A GUIDE TO LABWARE WASHER 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 rate dependent experiment by causing localized high concentration of reactants inside micelles. They can inhibit culture growth, cross-contaminate batches, and cause nonreproducible results.

To solve these problems, labware must be cleaned thoroughly and any interfering residues removed. This requires that an appropriate laboratory detergent be selected and an effective cleaning method used.

**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 build-up that can clog nozzles and deposit white calcium scale. Sometimes insoluble metal hydroxides form, amphoteric proteins deposit, and certain 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 a surface with the water repelling rinse aid. In laboratory labware washing, it is better to use multiple deionized water rinsing and good loading procedures to avoid trapping and carrying over wash water with residue load to avoid water spots. Note: if tap water is only available, it may be better to have the washer set 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 even just 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. The package should contain (as a minimum) the following components:

- User’s manual
- Maintenance manual
- Instrument list
- Electrical diagram
- Piping and instrumentation diagram
- Spare parts list
- Exploded view
- Welding report and welder certificate
- Source codes (in the form of a written copy, a floppy disc, and a spare E-prom)
- Passivation report
- As-built drawings
- IQ/OQ documentation

**How to Dose Detergents**

**Powder**: If there is a cup or receptacle built in to 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 owners 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 oz. of powder per gallon or 5 – 10 granules.

**Liquids**: Follow machine manufacturers directions. Not intended for powder detergent receptacles. If available, use liquid detergent reservoir, connecting tubes or metering pump. In general, use 1/2 – 1% solution in hot water wash cycle (1 1/4 – 2 1/2 Tbsp. per gallon, 3/4 – 1 1/4 oz. per gallon or 5 – 10 ml per liter – most machines need 2 1/2 oz. added at a typical 2 gallon wash cycle). For difficult soils, raise water temperature and use more detergent. Wear protective gloves and eyewear when handling. RINSE THOROUGHLY. For critical cleaning, do final or all rinsing in distilled, deionized or purified water. For food contact surfaces, rinse with potable water. Calculate the correct amount of liquid to use by consulting the owners 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 oz. of liquid detergent.
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.

Pipets require special flow thru fittings and racks to clean in a washer. Obtain a special pipet rack from the machine manufacturer.

### How to Select the Appropriate Lab Washer Detergent

- Use the Detergent Selection Guide below to help identify the Alconox cleaner for your type of Lab Washer Machine.
- Be sure to include in your decision-making process the requirements of College of American Pathology for Residue Detection Method and State and NLAC for Certificates of Analysis and Inhibitory Residue test reports.
- If your industry involves validating your residue detection method, all of the Alconox products listed below have methods for detection.

#### DETERGENT SELECTION GUIDE

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<th>Application</th>
<th>What Are You Cleaning?</th>
<th>Recommended Powder Detergent</th>
<th>Recommended Liquid Detergent</th>
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<tr>
<td>Healthcare/Veterinary</td>
<td>Surgical, anaesthetic and examining instruments.</td>
<td>ALCOJET</td>
<td>DETOJET</td>
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<tr>
<td>Pharmaceutical/Medical Device/Biotechnology</td>
<td>Titanium dioxide, petrolatum, oils, ointments, carbopol, lacquer, zinc oxides, proteins, steroids, and Eudragit® polymers, coatings, amines.</td>
<td>ALCOJET</td>
<td>SOLUJET</td>
</tr>
<tr>
<td>Laboratory/Environmental</td>
<td>Glass, metal, plastic labware, ceramics, tissue culture, porcelain.</td>
<td>ALCOJET or TERGAJET – phosphate free</td>
<td>DETOJET or SOLUJET phosphate free</td>
</tr>
<tr>
<td>Metalworking, Precision Manufacturing, and Optics</td>
<td>Delicate substrates.</td>
<td>ALCOJET or TERGAJET – phosphate free</td>
<td>LUMINOX</td>
</tr>
<tr>
<td>Electronics</td>
<td>Circuit boards, conductive residues, fluxes.</td>
<td>DETERGENT 8</td>
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#### Types of cleaner used in different types of labs

<table>
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<tr>
<th>Lab / Alconox Brand</th>
<th>TERGAJET</th>
<th>SOLUJET</th>
<th>CITRAJET</th>
<th>ALCOJET</th>
<th>DETOJET</th>
<th>CITRAJET</th>
<th>CITRAJET</th>
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<tr>
<td>Powder</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Powder</td>
<td>Liquid</td>
<td>Liquid</td>
<td>Acid</td>
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- 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

(1) Requires College of American Pathology (CAP) Questionnaire Residue Detection method from www.alconox.com
(2) Requires Inhibitory Residue Test data to comply with State and NLAC standards from COA and Inhibitory Residue test at www.alconox.com