on level and type of soil.

The benefits of aqueous cleaners are two-fold. First, aqueous cleaners provide a variety of options for application methods. If a part is made of a material that can be damaged by the intense heat and aggressiveness of the vapor degreasing process, an organization could instead leverage a more neutral cleaning solution that can be applied in milder or gentler method. Or if a part has a particularly large amount of soil and is made of a robust material, an organization can apply a stronger, more alkaline cleaner.

The second part is aqueous cleaners provide an economical and environmentally friendly water-based cleaning solution.

From an economic standpoint, aqueous cleaners have less restrictions on usage and don't require expensive cleaning equipment. Additionally, aqueous solutions can be reused as long as the concentration is checked and remains within your desired levels or specifications. There is also less down time as parts cleaned with aqueous cleaners do not require time to cool following application, meaning throughput remains efficient saving both time and money.

From an environmental standpoint, given that aqueous cleaners are water-based, they have less disposal costs, can be reused, and don't result in harm to the environment or operator.

Why Choose Daraclean?

Environmentally friendly

Every Daraclean solution features a water-based formulation which provides an equal or better cleaning outcome while also minimizing human and environmental harm compared to other cleaning options.

Daraclean products can be also recycled or reused within your cleaning processes, which reduces both the time and cost needed to replace cleaning agents. And, once your solution has reached the end of its effectiveness, the water-based solution requires less treatment to dispose of when compared to other cleaning solvents. Additionally, any rinsewater that occurs over the course of your cleaning process can be disposed of in equally reasonable fashion.

Effective and efficient cleaning

Daraclean provides your organization with a cleaning solution that gets the job done. With a variety of options, you can tailor your cleaning process with Daraclean to ensure complete and effective cleaning.

Daraclean's unique formulations also enable faster throughput as a result of lower working and processing temperatures compared to other methods, meaning a part can go straight to and from inspection.

Certification compliance

Daraclean has multiple specification compliant options for you to choose from. If your organization requires industry-standard certifications or needs to meet specific manufacturer standards from Boeing to Pratt and Whitney, Daraclean provides cleaning solutions that cover those needs.

1) What Specifications do You Have to Meet?

The first thing to consider when mapping your cleaning processes is the specifications that govern your organization and industry.

Whenever you process critical parts, there are specifications that dictate what cleaning methods and materials can be used. The aerospace industry in particular has stringent specifications and codes for how parts are processed and cleaned.

Most industries have universal standards which can be used as a reference and guide for developing your cleaning processes such as ASTM or AMS. Additionally, major manufacturers also have unique requirements which must be considered in conjunction with any industry standards. These manufacturers include Boeing, Lockheed, GEAE, Pratt & Whitney, and Raytheon specifications and procedures.

2) What Material are You Trying to Clean?

The materials of your parts are a critical factor in determining your cleaning process and your cleaning solutions.

When dealing with industrial parts, brass and aluminum will react to cleaners differently than carbon or stainless steel. An aggressive cleanser may get hard surfaces like stainless steel sparkling clean but etch and oxidize softer metals like copper and brass, ruining the surface. Thus, harder surfaces can handle more aggressive cleaners than softer surfaces.

The structure of the part will also influence your choices.

If your parts have delicate structures or precision surfaces, a milder cleanser and gentle application would be best. While that may mean more time spent cleaning, the alternative is potentially damaging the part. If your parts have less complex geometry or are made of more durable materials, you can increase the intensity of the cleaner and/or the application.

3) What are You Trying to Remove?

Just as your choice of cleaning solution will depend on your part's material, your choice of cleaning solution will also be dictated by what kind of grime or soil you're taking off your part. Understanding what you're trying to remove is just as important as understanding what you're cleaning.

Cleaning solutions are formulated with different ingredients to clean different types of soil.

For example, if your parts have carbonized soils and heavy greases, a caustic cleaner is needed to break the soil up and remove it. But if you're just removing a protective coating of machine oil from a precision part, you need a mild, neutral solution.

Some cleaning solutions are designed to emulsify the soils and hold them within a solution. The cleaner will break up the soil, pull it away from the part surface, and enable the soil to be removed along with the cleaning solution.

When using this type of cleaner, the amount of soil loading in the solution affects how well parts can be cleaned. After a period of time, the solution loses power and must be dumped and replaced. If the cost of the cleaner is low enough and disposal costs are low, then this can be cost-effective. However, if the parts have a lot of soil or the disposal costs are high, then this type of process won't work.

Other cleaning solutions are designed to pull soil off part surfaces and then reject them from solution, so they can be skimmed or filtered out. This extends the life of the cleaning solution, allowing it to be used again and again over time. Additional equipment is needed to filter the cleaner, and this investment must be balanced against the savings of reusing the cleaning solution. In-use cleaner concentration also needs to be checked periodically if using this process to maintain cleaning effectiveness.

