



REVISED BY:  
**UTTAM SAHA**  
**GARY HAWKINS**  
**PAMELA TURNER**

ORIGINALLY WRITTEN BY:  
PAUL F. VENDRELL  
JORGE H. ATILES

# YOUR HOUSEHOLD WATER QUALITY: **CORROSIVE OR SCALING WATER**

## WHAT ARE CORROSION AND SCALING?

Corrosiveness or scaling is an inherent property of some groundwater and is related to the type of rocks or sediments in contact with the groundwater.

**Corrosion is caused when water reacts with and dissolves metal plumbing.**

This can add toxic levels of metals like copper and lead to your water. Other problems associated with corrosive water include:

- Deterioration and damage to the plumbing
- Water damage caused by leaks
- Staining of laundry
- Bitter taste
- Staining of plumbing fixtures

**Scaling occurs when water has high levels of minerals like calcium carbonate, which can build-up on surfaces.**

Slight scaling can be considered beneficial because the inside surfaces of metal pipes become coated with harmless minerals that act as a barrier to corrosion. Increased levels of scaling, however, can be harmful. Hot-water heaters are the most common place for scale formation in a home water system. Problems caused by scaling include:

- Reduced efficiency of the hot-water heater
- Reduced or blocked flow to fixtures or appliances
- Leaky valves

The degree of either corrosiveness or scaling can be predicted using a Saturation Index (SI). The following information contains a description of the SI, non-treatment strategies for reducing problems, and treatment methods to reduce the corrosion or scale caused by your water.

## WHAT IS SATURATION INDEX?

A generally accepted measure for corrosivity and scale-forming ability of water is saturation index, which is calculated using pH, hardness, alkalinity, total dissolved solids content and temperature of water.

Langelier Saturation Index (SI) is the most common one, which is a calculation that compares the actual pH to a theoretical pH based on physical and chemical properties of your water. The values range from negative to positive:

- **Negative SI** numbers mean the water requires more dissolved metals to reach saturation—a potential for corrosion.
- **Positive SI** numbers mean the water contains excess dissolved metals which should be given up to reach saturation—a potential for scale formation.
- **SI values close to zero** indicate that the water is balanced—there should not be problems from either corrosion or scaling.

See the table on the right for the SI values, descriptions, and general recommendations.

LANGELIER SATURATION INDEX (SI)	DESCRIPTION	RECOMMENDATIONS
≤ -5.0	Very Severe Corrosion	Treatment Required
> -5.0 to -3.0	Severe Corrosion	Treatment Highly Recommended
> -3.0 to -2.0	Moderate Corrosion	Treatment Recommended
> -2.0 to -1.0	Mild Corrosion	Consider Treatment
> -1.0 to <1.0	No Corrosive or Scale Forming Effect	Treatment Unneeded
1.0 to <3	Mild Scale Formation	Treatment Optional
3.0 to <4.0	Moderate Scale Formation	Consider Treatment
≥4.0	Severe Scale Formation	Treatment Recommended

## WHAT CAN I DO TO REDUCE PROBLEMS FROM CORROSIVE WATER WITHOUT INSTALLING A TREATMENT SYSTEM (NON-TREATMENT STRATEGIES)?

Corrosive water can dissolve metals from plumbing system such as from the copper pipes joined by lead solders as found in some older homes. Such dissolution contaminates household water with metals as well as corrodes the pipes and joints leading to development of pin-hole sized leaks on them in extreme cases. Using plastic pipes in the house and non-corrosive fixtures will eliminate this problem. Submersible pumps should be constructed of stainless steel. If any metal plumbing hardware is used, do not join two different metals.

## WHAT CAN I DO IF THE NON-TREATMENT STRATEGIES DON'T REDUCE CORROSIVENESS?

Raising the pH of your water will reduce its corrosiveness. A filter bed containing basic minerals of calcium or magnesium is the recommended method for raising pH. Filter beds are commercially available that contain calcite (marble chips) or a blend of calcite and magnesium oxide (corosex). While calcite is a slow acting filter bed, corosex acts rapidly. Use the blend when the actual pH is below 6.0.

## WHAT CAN I DO TO REDUCE SCALE FORMATION WITHOUT INSTALLING A WATER SOFTENER?

Scale formation in the hot-water heater can be considerably reduced by lowering the temperature setting. Lower temperatures produce less scale. As an added benefit to lowering your hot-water temperature, your utility bill will be less. However, dish washers may not clean dishes properly at temperatures below 140 °F. Scale may still form in the hot water heater and accumulate over time. As scale builds up, the efficiency of this appliance will decline. Flushing out the accumulated scale on a regular schedule will restore the heat transfer efficiency.

## WHAT CAN I DO IF THE NON-TREATMENT STRATEGIES DON'T SOLVE MY SCALING PROBLEMS?

The most common treatment for reducing scale formation is to “soften” the water. “Softening” is a process where calcium and magnesium in the water are exchanged with sodium. Commercial softeners are available either through a plumbing equipment supplier or a water treatment professional. Note that the amount of sodium in your water will increase, which can create problems for people with hypertension and/or on low sodium diets. Only softening the hot water, removing the sodium before drinking, or by-passing the softener for drinking water can eliminate this problem. Sodium can be removed by reverse osmosis, distillation, or ion exchange resin filtration.

## Sources:

*Corrosive Waters*, Wilkes University Center for Environmental Quality, GeoEnvironmental Science and Engineering Department.

Carrier Air Conditioning Company. 1965. Handbook of Air Conditioning System Design. McGraw-Hill Books. New York.

Langelier, W. F. 1936. The analytical control of anti-corrosion water treatment. Journal of American Water Works Association 28: 1500-1521.

Ryznar, J.W. 1944. A new index for determining amount of calcium carbonate scale formed by a water. Journal of American Water Works Association 36: 472–486.

[www.lenntech.com/calculators/langelier/index/langelier.htm](http://www.lenntech.com/calculators/langelier/index/langelier.htm)

**extension.uga.edu**

---

**Circular 858-9**

**Revised October 2020**

Published by the University of Georgia in cooperation with Fort Valley State University, the U.S. Department of Agriculture, and counties of the state. For more information, contact your local UGA Cooperative Extension office. The University of Georgia College of Agricultural and Environmental Sciences (working cooperatively with Fort Valley State University, the U.S. Department of Agriculture, and the counties of Georgia) offers its educational programs, assistance, and materials to all people without regard to race, color, religion, sex, national origin, disability, gender identity, sexual orientation or protected veteran status and is an Equal Opportunity, Affirmative Action organization.