Laboratory Glassware Washers

LABCONCO

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Choosing the right glassware washer

Whether purchasing a new laboratory glassware washer or looking to replace an older model, there are six important questions to ask yourself before choosing one. Below are some helpful tips and guidelines when sifting through all the glassware options.

1. What are your laboratory's specific needs?

The laboratory environment is a dynamic, fast paced setting. Standard operating procedures (SOP) can change drastically within a relatively short amount of time. It is important to assess a glassware washer's ability to provide versatile options so end users can respond appropriately to those changes. Automated glassware washers should offer a certain level of rack interchangeability as well as being able to accommodate a wide range of labware accessories to help ensure the maximum level of cleanliness. Glassware washers that are constructed of 304 stainless steel provide the peace of mind that the glassware washer, racks and accessories will stand the test of time.

2. Are there specific performance measures need to be met?

Additionally, be aware of any performance requirements such as maximum wash temperature, number of wash and rinse cycles, or overall heating rate. Glassware washers can reach varying maximum water temperature; many can reach 93° C (199° F) or higher. Additionally, washers can either be configured to include single or three phase heating to increase heating rates and therefore reduce overall cycle times. When specialized SOPs or workflows demand high performance to ensure maximum cleanability of labware, implementing an automated glassware washer can help produce and capture consistent results day in and day out.

“Materials of construction are a sign of washer quality.”

SteamScrubber

FlaskScrubber
(with optional viewing window)

FlaskScrubber Vantage

3. Does the glassware washer form and function lend itself to maximum cleanability?

Is the washer more than the sum of its parts? The overall goal of a glassware washer is to provide reliably clean glassware; however, it is important to understand how the components are manufactured and assembled. A glassware washer should consist of mostly 304 type stainless steel because it can resist harsh laboratory environments. Decreased use of plastic components is a great indicator of quality. This leads to decreased downtime and maintenance costs. Reliable glassware washer manufacturers offer multi-year warranties.

4. What are your budgetary constraints?

It is always important to be aware of your laboratory's budget. Laboratory glassware washers are an investment, so knowing how long they will last is important. It is also important to not fall into the trap of using a cheap, underpowered residential washer. Not only are residential washers engineered to clean basic items such as plates and utensils, they often are made of less expensive components. Additionally, the temperature needed to successfully clean labware is not obtainable in a residential unit. They also don't offer pure water rinses for residue-free glassware. Finally, residential units will consist of a single pump for the wash and drain steps. This greatly increases the potential to cross contaminate labware. When looking to implement a laboratory glassware washer, it is important to identify manufacturers that can provide separate wash and drain pumps, to help lower the potential of cross contamination and residual carry-over.

