

Blue Earth Products®

Tank Cleaning Guidelines

Essential instructions for the planning and implementation of tank chemical cleanings

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Note:

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Pre-Cleaning Preparation

Preparation of the tank:

1. Read the “Important Safety Notice” at the end of this manual
2. Check access/escape routes and verify that ladders and hatches are safe and secure
 - **NOTE: IT IS CRITICAL YOU ALWAYS COMPLY WITH OSHA CONFINED SPACE AND FALL PROTECTION PROCEDURES**
3. Verify that electrical power is available for running the compressor and ensuring proper lighting
 - Use Shock Buster connectors for electrical equipment
4. Remove all power cables inside the tank
5. Check runoff discharge (tank drain to sewer, sump or other tank drain)
6. Install rinse water supply (fire hose)
7. Safety Assessment Form must be finalized and posted
8. Remove tank from service and drain completely
 - De-chlorinate water if needed, according to state and federal laws
 - Lock Out Tag Out Safety Protocol will apply
9. Place boot rinsing tray at entry and fill with 1:10 diluted Blue Earth Products Catalyst® or 12% Bleach
 - Step into tray each time you enter the tank
10. Make sure the tank has been locked out/tagged out
11. Remove sediment from tank floor
 - State-certified lab testing may be required for sediment disposal to determine hazardous or non-hazardous status, according to state and federal laws
12. Close tank drain

Personal Protective Equipment

- Chemical coverall - wear legs and sleeves outside boots and gloves
- Rubber boots - no lace-ups
- Full-face respirator with combination organic vapor / acid gas cartridges with a minimum of a N95 pre-filter attached.
- Rubber gloves
- Hard hat
- Harness (elevated or below-ground tanks)
- Fall protection line grab and descent control device (elevated tanks)

Spraying Equipment

- Electrical compressor
- Chemical pump
- Polyethylene (PE) hose
- Quick-connect fittings
- Spraying wand
- Spraying nozzles

Tank Cleaning Procedure

1. See “Quality Control Measures” for some quality control suggestions.
2. Mix cleaning chemistry of choice [CSR Plus®, Top Ultra®, Floran® Biogrowth Remover, Floran® Biodegreaser] as directed by your Blue Earth Products representative, with Floran® Catalyst at a 10:1 ratio
 - Only mix one container at a time.
 - Use the entire mixed amount even if the tank looks clean. **[IMPORTANT: CLEANERS THAT HAVE BEEN MIXED WITH FLORAN CATALYST MUST NEVER BE RECLOSED]**
 - On stainless steel, CSR Plus may be used alone. A mixture of CSR Plus with Floran Catalyst is not recommended for use on stainless steel.
 - If Floran® Biodegreaser is used; it must be applied prior to application of acid based cleaner of choice.
3. Spray tank sidewalls and all columns and pipes, use jet nozzle to reach higher parts. Allow solution to react for 1-10 minutes before rinsing off – foaming is common. Repeat as needed for heavily contaminated areas. [NOTE: Do not let foam and solution dry on tank surfaces. Use a test patch when treating bare metal surfaces such as stainless steel or aluminum. When applying to bare metal always rinse as quickly as possible]
4. Install pump for circulation (if available) or mix by fire hose or squeegee.
5. Flush tank with fire hose
6. Pump neutralizer of choice into tank or discharge drain as needed for pH neutralization
 - **IT IS CRITICAL TO USE THE PROPER PUMP SYSTEM WHEN HANDLING LIQUID CORROSIVE PRODUCTS**
 - **NEUTRALIZING REACTIONS ARE EXOTHERMIC, REQUIRES CONSTANT MONITORING**
 - **DO NOT ATTEMPT TO SLURRY PUMP PHINISH-S or PHAZE**
7. Check pH after each addition and mixing of neutralizer chemistry
 - Mix runoff using sump pump or fire hose
8. Stop adding neutralizer when pH is above 6.0 standard units.

- The maximum amount of pHinish-L® neutralizer needed is 0.75 gal per gal of cleaning chemistry usually less, especially in concrete tanks (See “Neutralization Tables” for additional conversions)
9. Flush pump with water
 10. Discharge runoff as required to the drain, sewer or lagoon
 11. See “Runoff Treatment and Disposal Procedure” for additional instructions
 12. Perform final disinfection per AWWA Standard and state regulatory requirements
 13. Close and lock tank

Runoff Treatment and Disposal Procedure

Tank cleaning treatments using Blue Earth Products chemical products produce runoffs that need to be discharged and disposed of in compliance with state, local, and federal safety and environmental requirements. It is very important to discuss the discharge procedures with the customer before scoping or pricing a job. Customers might have their own concerns in addition to regulatory issues, but in most cases operation personnel are helpful in determining the correct procedure.