4) When do your parts need to be cleaned?

The stage at which your parts need to be cleaned is also an important consideration.

To ensure quality inspections are as effective and accurate as possible in detecting flaws, parts are often cleaned prior to any inspections. For this reason, pre-cleaning is often the first step of any quality process. This means that any considerations of cleaning methods and materials need to be made with the understanding that it is critical that a part is clean and dry prior to penetrant application. Parts must be free not only of oil, grease, and particulates, but also cleaner residue.

Following a quality inspection where penetrant or MPI particles are applied to a part, those materials often need to be removed prior to final completion of the part. This can be accomplished in a variety of ways, be that with a simple water wash or with a stronger cleaning solution. In either case, post-cleaning is another important step of any cleaning process.

5) How Parts are Cleaned

Just as there are many cleaning solutions to choose from, there are also many methods to apply and use those cleaning solutions.

The simplest of all cleaning methods is **hand scrubbing**. This method requires an inspector physically scrub the soil off a part. Hand scrubbing is the lowest start-up cleaning method as far as equipment and setup cost, but it also has the highest operating labor costs since all the cleaning is done by the operator. This method is applicable if you don't have too many parts at once and if they don't take a lot of time and effort to clean. It's also best to use a mild cleaner, since the parts are being cleaned by hand and harsh cleaners could be hazardous and require more PPE.

If you have many small parts and a longer timeframe for inspection, **soaking** could be an ideal process. Soaking involves suspending the parts in a tank of cleaning solution or gently swirling them in the tank, which will loosen and remove dirt and oils from the surface. For tough, carbonized soils, soaking can loosen the dirt, making it easy to brush off by hand, just like when you soak pots and pans at home. When soaking parts, you can use more aggressive cleaners, since you don't have as much exposure to the cleaner as hand scrubbing. Time is a critical part of the soaking process as parts must be submerged long enough to ensure they are cleaned. From a set-up perspective, soaking presents a reasonable equipment and space investment to set up, but it is very simple to implement and has very low operating costs.

If simply soaking your parts doesn't remove all of the contamination, using an **agitated immersion washer** can provide an additional level of cleaning. These large machines provide the same benefits as soaking while also stirring up the cleaning solution to remove dirt and grime faster and more effectively than soaking alone. Many companies provide this type of machine for cleaning industrial parts. Some use baskets and move the parts around in the tank of cleaning solution while others will pump solution over the parts.

Such systems cost more than straight soak tanks to set up but significantly reduce the amount of time needed to clean parts.

Ultrasonic cleaning is another soaking-type method which combines the benefits of soaking with a scrubbing action induced by sound waves in the cleaning tank. This method can be used for precision cleaning on parts having complex surfaces, blind holes, and other features that would make normal soaking or spraying difficult. Ultrasonic cleaning uses sound waves to create microscopic bubbles in the cleaning solution which then collapse back on themselves. This creates a microscopic scrubbing action all over the surface of a part that will break up and remove dirt. The cost of setting up and running ultrasonic cleaning tanks is typically higher than agitated tanks but often produce better results with precision parts.

If volume is more of a concern than precision, a **spray cabinet** is a solution in situations where you must deal with a higher volume of parts, but you need to process them quickly. Parts are loaded on racks and run through a chamber where the cleaning solution is sprayed on them. This accomplishes a lot of work in a short amount of time. A soak tank may take 30 minutes to get a part clean, while a spray cabinet could be able to do it in 30 seconds. On the other hand, foam is a major concern with spray cleaning. A spray of cleaning solution will build up foam very quickly if it is not controlled. Setting up a spray cleaning process can represent significant investments in equipment, space, and maintenance. However, once running, the process can handle high volumes of parts in short times with consistent results.

6) Rinsing and Drying

For aqueous cleaners, rinsing and drying are very important steps, so special consideration should be given to adequate rinsing of your parts using clean water and adequate drying.

Neglecting the final rinse will leave cleaning solution on your parts, potentially leading to corrosion or pitting on the surfaces you just spent so much time and effort cleaning. While leaving water on the parts can lead to oxidation, rust, or mineral deposits that leave the surfaces discolored at best and oxidized and corroded at worst.

Often, parts need to move on to other machining and processing steps after cleaning. How well you rinse and dry the parts after cleaning will translate into how well prepared the parts will be for the next step in manufacturing. If cleaning is the last step in manufacturing, then the final rinse and drying will affect the appearance of your product, and the impression it makes on your customer.

