HYDRASTONE™

How to Prevent and Manage Scale Buildup

HUBBELL
a nudyne company

Preventing and Managing Scale Buildup

Causes and Impact

Presence of Hard Water

Hard Water Definition: Hard water contains high concentrations of dissolved minerals, mainly calcium (Ca^{2+}) and magnesium (Mg^{2+}) ions. Ferrous iron may also be present.

Sources: These minerals, in various concentrations, are naturally found in all groundwater, which absorbs them as it passes through mineral-rich soil and rock. Many city and town water supplies have ‘hard water’, which ironically gives water its"taste". Every area has varying levels of dissolved solids, making scale more or less prevalent than in other areas.

Heating Process

Water Heating: When hard water is heated inside the hot water tank, the solubility of calcium and magnesium decreases.

Temperature Effect: As the temperature increases, these minerals are less likely to stay dissolved and start to precipitate out of the water onto all wetted surfaces.

Formation of Scale

Precipitation: The calcium and magnesium ions combine with carbonate ions present in the water to form calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$), which are insoluble.

Crystallization: These compounds precipitate out of the water and form solid crystals, adhering to the surfaces inside the tank, including the heating elements and the tank walls.

Accumulation Over Time

Layer Formation: Over time, these mineral crystals accumulate, forming layers of scale on the surfaces inside the tank.

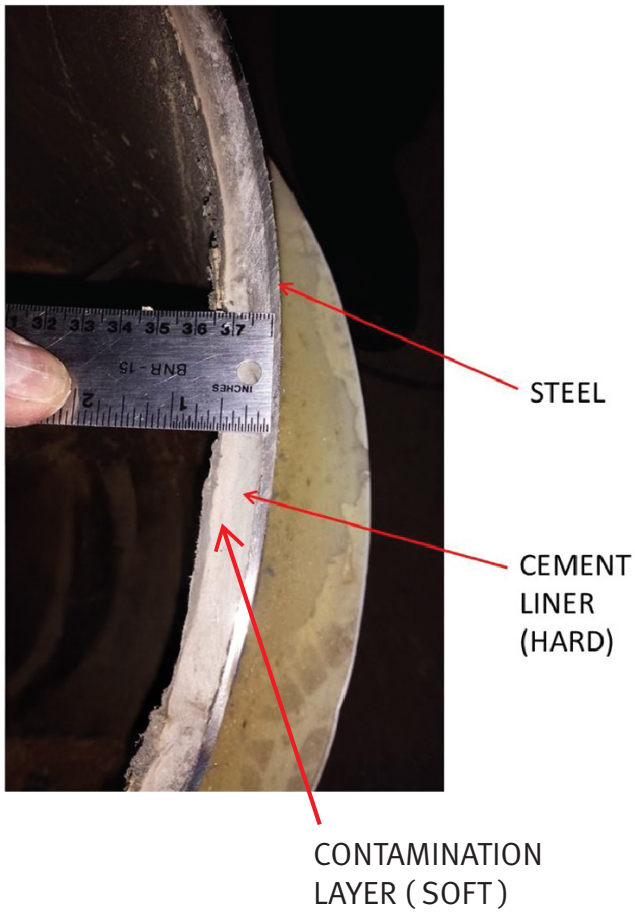
Continuous Process: As the heating and cooling cycle continues, along with freshwater introductions, more minerals precipitate and deposit to the existing scale layer, leading to possible significant buildup. Scale will reach a certain thickness and then flake off and fall to the bottom of the tank. If unchecked, this scale debris can significantly accumulate over time.

Impact on the Tank & Heating Elements

Reduced Efficiency: The scale acts as an insulating layer, reducing the efficiency of heat transfer from the heating exchanger to the water. This means the heater must work harder and consume more energy to heat the water

Decreased Capacity: Scale buildup can occupy space inside the tank, effectively reducing its water-holding capacity..

Corrosion and Damage: Scale can trap heat, causing localized overheating, which can damage the heating exchangerand other components. Additionally, it can create an environment that promotes corrosion, leading to potential leaks and tank failure.



Prevention

By understanding how scale buildup occurs and taking preventive measures, the efficiency and lifespan of tanks can be significantly improved, ensuring consistent performance and water quality.

Water Softening

Softening Systems: Install a water softener to remove calcium and magnesium ions from the water before it enters the hot water tank.

Ion Exchange Process: A common method involves exchanging calcium and magnesium ions with sodium or potassium ions, which do not precipitate out upon heating.

Regular Maintenance

Descaling: Periodically use descaling agents to dissolve and remove scale buildup from heat exchangers and other components.

Flushing: Regularly flush the tank to remove sediment and loose scale particles.