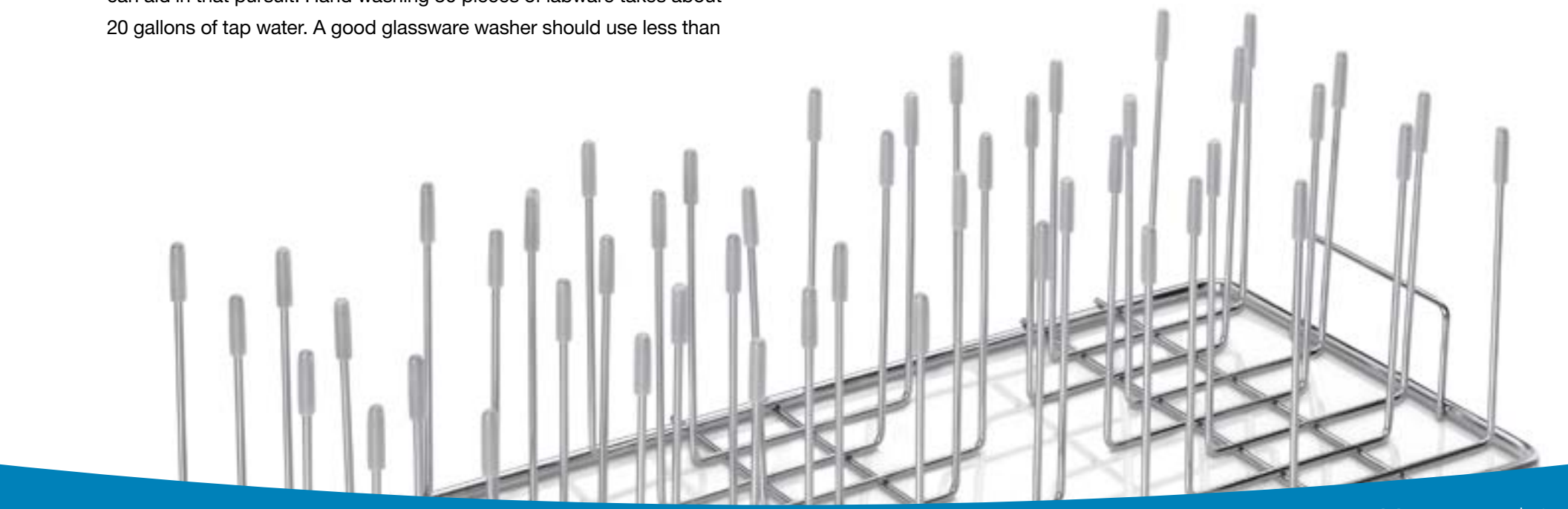
5. What resources do you put a premium on?

Automating this messy, unwanted task frees up valuable time so laboratory professionals can focus on what is important. Purchasing a new glassware washer also decreases the amount of energy wasted when hand washing glassware. More importantly, this also decreases the risk of potentially serious laceration sustained in the workplace due to broken glass labware. By selecting the right glassware washer for your laboratory, precious resources such as time, effort, and safety, are not wasted.

6. What conservation features does the glassware washer offer?

Always consider energy cost and water conservation when selecting a glassware washer. Laboratories and the people in them are trying to be more environmentally responsible, and your laboratory glassware washer can aid in that pursuit. Hand washing 30 pieces of labware takes about 20 gallons of tap water. A good glassware washer should use less than

> **“Knowing what to look for in a laboratory glassware washer can help ensure that your labware is completely clean.”**



13 gallons of water to wash the same amount of labware. This translates into savings of about 1,664 gallons of water per year. Many glassware washers can be set to delay start to wash during off-peak hours when energy costs can be lower. You could see up to 50% savings in energy costs annually. Finally, laboratory glassware washers should be manufactured with reusable components. Some washers use upwards of 50% recycled material during the manufacturing process. Even after the washer's useful life has ended, up to 70% of it should be recyclable.

By asking yourself the above six questions, a picture of the glassware washer that best suits your laboratory should emerge. Versatility to adapt to ever-changing procedures and protocols. Reliability and confidence that the glasswasher can withstand the rigors of a laboratory. Efficiency to help maximize cleanability.

Use our calculator

to quickly find out how much you could save using an efficient glassware washer.

What to look for in a glassware washer controller

As you evaluate what glassware washer to purchase, another important criterion to look closely at is the controller. Interacting with a piece of laboratory equipment should be a straightforward, pleasant experience that lends itself to your specific workflow. Some washer controllers can be very basic (stop/start), whereas others are designed with a lot more intelligence built in. Below are some things to consider evaluating what the controller should provide:

- Can I program the glassware washer to keep the same program that is best suited to my washing needs?
- Can I adjust the temperature of each wash cycle due to low soil contaminants, thereby saving money and time for a faster wash?
- Can I tailor the wash and rinse cycles to meet my application? For example, some applications may only need 2-3 rinse cycles to get glassware clean instead of the default number.
- Can I adjust the cycle to wash only plastic (quicker) rather than glass (longer) cycles?
- Can I run and eco-wash that will consist of minimal rinse and dry times?
- Can I log the wash program, transfer the data into a PDF format, and send to my computer?