Now we've covered all the bases – what we're cleaning, what we're trying to remove, how we're going to do it, and what specs we must comply with – hopefully you have a better understanding about how to approach industrial parts cleaning.

Summary

1) What Specifications do You Have to Meet?

Ensure your cleaning materials and processes are compliant with relevant industry and customer required standards.

2) What material are you trying to clean?

Understand the material your part is made of and how it can react to aggressive cleaners.

3) What are you trying to remove?

Understand how your cleaning solution interacts with the contaminants you are trying to remove and choose the best balance of cost to performance.

4) When do your parts need to be cleaned?

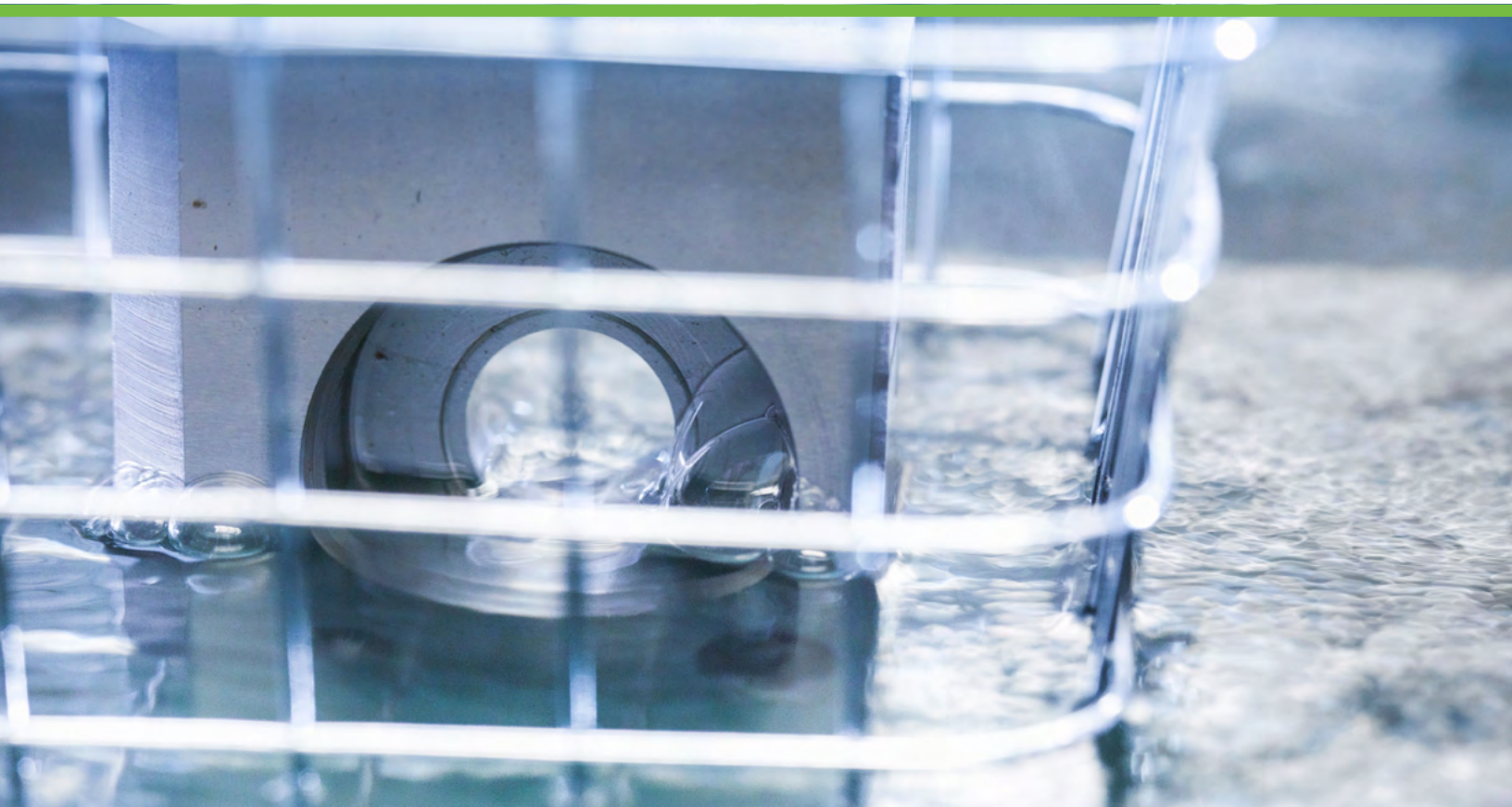
At what stage of the manufacturing and quality processes is cleaning necessitated and how does that factor into your cleaning procedures?