Tank cleanings produce significantly lower volumes of runoff than filter media treatments. The runoff consists of the chemicals used, the rinse water and the dissolved and suspended solids that are dislodged from the walls and present in residual sediment. In order to minimize the volume of runoff and thus make discharge easier, all heavy sediment should be flushed out of the tank before spraying the cleaning products. Final disinfection, if required, must be performed after all runoff is removed. No further flushing is done after disinfection.

Discharge of the runoff to the sewer or sludge lagoon is the preferred method of disposal. Some tanks have drains to the sewer and runoff can be flushed out easily while others have sewer manholes close enough to allow for pumping the runoff as a disposal point. If no such option is available, a pump truck can be used to collect the runoff and deliver it to the sewer plant. For discharge to the sewer, the pH of the runoff usually has to be adjusted to 6-9. Blue Earth Products has three products that can be utilized to accomplish the neutralization process: pHinish-L®, pHinish-S® & pHaze®.

Discharge to a ground or storm drain is less desirable than discharge to the sewer or sludge lagoon and usually requires approval from the city who must have a National Pollutant Discharge Elimination System (NPDES) permit in accordance with the Clean Water Act. If the customer approves, the runoff has to be neutralized, de-chlorinated and sometimes filtered through a sediment bag before draining or pumping it out of the tank.

Runoff Procedure

1. Rinse all tank walls
2. Collect runoff on tank bottom (closed drain)
3. Check pH using a pH strip. The runoff will usually be acidic (pH 1.5-6.0)
4. **pHinish-L** - Pump pHinish-L into the tank. The maximum amount needed is 75% of the volume of the cleaning chemistry (see "Neutralization Table") used (e.g. 3 gal of pHinish-L per 4 gal of Top Ultra). Start with no more than 1/3 of the maximum amount of pHinish-L required.

pHinish-S - When using pHinish-S, the most common mistake is overshooting the pH. This occurs primarily because pHinish-S must first dissolve before the neutralization reaction occurs thereby resulting in a delayed reaction and overshooting. The way to combat this is to first mix 4-5 lbs of pHinish-S in a 5-gallon bucket with 4-5 gallons of water. Always wear PPE and perform the operation slowly because the dilution reaction is exothermic (significant heat generation - the water could rapidly boil if improperly mixed). When pHinish-S is in solution it will neutralize the runoff almost instantly and completely making your pH checks more accurate.

pHaze – This product is buffered and dissolves quickly. There is no risk of overshooting the pH, therefore it may be applied in its dry form. In confined spaces, the use of pHaze poses a risk of suffocation as it evolves carbon dioxide gas during the neutralization reaction. Neutralize outside of the confined space whenever possible. If neutralization must be performed in the confined space, adequate air movement and exchange must be provided for. A personal oxygen gas meter should always be used.

5. Mix the runoff in the tank using a pump, fire hose or squeegee
6. Check pH and add neutralizer until pH is above 6.0 – **then stop*** [Note: add neutralizer outside of tank if possible to avoid recontamination with precipitated particles]
7. If de-chlorination is required before disposal (for storm drain discharge), spread sodium thiosulfate across the surface of the runoff at approximately 5 oz. (140 g) per 1,000 gallons of runoff – mix
8. If filtration is required for storm drain discharge, attach a filtration dirt bag to pump discharge hose and pump the runoff through the bag. The bag can be disposed of in any landfill.
9. Rinse and drain or pump out the tank

* A strong neutralizer such as pHinish-L or pHinish-S can easily cause the run-off to become highly basic, therefore care must be taken not to over dose.

