ALCONOX
Critical Cleaning Experts

TECHBRIEF

Critical Cleaning in the Cosmetic Industry

alconox.com

TBCOS.1

Abstract

The cosmetic industry presents difficult cleaning challenges that are unique compared to those found in other industries precisely because the products are designed to adhere, in some cases to naturally repellent skin tissue for over 48 hours. The ability of cosmetics to adhere to skin on a long-term basis typically indicates that its adherence to the glassware and stainless steel surfaces used in its development and processing presents a real cleaning challenge.

This TechBrief focuses on the critical cleaning of a wide range of hard surfaces utilized in the broad cosmetic industry such as: laboratory glassware and equipment, processing vessels and clean-in-place (CIP) manufacturing tanks, and cosmetic application instruments for use in spas, salons and tattoo facilities. We use the term critical cleaning to denote situations where the level of cleaning directly impacts the value of the end product or manufacturing efficiency.

Cleaning in the Cosmetic Industry

Critically clean processing equipment is vital as indicated by several regulatory bodies including the FDA. The potency, purity and quality, essential characteristics of any product, rely on critically clean surfaces. Cosmetic processing often features residues that are naturally quite resistant to cleaning efforts. Waxy residues, dyes, metal oxides, and products designed to be waterproof are very common.

The most efficient approach to tackling these challenging residues is to use detergents that are not only effective at removing the residues, but safe for end users, aqueous, free-rinsing (completely rinsed away), interfering residue-free, biodegradable, and devoid of any dyes, fragrances, brighteners, or softeners. In other words, use detergents that are environmentally friendly and can be used safely by worker while still providing residue-free cleaning. The goal of residue-free cleaning is the elimination of impurities to maintain the integrity of the final cosmetic product or instrument.

Typically, aqueous cleaners are formulated to ensure maximum cleaning performance by using key biodegradable ingredients such as surface-active agents (surfactants) as wetting agents. Surfactants allow the cleaning solution to penetrate crevices and get under soils to allow for removal. In concert with emulsification, chelation, dispersants, and other cleaning mechanisms, aqueous detergents provide multiple ways to get cosmetic residues reliably removed from equipment and instruments.

Often quite dilute solutions of an aqueous cleaner can effectively remove even worst-case substances off a variety of hard surfaces, including stainless steel, glass and plastic (which we refer to as substrates). In addition, hard surfaces found in cosmetic process equipment, mixing tanks, and laboratory equipment are compatible across a range of pH and temperatures. Thus, allowing for flexibility in detergent selection in terms of pH, cleaning conditions, and cleaning methods.

The ability to choose from a wide range of detergents should not be taken to mean any detergent will suffice. Indeed, achieving critically clean results with a water-based detergent requires a good bit of scientific expertise to match the correct detergent formulation to a specific cleaning challenge and substrate. Alconox Inc. provides the necessary technical support to select the most efficient and safest of our large family of products for almost any cleaning issue. We have a broad range of tried and true formulations covering a wide selection of pH and cleaning mechanism (foaming) content in both powdered and liquid detergents.

Quality in Cosmetic Industry

Fundamentally, when producing cosmetics products that are government regulated, we recommend using the same current good manufacturing practices (cGMP) employed by pharmaceutical, biotech and related manufacturers. The role of quality assurance is crucial in both cosmetic manufacturing (compounds and instruments) and in the application of cosmetic products by professionals. [The previous sentence has issues. I don't think the use of the word intrinsic is appropriate. What is gained by adding the parenthetical (compounds and instruments)? Are we qualifying the manufacturing to just instruments as opposed to, say, tanks? Not sure what is meant by: the

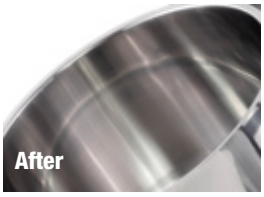
application of cosmetic products by professionals. Try again.] This is crucial because: manufacturing surfaces need to be free of adulterating chemical compounds from other cosmetic product batches, manufactured application instruments must similarly be free of machining residues prior to treatments, and those same instruments that are to be reused must be thoroughly cleaned and sterilized between applications.