Having a smart glassware washer controller can allow your laboratory maximum flexibility in cleaning your labware while allowing you to save money and time.

Reasons not to use a residential dishwasher

Running and maintaining a lab can be extremely costly; however, deciding to move forward with a home dishwasher just to save initial upfront costs is a mistake. Here are six reasons why a home dishwasher is not sufficient for a science lab.

1. Increased risk for cross contamination

Generally, home dishwashers only use a single pump for circulating water. This means that clean and dirty water pass through the same pump. Simply put, the incoming clean water traveling through the pump could have residual contaminants from dirty wash water. A quality laboratory glassware washer should employ separate wash and drain pumps, greatly reducing the potential for cross contamination.

2. Maximum heating temperature

Residential dishwashers are not calibrated for lab sanitization. The standard operating temperature for a residential dishwasher is between 130° F (54° C) and 150° F (66° C). While this is hot, a higher temperature is advantageous to properly clean your labware. Laboratory glassware washers can reach a maximum internal temperature of 199° F (93° C). When labware is exposed to those temperatures it can be considered sanitized. It's also important to remember that when heating to higher internal temperature, laboratory glassware washers must be constructed of components that can accommodate higher temperatures.

Need assistance selecting a labortory glassware washer? Our experts can help you make the right decision for your labware washing needs.

3. No direct spindle injection washing/drying

Washing narrow neck labware can be a challenge. Having direct injection spindles for washing and drying are essential if you're using any volume of Erlenmeyer, volumetric, or even distilling flasks. Having the ability to directly inject water and/or detergent through the spindle into the labware perched on top of the spindle allows for thorough and consistent washing, rinsing, and drying of labware.

4. Inferior materials of construction

A residential washer's warranty may not cover laboratory conditions. Comparatively speaking, they are less expensive than laboratory glassware washers. That's because residential dishwashers do not have to meet the harsh demands to properly clean labware. Lower grade steel alloys and increased dependency on molded plastic parts might lower the cost, but those parts will not be able to withstand the common solvents and chemicals used in the laboratory. Laboratory glassware washers constructed of type 304 stainless steel will resist the rigors of a harsh laboratory environment, and stand the test of time.

5. No purified water rinses

Residential washers only come with one inlet for the water source. When washing bowls and cups, that makes perfect sense; however, laboratory glassware used for analytical methods require a higher level of cleanliness. Applying multiple pure water rinses ensures labware is free of residual contaminants remaining from the wash cycle.

6. Specialized features

Often a laboratory must meet unique requirements. These can range from HEPA filter forced air chamber drying, to conductivity monitoring, to extensive data collection and export. A residential dishwasher will most likely not come with these features, thus limiting your laboratory's compliance in regards to specific SOP. Laboratory glassware washers can often be configured to include specialized features to accommodate these types of controlled conditions.

Top 5 glassware washing accessories for a successful laboratory

Different people have different preferences when it comes to glassware washer accessories. Though many accessories are tailored to specific labware, some accessories seem to be ubiquitous throughout the laboratory setting. After working in multiple labs, using many applications and processes, Labconco has developed a love for the little things that make life in the laboratory much easier. Here are our all-time top five laboratory glassware washer accessories.

1. Multi-Pin Insert

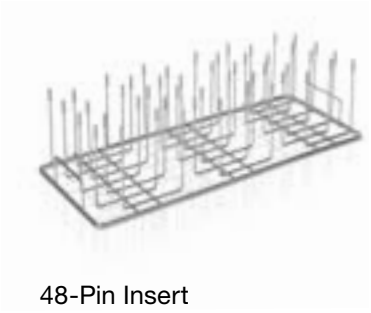
Are you using multiple beakers of variable volume? A multi-pin insert can accommodate small and large beakers and everything in between. Look for inserts with silicone tips to protect glassware from scratching.