Neutralization Tables

The following tables can be used to determine the maximum amount of neutralizing chemical needed to neutralize a unit volume of Blue Earth Products cleaning chemistry.

	pHinish-S (lbs)	pHinish-L (gal)	pHaze (lbs)
1 gal mix - CSR Plus® w/Floran® Catalyst	1.32	0.50	3.29
1 gal mix - Top Ultra® w/Floran® Catalyst	2.01	0.76	5.03
1 gal mix - Filter Fit® w/Floran® Catalyst	2.01	0.76	5.03

Table 1 – Neutralization conversions for acidic cleaning solutions (max amount required).

	pHinish-S (lbs)	pHinish-L (gal)	pHaze (lbs)
1 lbs - Media Master®	0.40	0.15	0.99
1 lbs - Media Master® RR	0.30	0.12	0.76
1 lbs - neXt®	0.28	0.11	0.70

Table 2 – Neutralization conversions for acidic cleaning solids (max amount required).

Final Tank Disinfection

Disinfection according to AWWA Standard C 652-92

1. Prepare a chlorine solution of at least 200 ppm free chlorine. This is equal to 1 cup of 10% (available chlorine) NSF Standard 60 bleach in 15 gallons of water. Bleach (same as sodium hypochlorite solution) can be obtained in different strengths. Make sure to adjust bleach dosage to strength (e.g. double the dosage for 5% bleach).
2. Spray the mixture onto every surface that comes into contact with water. Include all plumbing the ladder and your boots. Spray the insides of inflow/outflow pipes as far as possible. Pour remaining bleach into inflow/outflow pipe(s).
3. Exit tank and close manhole. The tank should sit empty for 30 minutes before re-filling.
4. Sample and report Bacteria Testing (BacT) as required by regulatory agencies.

Quality Control Measures

1. Take photos of the tank before and after treatment
2. Determine off-line tank chlorine demand before and after cleaning
3. Compare water quality data upstream and downstream of tank before and after cleaning
4. Have a certified tank inspector prepare a tank inspection report to identify repair needs and condition of paint coatings
5. Perform complete laboratory analysis of rinsate and solids (part of discharge procedure)
6. Execute bacterial testing of bulk water after re-filling according to AWWA Standards

Benefits and Results

1. Complete removal of surface deposits from all tank surface materials
 - Removes disinfectant demand and contribution to disinfection byproduct (DBP) generation and improves finished water quality
 - Water quality improvement from elimination of water-borne surface contamination
 - Reduction or elimination of risk of microbiological corrosion (MIC) and under deposit corrosion
2. Improved tank inspection:
 - Early detection of paint coating failure and corrosion, extended paint coatings lifetime, clearly visible tank surfaces
 - Non aggressive towards materials used in water tank construction
 - No surface damage from high-pressure spray applications and brushing of surfaces
3. Low labor and downtime for cleaning
 - Treatment of all surface areas without need for scaffolding
 - Reduces out of service time

Important Safety Notice

You are working with corrosive chemicals. These can be acids, caustics or oxidants. The products used can do harm through contact with the skin and eyes, ingestion and inhalation. The products are certified for use in drinking water facilities under Standard NSF-60. This means that they do not pose a health risk for drinking water customers if applied properly. This does not mean they do not pose a risk for those who apply the products.

Flush immediately if you come in contact with any of the chemicals. The neutralizer of choice can cause long-lasting, slow healing burns and severe eye damage. (The use of pHaze® can help eliminate the hazards of handling hazardous caustic products). Avoid contact and flush extensively if you get splashed. Do not ignore any small contact even if it does not burn immediately.

1. Review all Safety Data Sheets (SDS) for the products to be used prior to starting.
2. Find out the local emergency phone number that is used at the water plant in case you need medical attention.
3. Install a garden hose equipped with a nozzle as an emergency water supply. Leave water turned on and place nozzle where it can be easily reached. Use this for rinsing if you come in contact with any chemicals.

Gallery of Results

The images in this section show the benefits of performing chemical surface cleaning over other methods.