The Federal Food, Drug & Cosmetic Act defines cosmetics as "articles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body...for cleansing, beautifying, promoting attractiveness, or altering the appearance." Both cosmetic products, instruments and equipment used in their applications tend to come in contact with human hair, skin and possibly blood. Therefore, removal of impurities, i.e., critical cleaning, is essential for cosmetic products, as these products will come into contact with human tissue, some of which may be immunocompromised.

Beyond the regulatory framework of the Untied States, cosmetic products are strictly regulated in most of the major markets, including, the European Union, Asia, the Middle East, and Australia/New Zealand. Safety is at the heart of all cosmetic regulations, so it is important to ensure that products and services are in compliance with the relevant standards.

Selecting the Proper Aqueous Cleaner in Cosmetic Cleaning

Cleaning Chemistry



The cosmetic industry tends to be involved with processing a variety of organic and inorganic residues; therefore a combination of alkaline and acidic cleaners is generally the most effective. Alkaline cleaners remove organics including oils, waxes, and extracts. Most cleaning applications will involve at the very least an alkaline cleaner, and in many cases, there are residues that call for an acidic cleaner to follow as second stage. With micelle forming surfactants for emulsifying and chelating agents for metal oxides, aqueous detergents are the safe and effective option for cosmetic cleaning.

Alconox Inc. is armed with 75 years of experience recommending cleaners for use in cosmetics, dietary supplements, food, and pharmaceuticals, where we have gained experience cleaning all sorts of powders, lotions, and compounds. This experience allows us to bring great insight into removing all manner of cosmetic residues found in the manufacturing process. With our experience in medical device manufacturing, we can assist in cleaning issues with cosmetic applicators as well.

When large amounts of residue are attached to manufacturing surfaces, increased detergent concentration is generally required. Typically, a 1–2% (10–20 mL/L or 1.3–2.5 oz/gal) concentration suffices for routine cleaning, however, 2–5% (20–50 mL/L or 2.5–6 oz/gal) is often required for difficult, adherent residues. The higher the concentration of detergent, the greater the capacity available to remove a larger volume of soil. Accordingly, increased detergent concentration allows for most cosmetic bases, creams, lotions, ointments, oils, and the like to be removed, reducing or eliminating the need for repeated cleanings. Of course, there is an optimal detergent concentration. Using too high a detergent concentration is economically wasteful both in terms of the detergent as well as excessive rinsing requirements.

Heat is an important variable in cleaning processes. Within reason, higher temperatures ensure the softening of viscous oils and accelerates residue removal. Using elevated temperatures of 70–80°C (160–180°F), and occasionally higher temperatures, provides softening of solidified organics and efficient emulsification in most cases. This is especially true for silicone oils.

For some residues, like titanium dioxide (TiO_2) and zinc oxide (Zn0) that are commonly found in lotions and creams, (e.g., suntan lotion) excessive heat actually impedes the cleaning process. Heating titanium dioxide and zinc oxide may cause the formation of extremely resistant titanate and zincate salts, respectively. In such cases, ambient temperature cleaning with traditional aqueous detergents, or for maximum efficiency, high alkaline, high chelating detergents are recommended.

Critical Cleaning by Application

Laboratory: In the cosmetic laboratory where analysis, testing, and some pilot scale processing occurs, keeping your laboratory glassware and equipment critically clean is essential to avoid contamination. Cleaning in the lab is often accomplished through manual methods including scrubbing, soaking and use of an ultrasonic tank (sonication).

Unwanted residues are created from both previous use of the equipment or the ambient environment. Critically clean surfaces also help provide accurate quality control of testing results. Laboratory residues can span the gamut from inorganic salts and oxidation, to metallic oxides, to organic oils, waxes and serums. Alconox Inc. recommends following current good laboratory procedures (cGLP).

