

# CLEANING SYSTEM

## FOR

# **BREWERIES**

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## **OVERVIEW**

### **The Care and Sanitation of Modern Day Breweries**

The main purpose of any good cleaning system is to prevent the transfer of flavors and odors from one batch of product to another, to ensure the efficient operation of the plant, to eliminate soil contamination (which may harbor microorganisms), and to improve the working environment.

Cleaning is an essential precursor to effective sanitizing. Without effective cleaning, the residual soil load will interfere with the action of sanitizers, and in some cases may completely neutralize their effectiveness.

The procedures and outlines in this brochure are, of necessity, generalized to cover a wide range of circumstances. If you have any specific requirements regarding the cleaning procedures for any piece of equipment; a customized cleaning plan will be prepared by your Enerco Representative.

The initial sections provide procedures for various tanks and pieces of equipment that may be in use in your brewery. These are followed sections for information regarding specific Enerco products that can be employed in the procedures.

Enerco can supply you with an extensive array of cleaning chemicals, along with a broad range of cleaning, feed, and control equipment for use in a wide range of applications. For more details on the equipment and methods of controlling chemical consumption, consult your Enerco Representative.

## **BREWING EQUIPMENT**

### **New Stainless Steel Tanks and Equipment**

ANSI 300 series Stainless Steel surfaces resist corrosion through the formation of a molecule level protective layer of chromium-oxides. New and/or abused stainless steel lacks this protective “passive” layer.

Although this passive layer will form naturally when dry clean stainless steel is exposed to air, new stainless steel lacks this layer. Primarily, because shipping compounds applied during manufacture of the item as well as any dirt/debris prevent the exposure of the stainless steel to air as would be required for “natural” passivation.

Therefore, to maximize the useful life of the stainless steel, it is of vital importance that it be chemically passivated when new as well as when/if damage to the chromium-oxide layer is suspected.

To passivate a surface, three basic steps need to be followed:

1. **Degreasing/cleaning:** Neither air nor nitric acid can form a passive layer when grease, oil, fingerprints, or other contaminants are present on the surface. To ensure the surface is degreased, a water break test is often employed. Enerco recommends using **Water Based High Pressure Solvent (CS109)** [on older surfaces you may want to use **Chlorinated Alkaline CIP Cleaner (CS17)**] at 2-4 oz./gallon and circulating at 140 °F for 30 minutes. Follow this with a fresh water rinse. Determine the cleanliness using the water break test.
2. **Passivation:** For all ANSI 300 series Chromium-Nickel stainless steel, a nitric acid solution is the accepted passivation chemical. Enerco recommends using a 25% solution of **Acid CIP Cleaner Phos Nitric (CS35)** (1 gallon CS35 per 3 gallons of water) circulate the solution at 130-140 °F for 60 minutes.
3. **Rinsing:** Immediate and thorough rinsing with potable water of pH 6-8 is mandatory. Check the pH of the water to be sure that all of the residual acid has been rinsed out of the system. Continue rinsing until a constant pH of 6-8 has been reached and then allow the surface to dry. The stainless steel surface has now been passivated. Depending upon the application, before it can be used in food production, it must be sanitized.

## **Routine Cleaning of Inside of Tanks/Equipment**

### **Hot Liquor Tank**

Normally the soil in a Hot Liquor Tank is inorganic (simple calcium carbonate - limescale). This is normally caused by heating hard water in the tank. Installation and/or proper maintenance of an existing water softener can reduce scaling, but also removes the naturally occurring calcium and magnesium that may be desirable later in the brewing process. Mechanical web-induction devices can frequently be employed to temporarily inactivate the calcium allowing it to be used downstream while reducing scaling in the hot liquor tank. Enerco supplies softeners and web-induction devices, and your representative can provide you with further information.

Additionally, many brewers add phosphoric acid and or calcium carbonate/bicarbonate to their hot liquor tanks to adjust the pH of their mash. This can cause scaling. Our recommendation is to add the phosphoric acid and/or the calcium to your mash.

If these steps are impractical or impossible for your situation and scale (typically an off-white deposit in this tank) forms, then descaling will be required to maintain heating efficiency in the tank.