2. Utensil Basket

This one is a must-have. Not surprisingly, there are always some odd-shaped utensils, caps, or other miscellaneous tools that just don't seem to fit in a standardized glassware washer insert. This is where a utensil basket comes in. Find one that can accommodate your lab's miscellaneous labware such as stoppers, spatulas, spoons, caps, lids, and other light weight items. Look for one with a lid to keep everything in place.

3. Additional Standard and Spindle Racks

Do you want to expand your washing capacity? Consider adding either an upper or lower spindle rack. Although a glassware washer with forced air-drying capability is ideal for washing narrow-neck glassware, adding a spindle rack to any washer will expand its capability to wash narrow-neck labware.



48-Pin Insert

Utensil Basket

Upper Spindle Rack

4. Liquid Detergent and Acid Rinse Dispenser

A hands-free delivery system for liquid detergent and acid neutralizing rinse is great for the lab that has a large volume of labware to cleaned. Look for an upgrade kit that will allow your lab's washer to automatically inject liquid detergent and acid neutralizing rinse so there is no loading of detergent on your part.

5. Culture Tube Insert

This type of insert allows for a thorough cleaning of soiled glass culture tubes. Look for one that includes a retainer top to safely secure tubes to prevent them from falling out of the insert.

Bonus Accessories for Specific Applications

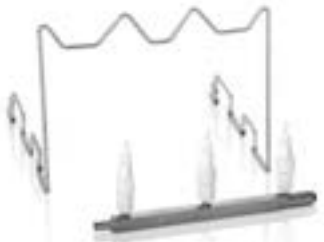
6. Pipette Cleaning Insert

This type of insert replaces the wasteful and inefficient manual process of pipette washing. Look for a pipette cleaning insert with the ability to directly attach to your washer's lower spindle rack. Some pipette inserts will allow you to wash as many as 24 volumetric pipettes at once. A gasketed base is preferable to provide a tight seal for direct water injection and air drying.

Have a wide range of graduated cylinders to wash? A graduated cylinder insert should position multiple cylinders, allowing direct injection washing and drying. Washers with spray nozzles that can directly inject hot forced air to completely dry your measuring devices are preferable.

Liquid Detergent and Acid Rinse Dispenser Kit

Culture Tube Insert 15-18mm



Graduated Cylinder Suppport

Water purity and lab glassware washers: Just how "pure" does it have to be?

The purity of rinse water supplied to a laboratory glassware washer to produce clean glassware has been the subject of debate. To begin with, it's important to define what the term deionized water refers to. Deionized (DI) water is water that has ions removed from it, such as sodium (Na+) and calcium (Ca2+), and does not refer to any specific water purity level.

DI water washing factors

The deionization process can produce water within a wide range of purity levels. Deionized water can be used in applications that call for medium grade water (10-20 microsiemens), or it can be used in a polishing station to produce Type 1 water (16-18 microsiemens). Below are four points to consider when selecting the purity level of the water used for rinsing in a laboratory glassware washer:

Material

Laboratory grade glassware washers are constructed with stainless steel interior components. Washer rinse cycles start with contaminated tap water. Using ultra-pure water for rinsing will not significantly reduce this contaminant load. This is because ultra-pure water will contaminate quickly as it fills a glassware washer's stainless-steel sump, resulting in rinse water that will never approach the 18 megohms purity target.

Enviroment

Laboratory water polishing systems actively produce 18 megohm water, storing and maintaining this type of water at that purity level is extremely difficult and costly. For example, even carbon dioxide in normal air, will contaminate exposed 18 megohm water, thus reducing its purity.

Availability

Deionization filters used in laboratory polishing systems are designed for producing Type I water for analytical applications. Type I water will quickly be exhausted due to the higher water usage rate during multiple rinse cycles available with laboratory glassware washers.

