A STEP BY STEP GUIDE TO **CHOOSING THE RIGHT CLEANING EQUIPMENT**

CLEANING TECHNOLOGIES GROUP

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Introduction

A new generation of industrial manufacturing is characterized by highly accurate machining and finishing processes, as well as precision manufacturing methods. Manufacturing tolerances and acceptable limits in part variation are tighter than ever. Any contamination or debris left behind on parts can affect physical dimension or measured value. The right cleaning equipment is essential to remove this material, so parts can function reliably and as intended.

The purpose of this eBook is to provide a step-by-step guide for choosing the parts cleaning equipment that is best suited to meet your process needs.

- **Step 1:** Determine your Best Option
- **Step 2:** Consider the Types of Contaminants
- **Step 3:** Assess Configuration Requirements
- **Step 4:** Consider Automation
- **Step 5:** Implement Testing (consider types of testing)

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Step 1: Determine your Best Option

The first step in selecting parts cleaning equipment is to considering your options. Evaluation of several variables will help you to determine which type of system is your best option.

Solvent Cleaning or Aqueous Cleaning

Solvent cleaning involves the use of chemical solvents to quickly dissolve grease, oil, dirt, burnt-on carbon, and thick lubricants. While effective for cleaning, some solvents create considerable health concerns, environmental risks and possible annual environmental reporting based upon usage.

Aqueous cleaning uses water-based solutions that are typically nonflammable and contain little or no VOCs. Instead of dissolving grease and solids like solvent cleaners, aqueous cleaners require heat, agitation, and soap action to break dirt into smaller particles.

Types of Parts Washers

In today's market, you will find a wide range of parts washers to meet virtually every need. They can be categorized into four main types:

Agitating Parts Washers

These washers incorporate impellers, paddles or moving the parts vertically in a up and down motion to create a violent action which helps remove contaminants from fully submerged parts. These parts washers necessitate the use of large holding tanks and require a matched aqueous cleaning solution based upon the temperature, action and contamination bring removed.

Rotary / Drum Parts Washers

These washers feature a rotating auger style conveyance for cleaning large volumes of products through continuous movement. With this type of parts cleaning system, spray nozzles are also used to help clean the parts.

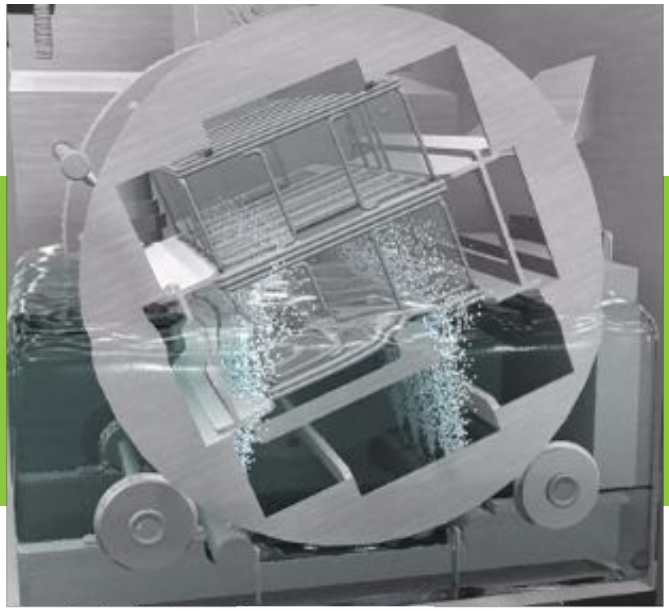
Spray Parts Washers

Spray washer technology utilizes high pressure water nozzles to spray heated water and cleaning solutions across the part surfaces. The necessary water pressure is supplied through solution pumps. Spray washers are commonly used to clean larger parts.

Immersion Parts Washers

Immersion parts washers involve the submersion of parts into large heated water tanks. They rely on a highly turbulated tank normally created from a pumping process but can also employ ultrasonic sound waves, propellers, or some sort of cavitation-inducing process or equipment to clean the parts.

Small parts washers usually hold the parts in baskets, while larger parts washers set the parts down on conveyors. A clean water tank is essential to all systems, so all parts washers must be equipped with some type of filtration system to collect the waste and debris to extend the bath life while also consistently maintaining the required cleaning expectations.



Part Considerations and Characteristics

Consider the characteristics of the parts you need to clean. The materials used to make the parts may limit what types of solvents or cleaning methods that can be used. The size, shape, and complexity of the part will also be important in determining the optimal cleaning method.