5) Choose the best method for cleaning your parts

Hand scrubbing, soaking, spray cleaning or ultrasonic. Understand the benefits and drawbacks of each one and how they interact with your specific manufacturing needs

6) Make sure the parts are adequately rinsed and dried after cleaning

Understanding how cleaning steps affects the finishing of a manufacturing process along with the final appearance and functionality of the product.



Compare Magnaflux Aqueous Aerospace and Industrial NDT Cleaners

	Daraclean 212	Daraclean 235	Daraclean 236	Daraclean 282	Daraclean 282GF	Daraclean 283
pH level	Neutral	Neutral	Neutral	Alkaline	Alkaline	High-alkaline
Foam level	High	Low	Moderate	Low	Low	Low
Silicates				✓	✓	✓
AQMD Certified					✓	
Immersion Application	✓	✓	✓	✓	✓	✓
Ultrasonic Application	✓	✓	✓	✓	✓	✓
Spray Application		✓	✓	✓	✓	✓
Steam Application	✓	✓	✓	✓	✓	
AMS 1551				✓		✓
ARP 1512				✓		
ARP 1755B					✓	
ASTM F495				✓		
ASTM F519				✓		
ASTM F945					✓	
ASTM F1110	✓					
Boeing BAC 5749						✓
Boeing BAC 5763	✓	✓		✓		
Boeing D6-48809				✓		
CSS 253				✓	✓	
GEAE Method 22, 51145				✓	✓	
Honeywell ARP 4992	✓	✓		✓		
Pratt & Whitney			✓	✓	✓	✓
PWA 407					✓	
PWA 36604				✓	✓	
PWA SOP 209					✓	
PWA K231				✓		
RR CSS 204 Type A				✓	✓	

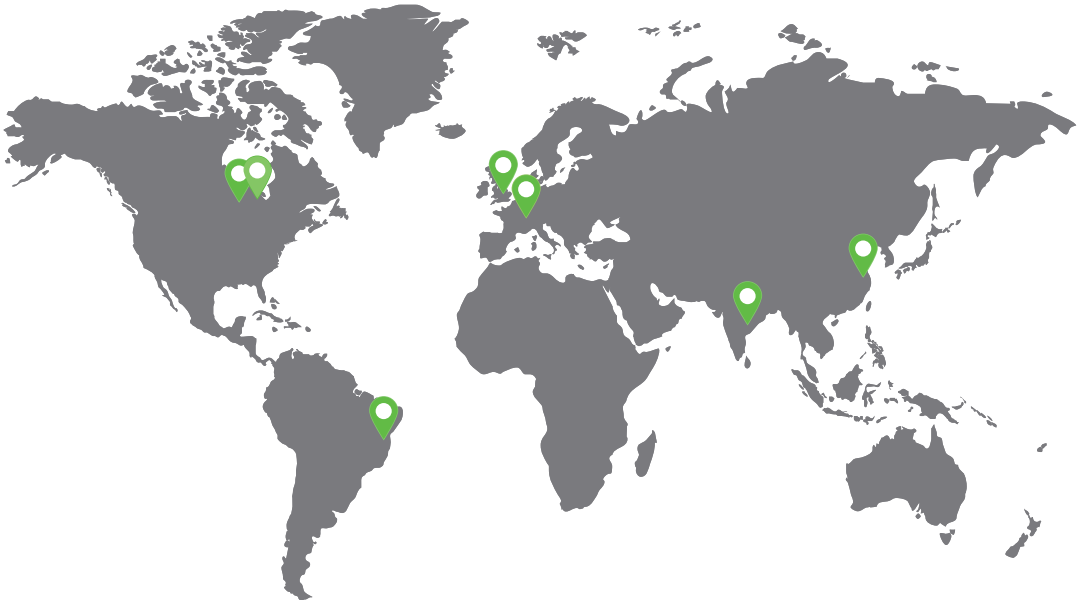
Choosing the Right Product

Selecting the right aqueous cleaner can be a challenge for even the most knowledgeable of NDT experts. From different part materials, to soil levels, to application methods there are a lot of factors to consider to ensure parts are effectively cleaned. Fortunately, Magnaflux has created this helpful tool to assist in picking the right product to meet any specific needs.

Just scan the QR code, open the selector tool, choose what part material is being cleaned, the level of soil, and how the cleaning solution will be applied and Magnaflux will recommend the right Daraclean product.

Download Our Informative Selector Tool

Want to learn more about NDT cleaning processes or the options you have for cleaning your parts? Visit **magnaflux.com/Aqueous-Cleaners** or connect with our application experts at support@magnaflux.com or +1 847-657-5300 to plan and execute your cleaning solution.



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Rev: E25