Temperature Control

- **Optimal Temperature:** Keep the water heater temperature at a moderate level to reduce the rate of scale formation. Scale buildup is directly proportional to elevated temperatures.
- **Thermostat Adjustment:** Avoid setting the thermostat too high, as higher temperatures accelerate the precipitation of minerals.

Descaling and Cleaning

Regular descaling and cleaning are crucial for maintaining the efficiency and longevity of a Hydrastone cement lined tank. The process involves removing mineral scale deposits and ensuring the tank is free from contaminants. Below a step-by-step guide on how to do it properly.

Safety Precaution

Always refer to the equipment manual for full listing of recommended safety precautions prior to performing any maintenance.

- **Turn Off Power and Water Supply:** Ensure the power to the tank (electric or gas) is turned off. Shut off the water supply to the tank.
- **Drain the Tank:** Attach a hose to the drain valve and direct the water to a safe drainage location. Open the drain valve, open faucet, and allow the tank to empty completely.
  Ventilation: Ensure proper ventilation if using chemicals.
  Equipment and Materials Needed
- **Descaling Agent (Optional):** Use a descaling agent safe for potable water tanks, typically containing food-grade phosphoric or citric acid.
- **Nylon Brush:** Use a stiff nylon brush for scrubbing the lining, as it is gentle and won't damage the lining.
- **Pressure Washer (Optional):** A pressure washer can be used if the cement lining is in good condition, but ensure the pressure is set to a low setting to avoid damaging the surface. **We suggest using a 1500psi up to 2000psi** pressure washer and wide-angle nozzles (25 degree up to 40 degree). This will distribute the pressure more evenly to reduce the chance of damage.
- **Soft Cloths or Sponges:** For gentle wiping and cleaning.
- **Bucket and Hose:** For rinsing and mixing cleaning solutions.
- **Wet/Dry Vacuum:** Include appropriate attachments and longer hose.
- **Personal Protective Equipment (PPE):** Gloves, goggles, and masks to protect against chemicals and debris.

Cleaning Procedure

Prepare the Descaling Solution (Optional):

Follow the manufacturer's instructions to mix the descaling agent with water in a bucket.

Apply the Descaling Solution (Optional):

- **Manual Application:** Use a soft cloth or sponge to apply the descaling solution to the tank's interior surfaces, ensuring even coverage.
- **Soaking Method:** Alternatively, fill the tank with the descaling solution and let it soak for the recommended time (usually a few hours).

Scrubbing:

- Use a nylon brush to scrub the interior surfaces gently. Avoid using a wire brush or metal tools as it can damage the cement lining.
- Focus on areas with visible scale buildup but be thorough with the entire surface.
- Be especially careful of elements, heat exchangers, temperature probes, dip tubes, or other in-tank features.

Using a Pressure Washer:

- If using a pressure washer, set it to a low-pressure setting. Do not exceed 2000psi.
- Use a 40-degree nozzle to start, and if it's not effective, switch to 25-degree nozzle. DO NOT use any nozzle narrower than a 25-degree spray (including rotary turbo nozzles).
- Test on a small area first to ensure it does not damage the lining.
- Carefully spray the interior surfaces, keeping a safe distance (12" to 18") from the surface to avoid damaging the lining. This will help remove loosened scale and debris.
- Keep the nozzle moving constantly to avoid focusing the pressure on one spot, which may cause damage.

Clean Debris and Rinse Thoroughly:

- Use a wet/dry vacuum with a plastic nozzle to help remove loose solids at the bottom of the tank.
- Use a hose to rinse the interior of the tank thoroughly.
- Ensure all descaling agent residues are completely removed to avoid contamination of potable water

Inspect the Lining:

- After cleaning, inspect the cement lining for any signs of damage or wear.
- Address any minor cracks greater than the thickness of a penny >1/16" wide or significant damage, with Hydrastone cement patching compound available from the manufacturer.
- If the tank needs substantial repair, it is suggested that a third-party tank relining contractor be utilized to re-apply the cement lining.

Sanitize (Optional):

- After descaling and cleaning, you may choose to sanitize the tank using a food-grade sanitizer.
- Follow the manufacturer's instructions for the sanitizer and rinse thoroughly afterward.

Refill and Restart:

- **Close the Drain Valve:** Ensure the drain valve is securely closed. Open a hot water faucet or outlet to allow air to leave the tank.

Refill the Tank:

- Turn on the water supply and allow the tank to fill completely.
- **Restore Power:** Once the tank is filled, restore power to the heating element and allow the water to heat to the desired temperature.

Regular Maintenance Tips:

- **Frequency:** Descale and clean the tank according to local conditions, but typically every 12-60 months, depending on water hardness and usage.
- **Inspection:** Regularly inspect the tank lining and promptly address any minor issues to prevent more significant problems.