For cleaning petrolatum, silicone oils, paraffin and other cosmetic residue from labware, we recommend a high emulsifying, alkaline detergent, safe for manual use. Cleaning of these types of residues is best done at a very hot temperature above the melting point of the wax or solidified oil, typically around 80°C (170°F). The initial rinse should also be of similar temperature to avoid thermal shock to micelles created by the chemical reactions of the detergent. Subsequent rinses can be at ambient temperatures.

For persistent organoleptic residues (aromas, dyes), we recommend a detergent with an oxidizing component. Oxidation breaks double bonds, rendering the residue compounds more water soluble.

Cleaning inorganic residues including salts, metallic salts, and oxidation, we recommend a mild acidic detergent with an effective surfactant to remove accompanying organic or environmental contamination.

For metallic oxides, TiO_2 and ZnO, high alkaline, high chelation, are recommended so the cleaning operation can proceed at a range of temperatures (from ambient to hot).

Typical concentration for laboratory use is 1–2% (10–20 mL/L or 1.25–2.5 oz/gal). For cleaning challenging cosmetic residues, often a hallmark of the industry, we would recommend starting at a 2–5% (20–50 mL/L or 4–6 oz/gal) concentration. Optimizing concentration from there can then follow. Higher concentrations of detergent increase detergent capacity, or amount of soil that can be carried away.

Most laboratory surfaces are widely compatible with aqueous detergents, including glassware, stainless steel and plastics. Some plastic is sensitive or stressed in nature. If the plastic is susceptible to crazing or stress cracking, we would recommend a surfactant-free detergent, safe on sensitive plastics.

A low foaming detergent is highly recommended, if not required, for use in connection with lab washers and other high-pressure spray applications.

Manufacturing: During the production of cosmetic products, it is important to follow cGMP. Critical cleaning of manufacturing equipment allows for pure, effective and safe cosmetic product manufacturing.

Cosmetic production can include a wide variety of residues similar to the laboratory but on a larger scale. This often necessitates automated cleaning systems for large production tanks, processing vessels, mixers and centrifuges.

For cleaning deodorants and other largely inorganic residues, such as aluminum chloride, they are best removed by acidic detergents. These detergents will be highly effective at removing inorganic residues, including the AlCl3, and other inorganics. Using warm temperatures and a 1–2% (10–20 mL/L or 1.25–2.5 oz/gal) detergent concentration is typically very effective. Acidic detergents are also compatible with other common cosmetic process equipment surfaces including glass, polypropylene (and other plastics) as well as other steel and aluminum surfaces.

For fragrances and organic residues that are being cleaned manually in a manufacturing setting, a high emulsifying mildly alkaline free-rinsing detergent can be used to soak, scrub or sonicate equipment parts and surfaces. These free-rinsing detergents are optimal because they are free of fragrances, brighteners, softeners, dyes, and emollients that might leave lingering residues. A critically clean surface will never interfere with the organoleptic properties of the next cosmetic material manufactured in/on that equipment.

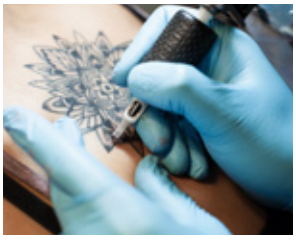
For cleaning via washers or other automated high-pressure spray-in-air units (e.g., clean-in-place – CIP) low-foaming detergents are typically required.

Low-foaming powdered detergent can be used for 'homestyle' under-sink laboratory washers that have an in-door compartment for powders or gels. (Note: for the purposes of detergent nomenclature, gels are not liquids, rather they are deemed solids.)

For larger industrial type washers and CIP, with liquid dispensing systems, a low-foaming, alkaline, liquid detergent is an excellent choice for cleaning creams, waxes, and other organic, oily residues. For essential oils, perfumes and other products that leave lingering scents, employing low foaming alkaline detergents with oxidizers is frequently a successful approach for complete residue removal.

