**U.S. Department of Energy - Energy Efficiency and Renewable Energy**

**Energy Savers**

# Scaling and Corrosion in Solar Water Heating Systems

The two major factors affecting the performance of properly sited and installed solar water heating systems include scaling (in liquid or hydronic-based systems) and corrosion (in hydronic and air systems).

## Scaling

Domestic water that is high in mineral content (or "hard water") may cause the buildup or scaling of mineral (calcium) deposits in hydronic solar heating systems. Scale buildup reduces system performance in a number of ways. If your system uses water as the heat-transfer fluid, scaling can occur in the collector, distribution piping, and heat exchanger. In systems that use other types of heat-transfer fluids (such as glycol, an anti-freeze), scaling can occur on the surface of the heat exchanger that transfers heat from the solar collector to the domestic water. Scaling may also cause valve and pump failures on the potable water loop.

You can avoid scaling by using water softeners or by circulating a mild acidic solution (such as vinegar) through the collector or domestic hot water loop every 3–5 years, or as necessary depending on water conditions. You may need to carefully clean heat exchanger surfaces with medium-grain sandpaper. A "wrap-around" external heat exchanger is an alternative to a heat exchanger located inside a storage tank.

## Corrosion

Most well-designed solar systems experience minimal corrosion. When they do, it is usually *galvanic corrosion*, an electrolytic process caused by two dissimilar metals coming into contact with each other. One metal has a stronger positive electrical charge and pulls electrons from the other, causing one of the metals to corrode. The heat-transfer fluid in some solar energy systems sometimes provides the bridge over which this exchange of electrons occurs.

Oxygen entering into an open loop hydronic solar system will cause rust in any iron or steel component. Such systems should have copper, bronze, brass, stainless steel, plastic, rubber components in the plumbing loop, and plastic or glass lined storage tanks.

## Learn More

**Financing & Incentives**

- Find Federal Tax Credits for Energy Efficiency
  ENERGY STAR®

**Product Information**

- Find ENERGY STAR® Solar Water Heaters
  ENERGY STAR

**Reading List**


- Vliet , G.; Baker, D. (1998). "Designing Solar Hot Water Systems for Scaling Environments." *Solar 98: American Solar Energy Society Annual Conference*. Albuquerque, New Mexico, June 14-17, 1998, pp. 307-312.