To clean or descale the Hot Liquor Tank use **Descaler Phosphoric (CS16)** as follows:

1. Empty tank.
2. Fill tank with about 10 % of volume or enough to circulate.
3. Add 1 ounce per gallon or 31 ounces per barrel of **CS16**.
4. Heat to 140° - 160° F.
5. CIP for 20 to 30 min.
6. Check tank.

At this point the tank may be clean.

If tank is clean:

7. Rinse with fresh warm water.

If tank still has scale:

8. Check pH of solution.
9. This product will be effective at a pH as high as 4.
10. If pH is above 4.0 and the solution appears clear, you may add enough **CS16** to bring the pH down to 2 and start over from # 4 above. If the solution is cloudy, or you have already made a second addition of product, drain the solution and repeat the procedure beginning at #2.

## Brew House Tanks

Depending on the actual design of the brewery in question, the equipment in the brewing area may consist of: a cereal cooker, mash tun, lauter tun, brew kettle, whirlpool and hot wort tanks. The cleaning program for all of these is essentially identical and is as follows:

1. After you knock out, keep the tank(s) wet until you have time to CIP clean.
2. Pre-rinse with water and drain thoroughly. Depending on the degree of soiling, it may be advantageous to repeat this 2 or even 3 times. Burst rinsing is more effective than continuous rinsing.
3. Detergent wash at 160-180°F with suitable caustic cleaner, such as:

<u>Liquid products</u>	<u>Granular products</u>
<b>Liquid Blended Caustic HD (CS20)</b>	<b>Granular Caustic Blend (CS47)</b>
<b>Hi Alk HW 464 (CS464)</b>	<b>Blended Caustic Granular (CS42)</b>
<b>Chelated Liquid Caustic (CS46)</b>	

  - a) If there is a great deal of beerstone (calcium oxalate), you may need to do as follows: Add **Beer and Milk Stone Remover (CS122)** to the detergent wash at normal use rates, and increase solution temperature to 175-195°F.
  - b) For hard to remove soils and/or baked-on areas and/or dried on “foam”, you may need to boost the cleaning power of the detergent wash with **OxyBoost! (CS252)**.
4. Circulate in the tank for 30 – 60 minutes, maintaining 160-180°F temperature of the cleaning solution.
5. Rinse. Check the pH of the draining rinse water and continue until the pH of the rinse water leaving the tank matches the fresh water pH.
6. Inspect tank for cleanliness. Repeat as needed.
7. Acid Wash (if needed) using **Acid CIP Cleaner Phos Nitric (CS35)** at ½ oz per gallon and 160-170°F for up to 30 minutes.
8. Rinse. Check the pH of the draining rinse water and continue until the pH of the rinse water leaving the tank matches the fresh water pH.
9. Sanitize as needed prior to placing the tank back in service.

If more than one tank is to be cleaned, it is possible to reuse either (caustic or acid) of these cleaning solutions to clean more than one tank. If a series of tanks are to be washed with the same solution, it is recommended that the tank with the least soil load be washed first.

## Storage Tanks

Storage tanks include any of the following: Fermenting Tanks, Aging Tanks, Finishing Tanks, Government Tanks, Brite Tanks, Serving Tanks.

If it is economical and timely to use hot water (160-180°F), then using the same caustic CIP solution that is used in the brew house tanks will work very well. CO<sub>2</sub> must be purged prior to using the brew house CIP procedure. If on the other hand it is hard to heat these tanks, then use one of the following after removal of all CO<sub>2</sub> and the opening of all vent lines and manholes:

### Liquid product

**Alkaline Chlorinated CIP  
Cleaner (CS17)**

### Granular product

**Chlorinated Alkaline Granular  
CIP Cleaner (CS50)**

1. Do not allow tank to dry prior to cleaning. Pre-rinse with water and drain thoroughly.
2. Fill tank to recirculation level with ambient, 140°F water.
3. Using a solution of ½ - 1 ounce **CS17** or **CS50**, let circulate for 20-30 minutes.
4. After this alkali wash, the solution should be drained and the tank thoroughly rinsed until the rinsing water tests free of alkalinity.
5. Acid Wash (if needed) using **Acid CIP Cleaner Phos Nitric (CS35)** at ½ oz per gallon ambient temp water for up to 30 minutes.
6. Drain the tanks, inspect, and sanitize with a suitable sanitizer, then reseal until ready for use.