The amount of residue that needs to be removed in cosmetic manufacturing and production operations can be significant. A concentration of 3–5% (30–50 mL/L or 4–6 oz/gal) is a good place to start for these low-foaming, CIP detergent applications. Recall that higher concentrations increase cleaning capacity, or amount of residue that can be removed by a detergent. Therefore, qualitatively speaking, if there is a large amount of residue, or the residue is difficult to emulsify, higher concentrations may be needed. Naturally, it is uneconomic to use a higher concentration than is required to achieve the desired result. Beyond economic considerations, more detergent does not always lead to a better result. However, using a detergent with the correct chemistry for a particular residue will always lead to a better result.

For the cleaning challenges found in the production of cosmetic applicators, the Alconox Inc. expertise in medical device manufacturing cleaning emerges as most essential. These applicators or instruments (often made of plastic and stainless steel) typically have oily and organic residues from machining and environmental issues. Alkaline detergents, higher foaming for manual operations, and lower foaming for automated ones, are recommended prior to final disinfection/sterilization and shipment.



Tattoo, Salon, Spas: According to the CDC, "Cleaning should precede all disinfection and sterilization processes. Cleaning involves the removal of debris (organic or inorganic) from an instrument or device. If visible debris is not removed, it will interfere with microbial inactivation and can compromise the disinfection or sterilization process." In other words, you may have "sterilized" residue on your equipment. Which of course isn't sterile. More precisely, those residues may harbor microbes beneath them resulting in a non-sterile surface.

Cleaning of cosmetic tools and instruments is vital to the safety of customers. While some shops use bleach water for pre-cleaning, the safer and more effective cleaning detergent in the tattoo, salon and spa industry is an enzymatic detergent just as is used in hospitals and the medical device reprocessing industries. Aqueous cleaning detergents have the following advantages over solvent based cleaners:

- Safe on tattoo, esthetician and other cosmetic equipment
- Effective in manual, soak, and ultrasonic cleaning
- Economical — concentrated to save you money
- Non-corrosive — prolongs instrument life
- Contain enzyme for blood and protein soil removal when appropriate

To clean instruments prior to sterilization, make a fresh 1–2% detergent solution (10–20 mL/L or 1.25–2.5 oz/gal) in cold or warm water (higher temperatures expedite cleaning). Use a high emulsifying powdered detergent for the standard tattoo, salon, spa and other cosmetic equipment cleaning or use a high emulsifying enzymatic detergent for enzymatic cleaning where health ordinances require. Enzymatic pre-cleaning can be required where blood and other biologic residue is present. For heavy residue a 2–3% concentration may be used to increase detergent capacity.

For equipment cleaning with an enzymatic detergent, use warm water below 130°F (55°C) — this ensures the enzymes do not degrade. Clean instruments by soak or ultrasonic method. Enzymatic solution will last up to eight hours once formulated (this maximizes enzyme activity).

For parts washers, use a low-foaming powdered or liquid concentrate detergent as needed based on unit requirements.

Rinse equipment thoroughly — preferably with running water. The instruments are now ready for your disinfection/sterilization process.

Methods to Clean and Cleaning Agents

Cleaning methods can be generally divided up into manual cleaning and automated cleaning.

Manual cleaning includes those with direct applied mechanical action. This is also where higher foaming detergents are not only permissible, but useful. As mentioned, foaming detergents are best for emulsifying. Emulsifying is the preferred approach to remove many of the tough organic soils, like oils, extracts, lotions, serums, waxes etc. and machining oils from cosmetic instruments. Manual cleaning methods are soaking, scrubbing, and sonication. Mechanical action, an integral facet of manual cleaning, is also useful in removing metal salts and oxides as well.

Automated methods include uses of washers, high pressure sprayers and CIP systems. Low foaming detergents use surfactants which foam less and thereby eliminate situations where over-foam can occur. The less efficient surfactants are compensated for by higher alkalinity, chelation, wetting agents and other methods to ensure cosmetic residues are quickly, safely and reliably removed.

Manual Cleaning Detergents

For the laboratory setting, we would recommend the following detergents for soaking, scrubbing or sonication of your parts from the organic and inorganic residues expected to be encountered:

Detonox® Ultimate Precision Cleaner is our most potent manual detergent. Ideal and safe for hand and ultrasonic use on difficult cosmetic residues. It is a non-caustic detergent for exceptional removal of oils serums, creams, and lotions. Effective at removing titanium and zinc oxides at ambient temperatures.

