

AQUEOUS CRITICAL CLEANING: A WHITE PAPER



Guidance for Labware Washer Cleaning

Better, Safer Science Through Proper Detergent Selection and Cleaning

The principal concern for any scientist or technician working in the laboratory is that glassware, instruments, and equipment be free of interfering residues. These often-unseen residues can cause invalid analytical results. For example, they can erroneously accelerate or decelerate a rate-dependent experiment by causing localized high concentrations of reactants inside micelles. They can inhibit culture growth, cross-contaminate batches, and cause unreproducible results. To avoid these problems, labware must be cleaned thoroughly and any interfering residues removed. This requires the use of both an effective cleaning method and an appropriate laboratory detergent.

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General Directions

Machine Washing is used in laboratories for cleaning large quantities of reusable labware. Selection and use of the correct detergent, good maintenance practices, and proper usage and loading of your washing machine will help you have reliably clean glassware and equipment.

Machine Maintenance Tips

Acid Rinsing is a periodic (monthly or quarterly) empty acid-wash cycle to remove scale buildup that can clog nozzles and deposit white calcium scale. Sometimes insoluble metal hydroxides form,

amphoteric proteins deposit, and alkaline insoluble residues such as certain polymers fail to be removed during alkaline cleaning. To remove these residues, an acid-rinse step is required.

Rinse Aids are not recommended for laboratory glassware washing. The Jet-Dry® type of rinse aid deposits on the glassware hydrophobically and repels the water off the glassware during drying to avoid water evaporating and forming water spots. Many rinse aids are cationic positively charged compounds that are attracted to surfaces that repel the water. This can leave deposits of water-repelling rinse aid on the surface.



To avoid water spots when washing labware, it is better to use multiple deionized water rinses and good loading procedures to avoid trapping and carrying over wash water with residue load. Note: If tap water is only available, it may be better to set the washer to air dry and open the washer immediately after the first rinse. Then manually rinse in deionized water before proceeding to an air dry or a heated drying cycle.

Machine Validation

The GMP regulations include several specifications (Part 133.4, 1963, and Part 211.67, 1978) that provide guidelines for GMP washer/dryer design and construction. Unfortunately, these regulations leave many areas open for interpretation. With no clear standard, a great many “lab style” washers have been developed — their limitations not evident until long after purchase and installation.

A documentation package is needed to complete the validation and qualify the cleaning system. At a minimum, the package should contain the following components:

- Users manual
- Maintenance manual
- Instrument list
- Electrical diagram
- Piping and instrumentation diagram
- Spare parts list
- Exploded view
- Welding report and welder certificate
- Source codes in both printed and digital form
- Passivation report
- As-built drawings
- IQ/OQ documentation

How to Dose Detergents

Powder — If there is a cup or receptacle built into the washer, fill the receptacle according to the machine manufacturer’s directions. Many under-counter washers can use powders. If no receptacle is available, you can still dose a correct amount of powder into the bottom of a washer prior to washing as long as you skip the pre-wash cycle or add the powder after the pre-wash cycle finishes.

Calculate the correct amount of powder by consulting the users manual and seeing how much

water is used in the wash cycle. A typical under-counter washer will use about 2 gallons (about 8 liters). A medium size washer might use around 4 gallons (16 liters), and a large floor-standing washer might use as much as 10 gallons (38 liters). Use 0.5–1.25 ounces (5–10 grams/liter) of powder per gallon.

Store detergent in a dry location (not under the sink) to avoid caking. Always dose the detergent in to a dry, clean cup. Remove any caked on residue or water from the dosing cup before putting fresh detergent in the cup. Do not add powdered detergent to the cup until just before turning the washer on. All of these precautions will minimize caking of powdered detergents.

Liquids — Follow machine manufacturers directions. Do not add liquid detergents to powder detergent dosing cups, as the detergent just runs out of the cup and is used up in the initial short, cold prewash cycle. If available, use liquid detergent reservoir, connecting tubes or metering pump. Wear protective gloves and eyewear when handling.

Calculate the correct amount of liquid to use by consulting the users manual and seeing how much water is used in the wash cycle. A typical under-counter washer will use about 2 gallons of water (about 8 liters) and 1.0–2.5 ounces of liquid detergent.

In general, use a 1/2–1% solution in the hot water wash cycle (1 1/4–2 1/2 tbsp per gal; 3/4–1 1/4 oz per gallon; 5–10 mL per L — most machines need 2 1/2 oz added at a typical 2 gal wash cycle). For difficult soils, raise water temperature and use more detergent.

Take special care to rinse thoroughly. For critical cleaning, do final or all rinsing in distilled, deionized or purified water. For food contact surfaces, rinse with potable water.

Problem Glassware

Graduated cylinders need to be loaded at an angle so that the base does not trap a large amount of dirty washwater and contaminate the rinse. If there is no option to tilt the cylinders to promote drainage, then extra rinse may allow sufficient exchange of water by stopping at the end of the wash cycle. Manually dumping out the tops of the cylinders can help also.

Pipettes require special flow-through fittings and

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racks to clean in a washer. Obtain a special pipette rack from the machine manufacturer.