Some additional considerations include:

- Parts volume your cleaning equipment must accommodate
- Labor available for performing parts cleaning related tasks
- Applicable regulatory requirements concerning solvents used
- Cleaning results requirements, such as ISO 16232

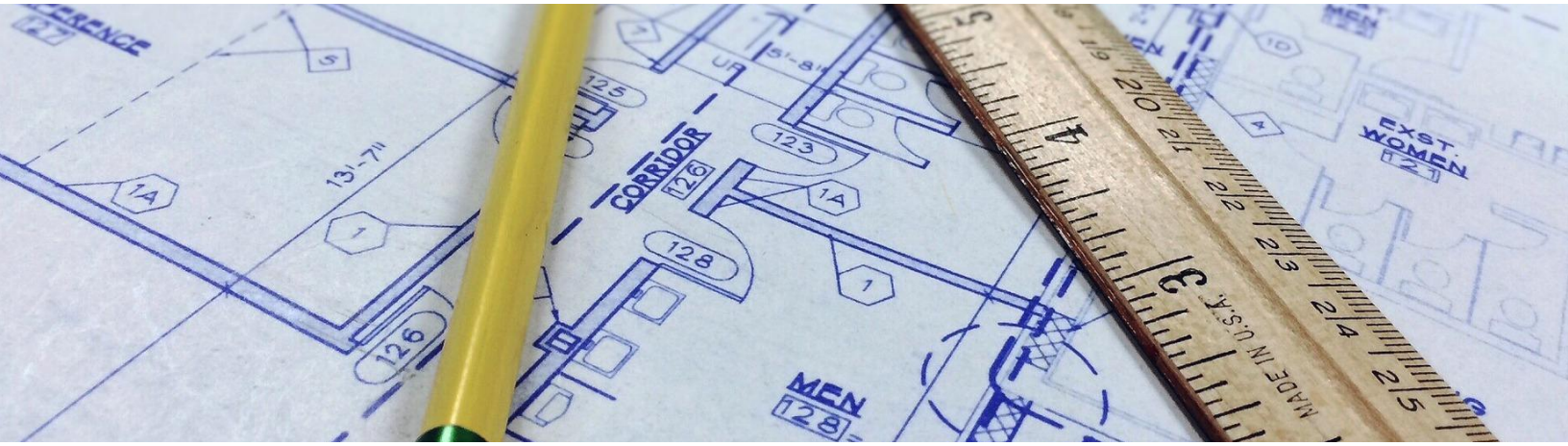
Step 2: Consider the Types of Contaminants

In order to choose an effective parts washer for a particular application, the types of contaminants involved must be considered. The American Society for Testing and Materials (ASTM) categorizes contaminants into six primary groups:

- Pigmented and chlorinated drawing compounds
- Unpigmented oil and grease
- Chips and cutting fluids
- Polishing, lapping and buffing compounds
- Rust and scale
- Others

The acceptable level of cleanliness of a part and the degree to which contaminants must be removed is largely determined by the industry and type of product that is being produced. It is common to have several different contaminants present so the process of selecting the cleaning agent must take all items into account.

Step 3: Assess Configuration Requirements



An important consideration in the selection of parts cleaning equipment is floor space. You will need to determine how much space is available in order to know what parts cleaning systems your process and facility can accommodate. With all of the different parts cleaning equipment available today, you have options and a fair degree of flexibility.

Parts cleaning equipment is available in varying configurations ranging from conveyor lines, automated systems, and standalone or lean units. Once you have decided on what features you need in your parts cleaning equipment, you can look at what specific configurations are available for the industrial parts washer or ultrasonic cleaning equipment you need.

Take time to assess the space you are designating for your parts cleaning system. Measure the available space, and take into account fixed obstacles such as columns, walls, and doors. Also consider the power, air and water supplies necessary to operate your parts cleaning equipment. Access to items such as tank, heaters and filters must also be considered.

Finally, think about the work flow paths that are currently established. Taking into consideration the existing work flow paths during the planning stage makes things much easier and more efficient than having to redevelop an entirely new process flow to accommodate your parts cleaning equipment.