**Perasan A (CS513)** is a good choice for sanitizing these tanks.

The CO<sub>2</sub> blanket can be effectively maintained on lightly soiled tanks by cleaning with **Acid Detergent (CS598)**. Skip steps 2 and 3 above, and use **CS598** at 140°F for 30 minutes in addition to **CS35** in step 5.

If there are problems with calcium oxalate, **Beer and Milk Stone Remover (CS122)** should be added to the caustic cleaning solution.

In some instances, manual cleaning may be required. Again it is critical to ensure the removal of any CO<sub>2</sub> from the vessel before alkaline cleaning is undertaken. Manual cleaning can normally be completed without operator entrance into the tank. Should entry be required, OSHA guidelines for Confined Space Entry must be followed.

For manual cleaning, solutions of products such as **HD Foamer Chlorinated (CS12)** or **Manual Chlorinated Granular (CS82)** at about 1 ounce per gallon should be used, followed by rinsing and sanitizing.

### Lines and Heat Exchangers

If it is convenient to clean lines and heat exchangers in place, then the solutions used to clean the brew house tanks may be conveniently circulated through these lines, followed by the appropriate rinsing, acid washing, and sanitizing where necessary.

NOTE: For this system to be completely successful, recirculation will be necessary to achieve the necessary contact time (around 30 – 45 minutes) in the detergent wash step of the system.

If clean-out-of-place is used, a manual chlorinated cleaner, **HD Foamer Chlorinated (CS12)** should be used, followed by appropriate rinsing and sanitizing before reassembly.

In cases where build-up of mineral occurs in the tubing, acid wash with **Acid CIP Cleaner Phos Nitric (CS35)** may be required on occasion to aid in the removal of this soil – again followed by an appropriate rinsing and sanitizing before reassembly.

**Beer & Milk Stone Remover (CS122)** can be added to caustic to help remove beerstone.

### Tank and Equipment Exteriors

#### Tank Exteriors

Tank exteriors must be kept clean for both cosmetic and sanitation reasons. The best way to control mold, mildew, and yeast growth in a brewery is to foam clean with **HD Foamer Chlorinated (CS12)**. **CS12** can be used on stainless steel tank exteriors, walls, and floors. **Do not use** on Copper or Copper coated tanks.

For Soft Metal (copper and copper coated) Equipment and Tanks, use **Foamer Aluminum Safe (CS11)**.

#### Floor and Wall Surfaces

Floor surfaces must be kept clean to control the growth of microorganisms. High pressure or foam cleaning and sanitizing are appropriate methods. Products that can be used are:

Liquid product

Granular product

**HD Foamer Chlorinated (CS12)** **Chlorinated TSP (CS143)**

**Manual Chlorinated Granular (CS82)**

Followed by sanitizing with **4Quat** or **Perasan A (CS513)**.

## Drains

Floor drains and trenches can be a hidden breeding ground for microbial growth. Care must be taken not to “blow” microorganisms out of drains while pressure washing or rinsing floor and/or other plant surfaces.

Sanitizing drains can be achieved with **4Quat** or **Power Plus**. In many cases, drains may be kept sufficiently clean with run-off of cleaners and sanitizers from exterior tank surfaces and facility cleaning processes.

## Fittings and Pipelines

All fittings, reducers, parts, adapters, valves, etc. should be thoroughly cleaned and stored immersed in an appropriate chlorinated solution such as **TSP Chlorinated (CS143)**. Rinse with potable water before use.

Alternately, these items can be cleaned in a 1 oz/gal solution of **Granular HD SMS Cleaner (CS128)**. Followed by rinsing and sanitizing prior to re-assembly. Sanitizing can be done with **Perasan A (CS513)** or **Power Plus**.