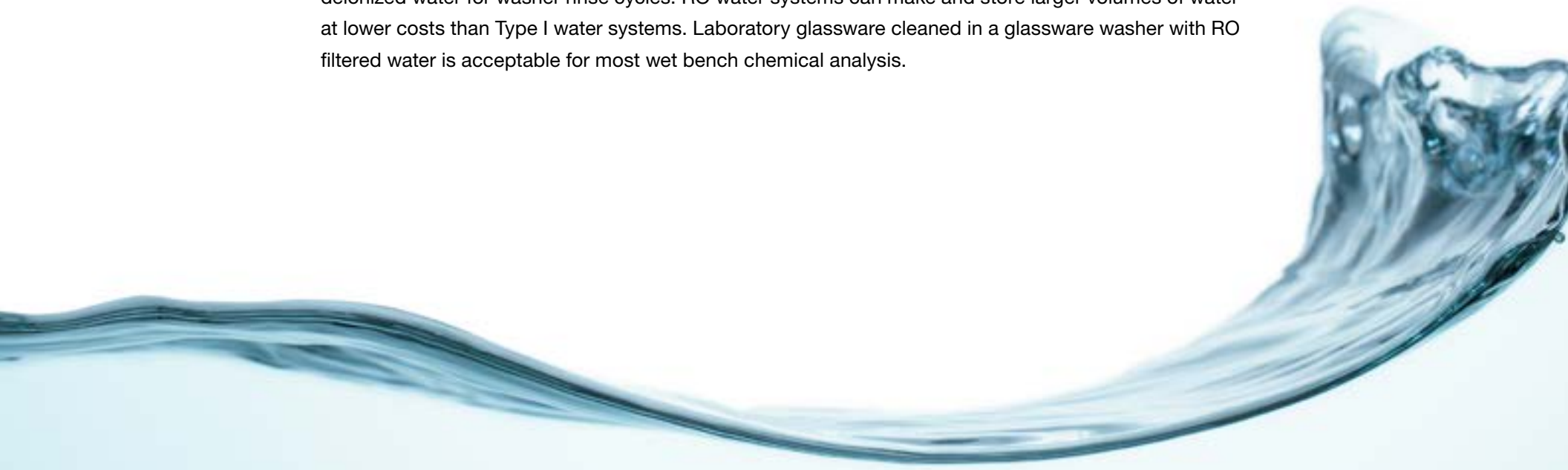
Exposure

It should be noted that at very high temperatures and over a long period of time, 18 megohm water can corrode the stainless interior of a glassware washer.

“Other factors that can have an impact on water purity”

Aggressive acid baths, which are not recommended in a glassware washer, and subsequent rinsing with Type I water can clean glassware to roughly the same ionic concentration level found in Type I water. For organic chemical removal, a usual first step is to bake the labware in an oven.

Given the initial limitations of glassware washer water cleanliness levels, as well as cost of making and storing the volumes needed for Type I water, it is far more economical to use reverse osmosis (RO) or deionized water for washer rinse cycles. RO water systems can make and store larger volumes of water at lower costs than Type I water systems. Laboratory glassware cleaned in a glassware washer with RO filtered water is acceptable for most wet bench chemical analysis.



Eliminating contamination in analytical experiments

A key pain point for any scientist is the realization that experimental samples have become contaminated. Instead of insightful results and discussion, confusion and frustration arise. Was a sample tube improperly aliquoted? Were reagents made incorrectly? Perhaps an instrument was not properly calibrated? While sometimes the problem is easily solvable, complex multi-step experiments can result in lengthy investigational measures that progress without end in sight.

For scientists performing HPLC separations, resolving contamination issues can be especially challenging due to the sensitivity of various paired detection methods. Ultraviolet Visible Spectroscopy (UV-Vis) or extremely sensitive detection using Mass Spectrometry can identify trace analyte concentrations as low as single picograms per milliliter (pg/mL), thus demanding complete elimination of contamination from a sample to deliver accurate results.