Alconox® Powdered Precision Cleaner is a powerful emulsifier of organic and oily residues, used for many decades in cosmetic cleaning. It is biodegradable, drain-safe and completely free rinsing. A powdered alternative to Detonox detergent.

Liquinox® Critical Cleaning Liquid Detergent is a phosphate free alternative to Detonox and Alconox detergents for manual cleaning.

Citranox® Liquid Acid Cleaner and Detergent is a phosphate free acidic cleaner and metal brightener for removal of oxidation, scale, salts and inorganic residues in manual and ultrasonic cleaning. Corrosion inhibited and free rinsing for reliable results and no interfering residues.

For each of the above, we would recommend a warm temperatures and 2-3% concentration for starters. In the cases of difficult oily, organic residues, high temperatures (70°C+/160°F) are recommend. Initial rinse should also be at similar high temperature to avoid thermal shock of micelles that form. For the challenging metal oxides of titanium dioxide and zinc oxide via manual cleaning, ambient temperature and mechanical action is recommended. In all cases, concentrations up to 5% can be required for higher residue or the most challenging cleaning applications.

CIP System and Washer Detergents

For cleaning via washers or other automated high-pressure units (ex. CIP) necessitating low-foaming detergents, we would recommend:

Keylajet® Low-foaming Chelating High Alkaline Liquid is ideal for CIP and washer cleaning where the washer has a liquid dosing system to remove tough, adherent organic and oily soils. This is also ideal for cleaning titanium dioxide (TiO_2) and zinc oxides (ZnO) which are used as pigment and pearlescent ingredients in many cosmetic and personal care tablets, creams, lotions, and sunscreens manufacturing.

A concentration of 3–5% detergent (30–50 mL/L or 4–6 oz/gal) is a good place to start, and the highest temperature that can be reasonably achieved (note that the need for ambient temperature with TiO2 and ZnO is not a requirement due to Keylajet detergent's alkaline effectiveness). Recall that heat expedites cleaning and higher detergent concentrations increase capacity, or amount that can be removed by a detergent. Therefore, qualitatively speaking, if there is a large amount of residue, higher concentrations may be needed.

Alcojet® Low Foaming Powdered Detergent is ideal for washers with a cup-in-door designed to hold powdered detergent, often with a door that stays closed during the prewash cycle and then pops open during the wash cycle.

Citrajet® Low-Foam Liquid Acid Cleaner/Rinse is a low foaming, phosphate free acidic cleaner and metal brightener for removal of oxidation, scale, salts and inorganic residues in automated, high pressure cleaning. Corrosion inhibited and free rinsing for reliable results and no interfering residues.

Detojet® Low Foaming Liquid Detergent is ideal for cleaning sensitive plastics and stressed polycarbonates. It can also be used in place of Alcojet cleaner when a liquid detergent is preferred. It contains oxidizers and provides thorough, effective removal of dye and fragrance residues.

In both manual and washer applications, the detergent amount, time and temperature can be optimized in collaboration with Alconox Inc. critical cleaning experts.

References

- *The Aqueous Cleaning Handbook* by Malcolm C. McLaughlin, M.A and Alan S. Zisman, M.D and the Technical Services Staff of Alconox, Inc. Fourth Edition. AI Technical Communications, LLC White Plains, NY 2005.
- https://alconox.com
- https://technotes.alconox.com

ALCONOX
Critical Cleaning Experts

30 Glenn Street, Suite 309
White Plains, NY 10603 • USA

Get Validation Support or Help With Your Critical Cleaning Challenge

Alconox Inc. has more than 70 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:

cleaning@alconox.com

Learn More About Critical Cleaning

Request a FREE copy of:

The Aqueous Cleaning Handbook
or
Critical Cleaning Guide

Try a Free Sample of Alconox Inc. Detergents

Use our sample request form at alconox.com. Or call:

++914-948-4040

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