## Filter Cleaning

For diatomaceous silica filters, the usual method is to flush with water between filter cycles and to clean weekly with chemicals. For regular cleaning, remove the screens from the filter and flush away all traces of the diatomaceous earth. Replace screens in the filter and circulate a 1.6% by volume solution of **Chelated Liquid Caustic (CS46)** at 180°F. Flush with fresh water to rinse filter.

## General Cleaning

General cleaning around brewing equipment is also needed. This can often be done with foam and/or manual cleaning methods. For recommendations of products to be used in such systems, consult your Enerco Representative.

## External Cleaning Procedure

Appropriate for External Cleaning of All Process Tanks, Lines, Floor & Wall Surfaces:

1. Pre-Rinse external surfaces to remove all loose soil prior to cleaning.
2. For Foam Cleaning Applications: Add 2-6 ounces of:

Stainless Steel Tanks

Soft Metal Tanks

**HD Foamer Chlorinated (CS12) Foamer Aluminum Safe (CS11)**

per gallon of water in foamer reservoir. Or set appropriate rate on foamer proportioner. Warm, 110°F, water is ideal.

3. Adjust foam to desired consistency (typically like shaving cream), and apply to surfaces starting at the bottom and working side-to-side and up.
4. Allow a contact time of between 5 – 15 minutes. To facilitate cleaning, use a brush or green pad on contact surfaces. However, do not allow cleaner to dry on surfaces.
5. Rinse surfaces thoroughly with Potable Water, from the top-down.

In the absence of proper foam making equipment, solutions of 2-4 oz/gal of **CS12/CS11** for tanks and 2-4 oz/gal **CS12** or 1 oz/gal **CS143/CS128** for other surfaces can be made in a bucket and applied manually. Followed by rinsing.

To brighten Stainless Steel tanks a 4-6 ounce/gallon solution of **Foam Cleaner Acid (CS38)** applied via foamer or sprayer can be used. Followed by rinsing.

6. When cleaning is completed, stainless steel tanks and the areas around all tanks should be sanitized with **Perasan A (CS513)**. Alternately, **4Quat or Power Plus** can be used to sanitize floor and wall surfaces.

## **PRODUCT SUMMARY**

Below is a brief summary of all the specific Enerco products mentioned in the preceding pages. Due to the multiple use nature of many of Enerco's products, it should be noted that a typical brewery will only use a fraction (perhaps 4-6) of all of these. The selection of which is mainly a result of preferences of the brewer. For instance one brewer may prefer granular products, another liquid products.

The products are listed here in number order. For additional product information, refer to the appropriate product bulletin.

### **CS11**

Foamer Aluminum Safe (CS11) is a liquid, non-phosphate, chlorinated, high-foaming product designed for foam cleaning in industrial plants, beverage, meat, and other food plants.

Foamer Aluminum Safe is inhibited to reduce corrosion on soft metals, especially on aluminum surfaces. It can also be used as a general cleaning in food and beverage plants.

### **CS12**

HD Foamer Chlorinated (CS12) is a heavy-duty, self-foaming chlorinated alkaline cleaner for foam, spray, soak, and high pressure cleaning applications in the food processing, meat, fish, poultry, dairy, canning, brewing, malting, and beverage industries.

### **CS16**

Descaler Phosphoric (CS16) is a concentrated blended acid cleaner formulated specifically for spray and circulation cleaning of pipelines, storage tanks, HTST units, and other processing plant equipment.

### **CS17**

Alkaline Chlorinated CIP Cleaner (CS17) is a liquid chlorinated cleaner designed for circulation, spray, pressure spray, and cleaning of dairy, meat, brewing, beverage and food processing equipment.

### **CS20**

Blended Caustic HD (CS20), a heavy-duty blended alkali is designed for effective circulation cleaning of HTST pasteurizers, brew kettles, lauter tuns, evaporators, ultra high heat processors, and other hot processing equipment and lines. Blended Caustic HD is useful in high pressure washers for cleaning stainless steel parts, black iron utensils, and for spray or atomization cleaning of smokehouses and other meat plant areas.