With so many possible sources of contamination in the lab, how can you narrow down your risk? For starters, ensure that your glassware is unmistakably clean.

Labware Selection

Labware should always be evaluated prior to use. All labware should be stored in a manner that prevents ingress of dust or other contaminants that may interfere with an experiment. Glassware can be safely stored in a laboratory washer between uses, or should be stored with a lid on or in drawers. Any marring, chips, cloudiness or stains on labware should be carefully evaluated, discarding pieces that may harbor unwanted contaminants or leach material into an experiment.

For most analytical work, glass vessels are widely adopted for their reusability and broad compatibility with most chemistries – particularly mobile phases, needle rinses, and other HPLC solutions. Even glass HPLC vials may be reused after careful processing in a laboratory washer. When using plastic labware, ensure that labware material (often polypropylene) is chemically compatible with any solutions or analytes used in an experiment. Any known incompatibilities with chemicals should be reason to select different labware to eliminate potential issues with degradation of a vessel, or leaching of contaminants into precious samples. Alternatively, some plastic labware may be available with silanized coatings, which can reduce background noise and extend usable life of the consumable by improving reusability.

Washing

After using a piece of labware, thorough cleaning should commence immediately to prevent analytes and other unwanted chemicals from causing damage such as etching. Etching can leave unwanted damage, which may harbor chemicals or even obstruct visual markers such as meniscus lines on volumetric flasks. Using a laboratory glassware washer provides a fast, powerful, consistent means for processing of glassware batches, helping you keep focus on other important tasks in the laboratory.

When processing used labware in a glassware washer, it is important to identify cleaning parameters that effectively clean the pieces from your experiments. A laboratory washer should include a robust operating system that allows for program customization to reach hot temperatures, deliver pure water rinses, conductivity (cleanliness) measurement, and data storage to trace washing history in the event of a laboratory investigation. It is also imperative to select racks and inserts that are designed specifically for laboratory items to ensure thorough washing is not impeded. Narrow-neck items, such as volumetric flasks, should be washed on spindles to ensure delivery of water and detergent directly into the flask bodies to remove analyte and other chemical residues. Lids, caps, stir bars, and other supportive items should be processed using baskets that allow for direct contact with powerful water pressure from washer spray arms.

“Regular validation should take place to monitor cleaning effectiveness through all batches”

Careful selection of detergent and rinse aid are also key steps in reduction of contamination from labware. Laboratory grade detergents designed for automatic washers should be used because of their potency and chemical purity, with blends leaving out unnecessary chemicals that may disrupt sensitive analytical instruments. Detergents designed for residential use frequently contain agents that leave unwanted residues on washed labware. Additionally, laboratory-grade rinse aids should be used to ensure the free rinsing of any detergents used to process labware. Ensuring free-rinsing of detergent is a key step to ensuring batch cleanliness. Upon completion of washing it is important to validate batch cleaning effectiveness, which can be accomplished using techniques such as conductivity monitoring or detection of detergent residue.

Ensuring Consistency

With the use of a laboratory glassware washer, it is possible to soundly eliminate the risk of contamination from reusable labware. By removing risk from reusable labware, scientists can reduce environmental impact by using fewer consumables, worry less about experimental failures, and spend less time on laboratory investigations into frustrating sample contamination.

Methods for evaluating glassware cleanliness

Utilizing a laboratory glassware washer is an excellent way to produce consistently clean, contamination-free glassware. Depending on the demands of your work, you may choose to validate the cleanliness of items washed in your laboratory washer. Four common methods are employed in labs of all types: Detergent Residue Detection, Conductivity Monitoring, Analytical Instrument Evaluation, and Visual.