Narrow neck flasks are best cleaned using special spray spindles that fit up inside the flasks to assure that cleaning and rinsing solution gets to the inside of the flasks. See the picture on the front.

For difficult irregularly shaped glassware you may be able to get custom racks that promote proper cleaning and draining from the washer manufacturer.

How to Select the Appropriate Lab Washer Detergent

- Use the Detergent Selection Guide (pg. 4) to identify the Alconox Inc. cleaner for your type of lab washer. Select the correct detergent and then where you machine is set up to use an acid rinse, select Citrajel acid rinse.
- Be sure to include in your decision-making process the requirements of the College of American Pathology for residue detection method, and state and NELAC standards for certificates of analysis and inhibitory residue test reports.
- If your industry requires validating your residue detection method, all of the Alconox Inc. products listed on page 4 have methods for detection.

Alconox Inc. Provides Validation Support and Expertise

Because Alconox Inc. is a supplier to companies requiring exacting levels of quality control and technical service, each product is tested by lot number, with Certificates of Analysis available to end-users with quality control or regulatory-compliance requirements.

Support for regulatory-compliant cleaning validations includes lot number traceability of all cleaners and ingredients, cleaner toxicity and reactivity/degradation information, shelf-life testing, residue sampling, detection methods and written cleaning procedures.

As a leader in the field of critical cleaning, Alconox Inc. can provide valuable consulting and information to laboratories — as well as to vendors, suppliers, and clients in many other industries who wish to establish cleaning validation methods and procedures.

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DETERGENT SELECTION GUIDE FOR LABWARE MACHINE WASHERS

Type of Lab	Alconox Inc. Phosphate Free Cleaners			Alconox Inc. General Purpose Cleaners			Trace Metal
	TERGAJET® Alkaline Powder	SOLUJET® Alkaline Liquid	CITRAJET® Acid/Rinse Liquid	ALCOJET® Alkaline Powder	DETOJET® Alkaline Liquid	CITRAJET® Acid/Rinse Liquid	CITRAJET® Liquid Acid
Environmental trace analysis (2)	●	●	●				
Microbiology	●	●	●				
Wastewater (2)	●	●	●				
Water and Drinking Water (2)	●	●	●				
Biochemistry/Biology				●	●	●	●
Chemistry, Analytical				●	●	●	●
Food				●	●	●	●
Forensics				●	●	●	●
Genetics				●	●	●	●
Hospital/Medical Laboratory				●	●	●	●
Materials Testing				●	●	●	●
Microbiology				●	●	●	●
Nuclear (radioisotopes)				●	●	●	●
Pathology(1)				●	●	●	●
Petrochemicals				●	●	●	●
Pharmaceuticals				●	●	●	●
Pharmacology				●	●	●	●
QA/QC				●	●	●	●
Toxicology				●	●	●	●

If your industry requires validating your residue detection method, all of the Alconox Inc. products listed here have methods for detection.

(1) Requires College of American Pathology (CAP) residue detection method questionnaire from www.alconox.com

(2) Requires inhibitory residue test data to comply with state and NELAC standards from COA and inhibitory residue test at www.alconox.com

Application Key Concerns	What Are You Cleaning?	Recommended Powder Detergent	Recommended Liquid Detergent
Healthcare/Veterinary — Effective preparation for sterilization; longer instrument life.	Surgical, anesthetics and examining instruments.	ALCOJET®	DETOJET®
Pharmaceutical/Medical Device/Biotechnology — Pass cleaning validation for FDA good manufacturing practices. Stainless steel, glass, plastic, elastomer cleaning.	Titanium dioxide, petrolatum, oils, ointments, carbopols, lacquer, zinc oxides, proteins, steroids, and Eudragit® polymers, coatings, amines.	ALCOJET®	SOLUJET®
	Inorganic residues, salts, metallics, pigments, Eudragit® polymers, amphoteric, coating amines, ethers, starches.		CITRAJET®
Laboratory/Environmental — Reproducible results; no interfering residues. Keep laboratory accreditation. Lab safety.	Glass, metal, plastic labware, ceramics, tissue culture, porcelain.	ALCOJET® TERGAJET® (phosphate free)	DETOJET® SOLUJET® (phosphate free)
Metalworking, Precision Manufacturing, and Optics — Clean parts; avoid volatile solvents, strong acids and other hazardous chemicals.	Delicate substrates.		LUMINOX®
Electronics — Avoid conductive residues; avoid CFC; pass cleaning criteria.	Circuit boards, conductive residues, fluxes.		DETERGENT 8®



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Get Validation Support or Help With Your Critical Cleaning Challenge

Alconox Inc. has more than 75 years' experience developing aqueous cleaning solutions for pharmaceutical manufacturing. Let us help solve your next critical cleaning challenge.

Please contact Alconox Inc. for expert validation support or verification laboratory services:

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Learn More About Critical Cleaning

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The Aqueous Cleaning Handbook

OR

Critical Cleaning Guide

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For questions or comments about this white paper, please contact Alconox Inc. Technical Support at 914.948.4040 or cleaning@alconox.com

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