### **CS35**

Acid CIP Cleaner Phos Nitric (CS35) is a liquid, heavy duty, low foam acid cleaner. It is a combination of acids and surfactants which promote the removal of a wide variety of stains and mineral films from dairy, food, brewing, and beverage processing equipment. This leaves the surface exceptionally shiny.

### **CS38**

Foam Cleaner Acid (CS38) is a self-foaming liquid acid foam cleaner containing a blend of acid and high-foaming surfactants. This product has been specially formulated for cleaning and brightening Stainless Steel equipment in food and beverage plants. Foam Cleaner Acid is specifically designed for removing mineral deposits from Stainless Steel and/or tile surfaces found in food and beverage plants.

This product can also be used to remove burned-on soils from cooking fryers found in many processed food plants.

Foam Cleaner Acid can be successfully applied by either foam or spray cleaning methods and can be used occasionally as an alternate to a plant's normal foaming procedure to help brighten equipment.

### **CS42**

Blended Granular Caustic (CS42) is designed for the cleaning of stainless steel and steel surfaces contaminated with heavy deposits of fats, grease, rust, and protein soils.

Blended Granular Caustic is formulated for all water hardness levels to prevent deposition of minerals on equipment surfaces, to penetrate and remove soils quickly, to eliminate rust by chelation, and to prevent foaming of cleaning solutions.

Blended Granular Caustic can be used in manual, circulation, spray, soak, and boil-out cleaning procedures.

### **CS46**

Chelated Liquid Caustic (CS46) is a gluconated liquid caustic designed for use as a bottle washing compound in hard water.

### **CS47**

Granular Caustic Blend (CS47) is a highly caustic granular cleaner formulated to wash bottle in both soak and hydro machines. It is a complete bottle washing compound containing both scale control and rinse additives.

Granular Caustic Blend is an excellent spray cleaner for brew kettles, fermenters, and beer storage tanks. Granular Caustic Blend can also be used for cleaning HTST or vacuum pans, as well as deep fat fryers.

### **CS50**

Chlorinated Alkaline Granular CIP Cleaner (CS50) is a heavy-duty, granular, chlorinated caustic cleaner used for cleaning-in-place (CIP) operations in food and beverage plants or dairy farms.

### **CS82**

Manual Chlorinated Granular (CS82) is a chlorinated, moderately alkaline cleaner designed specifically for the manual cleaning of equipment in all food processing and beverage applications.

### **CS109**

Water Based High Pressure Solvent (CS109) is a water based liquid alkaline cleaner with solvent action. It is recommended for use on equipment, floors, and walls where fatty and/or oily soil conditions exist. Water Based High Pressure Solvent can be used for manual, pressure spray, and foam cleaning(with a foam additive).

### **CS122**

Beer & Milk Stone Remover (CS122) is a unique formulation of ingredients to remove troublesome deposits of beer stone and other forms of calcium oxylate deposits.

### **CS128**

Granular HD SMS Cleaner (CS128) is a powdered non-chlorinated heavy-duty circulation cleaner suitable for use on soft metals.

### **CS143**

TSP Chlorinated (CS143) is a chlorinated alkaline product designed for use as a manual or circulation type cleaner.

### **CS252**

OxyBoost! (CS252) is a caustic cleaner additive product that releases oxygen during the cleaning process to assist the caustic in neutralizing, penetrating and removing organic deposits.

### **CS464**

Hi Alk HW 464 (CS464) is a unique alkaline cleaner especially developed for many food processing, dairy, beverage, or brewing applications; wherever the need for effective beer or milkstone removal exists.

Hi Alk HW 464 may be used by spray, circulation, or manual cleaning for removing these soils.

### **CS513**

Perasan A (CS513) is a peroxyacetic acid based non-foaming sanitizer.

### **CS598**

Acid Detergent (CS598) is designed to allow removal of organic deposits at a low pH without burn-on of the deposit so that CO<sub>2</sub> can be maintained in tanks when desired.

### **4Quat**

4Quat is an ammonium chloride based sanitizer.

### **Power Plus**

Power Plus is an iodine based foaming sanitizer.