Detergent Residue Detection

A widely used validation method for the cleanliness of labware processed in a laboratory glassware washer is the detection of detergent residue on washed items. By examining for detergent residue, it is possible to determine if processed labware was effectively rinsed of contaminants including detergent. To perform a detergent residue detection test, a method of pH detection is required such as a pH meter or pH indicator (e.g. bromothymol blue). Using the pH detector, a piece of processed labware may be filled with Type I water, then the water may be evaluated for a change in pH. A neutral pH indicates successful rinsing of detergent. Some detergents may have a neutral pH, which requires the use of anionic detection methods. Contact your detergent manufacturer for additional information.

Conductivity

Some laboratory glassware washers come equipped with a conductivity sensor, which detects the ability of water within the washer to conduct an electrical charge. High level of soils within water serve as sources of electrical conductance, and thus a high level of conductance implies a high level of dirtiness. Batch cleanliness can be determined by a recognized drop in the conductivity level of the water in the washer over time. Conductivity sensing is an extremely fast, accurate way to assess overall batch cleanliness – however it is imperative to validate glassware for presence of specific contaminants using additional analytical methods.

Analytical Evaluation

When access is available to analytical instruments, labware processed in a laboratory glassware washer may be directly evaluated for presence of soils such as solvents, analyte, or other constituents (if known). Specific methods must be developed to run detection experiments for washed glassware, but there is no better way to evaluate for cleanliness than to directly measure suspected contaminants through highly sensitive analytical techniques.

Visual Inspection

Depending on the types of soils that come into contact with your labware, it may be possible to perform a visual inspection to confirm cleanliness. While visual inspection is a method typically reserved for non-critical washing applications some laboratory cleanliness requirements may find this method perfectly suitable. For instances where the soiling itself is not visible, an alternative validation method is the washer's ability to clean a batch by evaluating spray pattern effectiveness across a sample load. To evaluate, a mixture of riboflavin (vitamin B12) diluted into water may be sprayed across all items loaded into a glassware washer. The riboflavin mixture produces a bright fluorescent green color when exposed to black or UV light, allowing for easy detection of residual contamination on a sample load of labware.

Glassware washers and detergent: Synergy at its finest

The laboratory environment is a thriving ecosystem of laboratory professionals and highly sophisticated equipment and workflows. Each component must complement and enhance the next. Leveraging a glassware washer to reliably produce consistently clean labware is essential to maintaining laboratory quality. Understanding the synergistic relationship that glassware washers have with various detergents will maximize wash results as well as reducing worry about labware cleanliness. Below are brief descriptions of the important components on detergents, a general rule of thumb when selecting a detergent, understanding your substrate needing to be cleaned, and how glassware washers and detergent complement each other to maximize labware cleanability.

What are surfactants?

Surfactants, also known as surface-active agents, are responsible for lowering the surface tension of water. This is important because lowering the surface of tension allows enhanced wetting and spreading of water molecules. From a chemical composition standpoint, surfactants are amphiphilic, this is due to surfactants being comprised of hydrophobic tails and hydrophilic heads. This molecular composition allows surfactants to form aggregates known as micelles. Micelles are a colloidal suspension that will sequester and disperse soil and other contaminates found on dirty labware.

What are builders?

Another important component of detergents are “builders” and are referred to in general terms as chelators or sequestering agents. Builders simply bind positively charged ions such as calcium (Ca^{2+}) and magnesium (Mg^{2+}). By binding these free cations, builders are responsible for enhancing and promoting the effectiveness of the overall detergent. Another benefit of removing excess free ions from water is that the level of water hardness is reduced greatly.

What are other important components of detergent?

There are other various components of detergent including carriers, solvents, boosters, emulsifiers, and enzymes. These important parts of detergent further enhance the chemical breakdown and dispersion of soil and other contaminants on labware. Solvents are often tasked with further reducing the surface tension of water. Boosting elements are incorporated into a wide variety of detergents to optimize the water conditions thereby boosting cleaning performance of the detergent overall. Emulsifiers are specific molecules that can target and break down various lipid compounds. Finally, enzymes are often incorporated into detergents to help break down and remove stubborn protein and lipid residues.