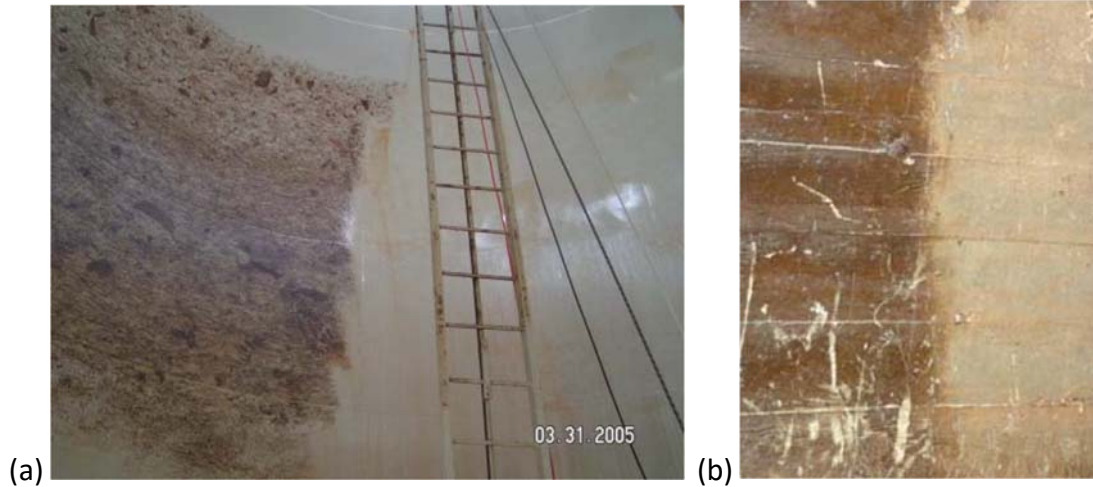


Figure 1 – (a) side by side example of dirty vs. chemically cleaned coated tank. (b) side by side example of dirty vs. chemically cleaned concrete tank.

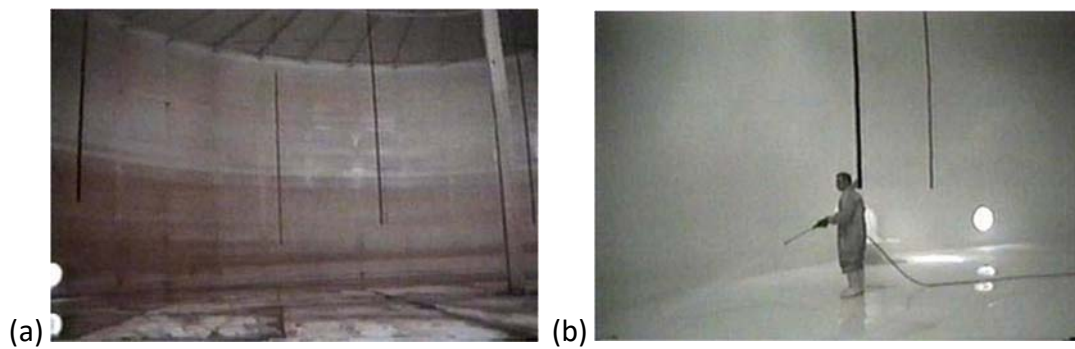


Figure 2 – (a) Steel tank after power washing. (b) same tank after chemical cleaning.

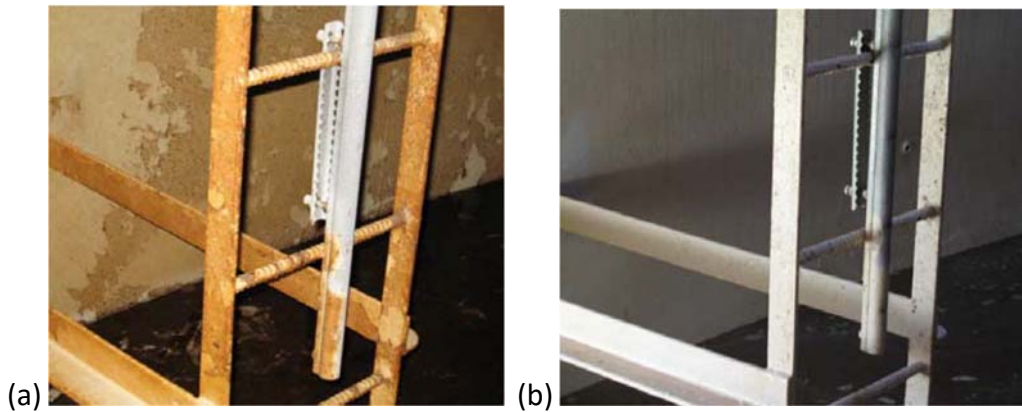


Figure 3 – (a) after wash-down inspection remains difficult. (b) after chemical cleaning, accurate inspection can occur.