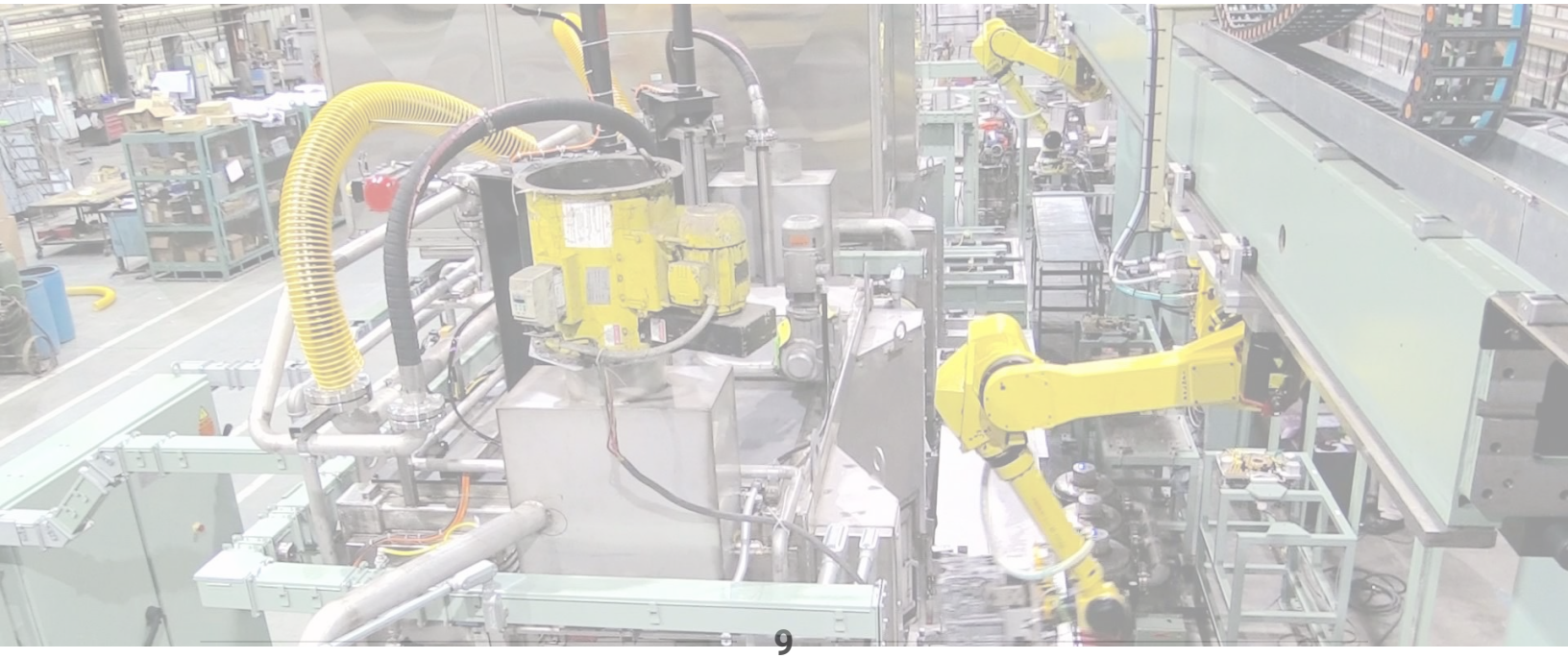
Step 4: Considering Automation

A new level of efficiency in parts washing technology is now available through robotic automation. These robotic parts washers combine extremely flexible robot-operated spray nozzles, a precision worktable, powerful controls, and programmability to deliver optimal cleaning performance and efficiency for increasingly demanding and complex parts washing requirements.

Robotic technology can also be incorporated into your parts washing system through the use of robotic machine tending. This approach involves the use of a robot to load and / or unload parts into the parts washer.

Large volume cleaning and drying operations can be managed with a fully automated modular parts washing system.

Automation can be an incredibly effective way to enhance the efficiency and productivity of your parts washing process. It is important to work with a knowledgeable parts cleaning equipment specialist with familiarity and experience in automated parts washing technology. They will assist you in performing a cost analysis to discover what automation options may be economically beneficial for your process and facility.



Step 5: Implement Testing

In order to assure that your parts cleaning equipment is meeting your requirements, some method of testing should be part of your process. The acceptable level of clean is relative for every application, so it is important to understand part cleanliness and the various cleaning test specifications. The following are some of the most commonly used testing methods:

Gravimetric / Milliport Patch Test

Also referred to as a solvent extraction test, this method inspects for particulate remaining on the part following the cleaning process. Particulate is flushed off the part and collected on a filter membrane paper for microscopic analysis. Automated scanning particle counters identify the size and amount of particulate collected.