Is there a general rule of thumb when choosing the right detergent?

Identification of the contaminate is key when selecting a detergent. Various residues and contaminates will respond differently to detergents. Below is a chart that can help cut through the numerous options surrounding laboratory detergents.

Type of Cleaner	pH	Typical Contaminants
Mineral acids	0.0-2.0	Heavy scales
Mild acids	2.0-5.5	Salts, oxides, metallics
Neutral	5.5-8.5	Light oil and particulates
Mild alkaline	8.5-11.0	Oils and films
Alkaline	11.0-12.5	Natural oil, fat, resin
Corrosive	12.5+	Heavy greases and soils

Does my substrate matter?

When choosing a detergent understanding the substrate that you are trying to get clean is just as important as understanding the contaminate you are trying to remove. Aluminum and other soft metals are best suited to be washed using detergents that fall between a mild alkaline to modest acid (pH 2.5-9.5). Mild steel, which contains a small percentage of carbon, must be carefully monitored for corrosion by fully rinsing and drying this substrate. Plastics and other plastic polymers are suitable to be washed using a broad range of aqueous cleaners. Stainless steel will benefit from alkaline detergents the most. Finally, borosilicate glass is suitable for a wide range of detergents.

Thermal, mechanical, or chemical cleaning? Why not all three?

Not surprisingly, laboratory detergents are able to provide the chemical cleaning of labware. As outlined previously, several components of detergent function in sequestering or breaking down various residues and contaminates so they can be washed away. The glassware washer is responsible for providing the thermal and mechanical cleaning. More efficient and higher wash water temperatures make it possible to thermally treat stubborn residues so they can be washed away in later rinse steps. Mechanical cleaning is provided by the glassware washer as well. When circulating at a high rate (higher spray pressure), wash water can further dislodge and remove stuck on laboratory contaminates.

The relationship between a detergent and glassware washer is an important one. Having a basic understanding of detergents and how they enhance the ability to produce reliable clean labware is fundamental to maintaining quality throughout the laboratory. Additionally, having a solid grasp of heating and circulation rates of your glassware washer are necessary to ensure that strict quality measures found throughout the laboratory environment are met.

Maintaining glassware washers during periods of inactivity

The pandemic of 2020 has taught us many things. We were all forced, very unexpectedly, to live and work in unconventional ways. During these times, many issues came up in laboratories that were previously of little concern. For most labs, equipment is used routinely or continuously, and not much thought is given to what would happen if the equipment were to sit idle for an extended period of time. This article will explain how to prepare your glassware washer for an extended period of inactivity, and how to return it to normal use.

Just as bacteria can grow in water purification systems, it can also grow in the water sitting in the sump and tubing of a glassware washer. During regular use, Labconco washers open the inlet valve and run the drain for a short time at the very beginning of each run specifically to flush out any stagnant water in the bottom. Before a long period of inactivity, ensure the inside of the washer is dry, clean debris from the sump filter screen and remove any buildup as described in the user manual. Leave the door slightly ajar allowing for air circulation inside the unit to decrease the chance of microbial growth.

Upon return, check the main gaskets and verify that the automatic detergent and rinse aid containers are full. Next, run one wash cycle without glassware. This cycle ensures the water is filling the washer and draining as expected. Should you notice the unit takes longer to fill, check the water fill valve and ensure the filter is debris free. If the glassware washer is draining slowly, check the air gap for build-up. Refer to the user manual for the fill valve and air gap locations and cleaning requirements for your specific model. Going forward, the glassware washer can be loaded and used as before.

In summary, selecting a glassware washer involves many elements: laboratory needs, budget, performance, etc. With many suppliers and models available, this guide can be a helpful resource in which your lab can navigate the correct type and model of glassware washer for your lab.

labconco.com/washers

Contact our experts for more information about laboratory glassware washers or for assistance selecting the right one for your application.

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