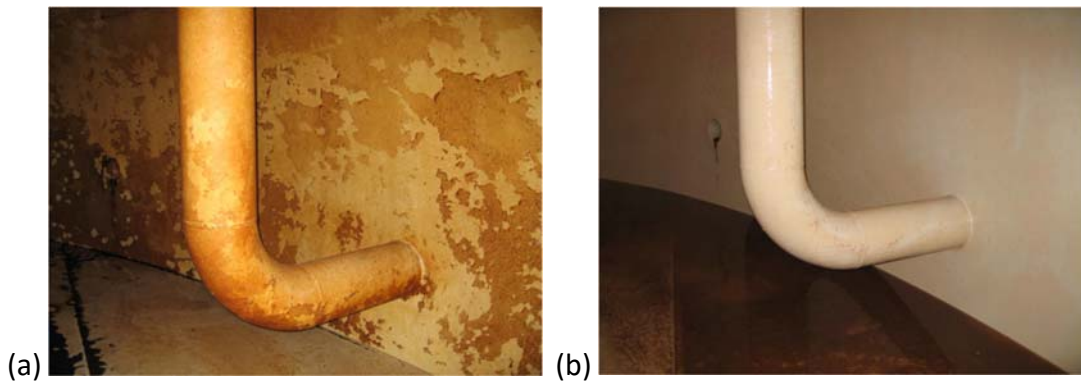


Figure 4 – (a) after traditional wash-down. (b) after chemical cleaning showing neutralized runoff on the floor of the tank, ready for final rinse.

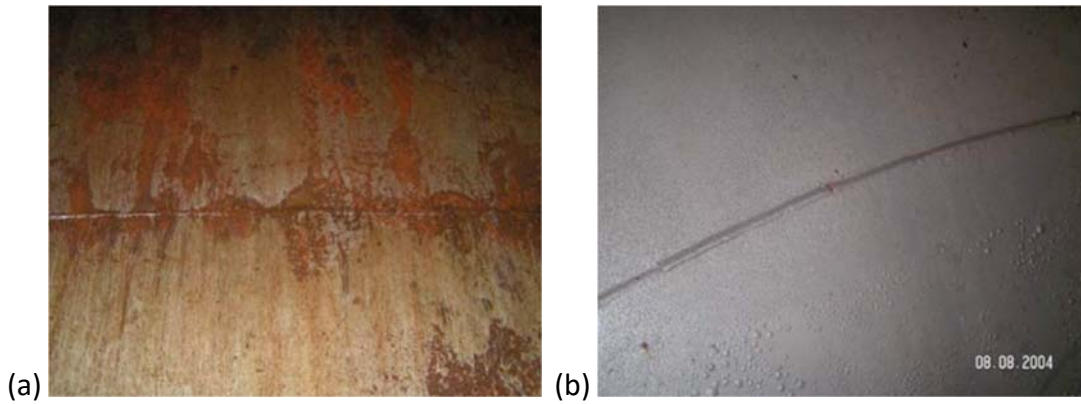


Figure 5 – (a) blisters in coatings are obscured. (b) after chemical cleaning blisters are easily seen.

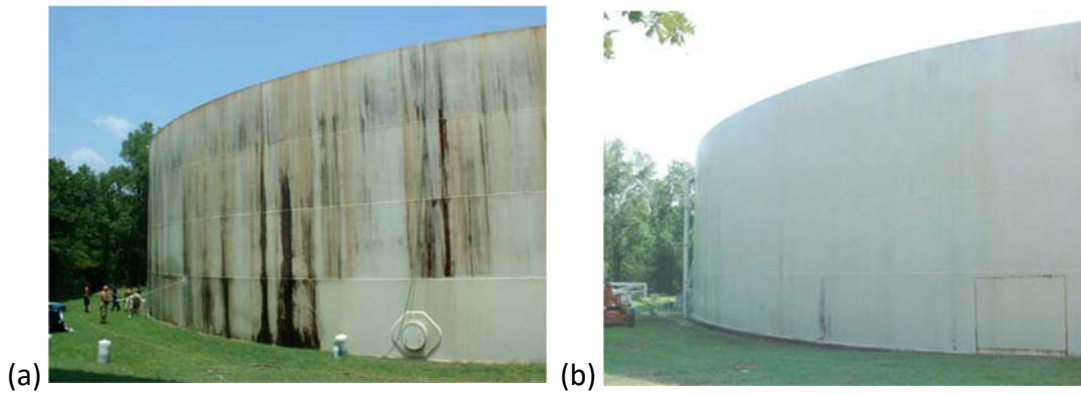


Figure 6 – Tank exteriors are also easily cleaned (a) before and (b) after.