Fourier Transform Infrared Spectroscopy (FTIR) Test

This test method is typically used for testing organic cleanliness of a part before and after the parts cleaning process. The IR infrared spectrum absorption of a substrate sample is scanned to determine the constituents.

Total Organic Carbon (TOC) Test

TOC testing can be run before and after the parts cleaning process to assess part cleaning effectiveness. It is used after cleaning to detect remaining alkaline chemistry drag out on the part, as well. This method can also be useful in evaluating rinse water quality.

Water Break Free Test

The test is commonly used on clean stainless steel, titanium, steel, aluminum, brass and other metals that are hydrophilic, i.e. water-attracting. The test involves immersing a clean part in fresh, clean rinse water at a steep angle to look for complete shedding of water or “sheeting”. Any droplets that form can indicate the presence of oils or other residues.

Dyne Testing

Also referred to as corona test fluids, dyne test inks and fluids provide a simple measurement of surface energy or wetting tension based on the known surface tension of the fluid. Since the contaminants are of lower surface energy than the underlying metal surface, the wettability of the surface, as measured in dynes/cm, is a good indicator of the degree of cleanliness of the material.

Conductivity Rinse Testing

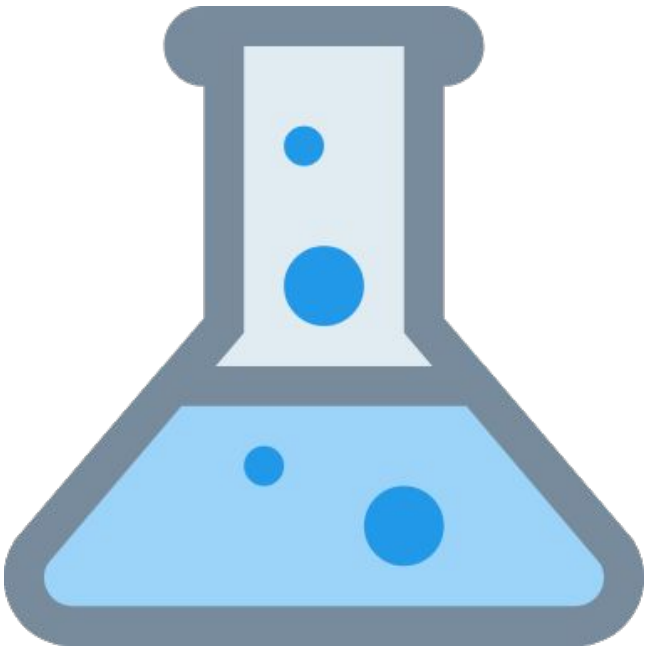
This is a simple in-process test that evaluates water conductivity / resistivity before, during, and after rinsing. The stabilization and change of the rinse water can provide an accurate indication of rinsing effectiveness.

Resistivity of Solvent Extract (ROSE) Test

This test is used to reveal the presence of bulk ionics on parts such as PCBs (printed circuit boards). The method uses a solvent solution to draw and capture ions from the part surface. The solution resistivity is analyzed before and after to determine total ionic contamination of a PCB.

Ion Chromatography (IC) Testing

A more in depth version of the ROSE test, this method measures the total ionic constituents extractable from PCBs and other substrates or parts. Thermal extraction is used to extract ionics into solution. Once extracted, the solution is tested using various standards in an ion chromatograph. The results indicate the individual ionic species present and the level of each per square inch.



White Glove / White Wipe Test

This test uses a clean, dry white cloth or glove to wipe across a flat surface. The white cloth or glove reveals contamination of colored residues through visual examination. A pass / fail criteria typically applies since the method is qualitative.

Contact Angle

The contact angle concept is used as the basis for some rudimentary types of testing. A drop of water resting at equilibrium on a surface will intersect that surface at a measurable angle called the contact angle. The less active the surface the greater the contact angle will be.

Conclusion

Parts cleaning equipment is an important investment, which has the potential to return significant rewards. Choosing the correct parts cleaning equipment will allow you to reduce costs, minimize rejects, and improve end customer satisfaction. By taking the time to thoroughly review all of the steps outlined in this guide you can almost assure the success of your parts cleaning solution.

Investing in the right equipment will result in substantial benefits and improve your bottom line profits. Working with a knowledgeable and experienced parts cleaning equipment expert can make the equipment selection and implementation process easier. Look for a parts equipment supplier that will offer you:

- **A single source solution**
- **A verifiable process**
- **Solutions to meet your requirements with test cleaning before you purchase**
- **Proven experience with providing many different cleaning solutions for all industries**
- **Reliable local service and support**

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