

New Life for Your Old Water Heater

Water Heater & Solar Tank Anode Rods

Chuck Marken

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Most people aren't too concerned with the life of their water heater or storage tank—until it starts leaking. A pound of prevention with water heater tanks can save you one or two hundred pounds of grief. If you want to know more about how to make them last longer, follow along.

Tank Construction

Gas and electric water heater tanks and glass-lined storage tanks are very similar. The water heaters have thermostats

and heating elements or burners built in, but the tank is the same as a solar storage tank. They are all glass-lined, welded steel cylinders. There are five large manufacturers of glass-lined tanks in the United States, and about twenty small manufacturers.

The glass lining in a tank serves to prolong the life of the steel tank. Unlined steel tanks can have very limited life spans, sometimes less than two years. With the glass lining, manufacturers can feel comfortable offering five- to ten-year warranties. Tanks normally last at least twice the period of the warranty.

One thing the glass lining does is keep the water from being rust colored. It also helps protect the steel tank, but the lining always seems to have a few flaws. These may be caused during shipment, or they might be manufacturing defects. Leaks in tanks always seem to occur at the welds. This is probably the weakest point, where the lining is most likely to chip or otherwise be harmed. The lining helps, but the real protection of the steel tank comes from the anode rod.

Anodes & Corrosion

Corrosion in tanks results from a flow of electrical charges. The anode is the electrode where oxidation (corrosion) occurs. The cathode is a metallic electrode receptive to the flow of charges from the anode.

Metals have a hierarchy of sorts when it comes to corrosion. Precious metals like platinum, gold, and silver (in that order) will all corrode more slowly than metals at the other end of the scale. Zinc, aluminum, and magnesium will corrode much more

Don Keefe of AAA Solar lifts out the remains of a used-up anode rod.



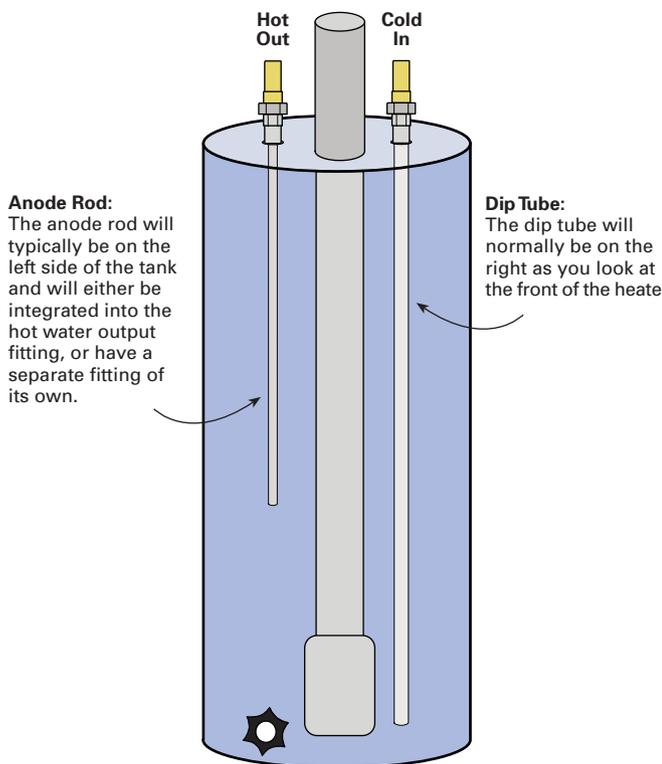
quickly than the precious metals. Stainless steel will corrode a little faster than the precious metals, but not as fast as copper or steel.

Common metals that a plumber should be familiar with are copper, steel, aluminum, and magnesium. These four metals are listed in the order of resistance to corrosion in relation to the other metals in the group. The higher metal will act as a cathode in relation to metals lower on the list; the lower metal will be the sacrificial anode.

Copper, when present in a water system with any of the other common metals, will act as a cathode. The other three metals will act as an anode. Steel and copper together will always create a situation where the steel is constantly undergoing deterioration. Aluminum and magnesium are better anodes to copper than the steel tank. Take a magnesium rod, immerse it in the tank, and it will act as a sacrificial anode before the steel tank does. It's very simple and very effective.

There's only one problem with using an anode rod—it will deteriorate and disappear over time. How long the rod lasts depends on the water quality. Salty water and over-softened water accelerate the deterioration of the anode rod. After the anode is gone, the next metal present in the system will become the anode. In this case, it will be the steel of the tank. Anywhere there is a flaw in the glass lining becomes fair game for the corrosion. Once a leak starts, the tank is history.

Gas Water Heater Anatomy



Anode Rod Replacement—Step by Step

1. If the water heater is electric and has electricity hooked up, turn off the breaker—probably a two-pole, 30-amp breaker. If it's a gas heater, turn the thermostat to the lowest setting or turn the gas valve completely off.
2. Turn off the cold water going to the tank—usually a gate valve—and drain a little water from the tank using a garden hose at the bottom of the tank.
3. Locate the anode rod. It is usually on the hot water side—the left as you look at the cover plates on the sides of tanks and water heaters. It should also be stamped in the sheet metal at the top of the tank—H for hot, C for cold. You may have to use a short ladder to see the stamping.

Some water heaters may have the anode rod attached to a square- or hex-headed plug in the top of the tank. The sheet-metal top of the tank may be stamped "Anode" next to this fitting.

4. Using care and an appropriate wrench or socket, unscrew (counterclockwise) the fitting on the top of the tank. This fitting can be tough to get loose, and may require lots of leverage. If you're lucky, the pipe nipple and anode rod will start unthreading right at the threads in the tank itself. If the nipple doesn't unthread at the tank fitting itself, you may have to use a pipe wrench on the nipple threads. Use care—they can easily be ruined.
5. Pull out the old anode rod. If the anode has half or less of the magnesium remaining (compare it to the new rod), replace it. Overhead clearance can be a problem with new anode installation, since the new rods are 3 to 4 feet (0.9–1.2 m) long. If this is a problem, use a bendable rod, but try to keep it as straight as possible to prevent it from hitting the top element in an electric heater or the flue in a gas heater.
6. Apply Teflon tape or pipe sealer to the threads on the anode rod nipple. Tighten it down sufficiently and turn the cold water valve on. Make sure to turn the breakers back on for electric water heaters or readjust the thermostat for gas heaters. Don't forget to check for leaks!

Anode Rod Replacement

New anode rods are smooth cylinders about a 1/2 inch (13 mm) to 3/4 inch (19 mm) in diameter. Used-up anode rods look like they have been dinner for some small metal-eating animal. The thin metal wire in the center of the rod is the steel core. If it's all that's left, there is no sacrificial anode.

If your tank is more than ten years old, chances are the anode is getting long (short) in the tooth. It is fairly easy to check, but you should have a new anode on hand if you take the old one out. They almost always need replacing, and if you have a new one on hand, you'll know how much the other has corroded.

If your used anode rod looks anything like the old ones in the photos, it's time to feed the tank a new one. If it is halfway between the used one in the photo and the new one, it probably still has at least a few years left before it will need replacing. If in doubt, replace it. On virtually all tanks manufactured in the last few decades, the new hot water nipple with attached anode rod should screw into the existing port with ease. Use Teflon tape or a good grade of pipe dope to seal the nipple/anode rod replacement.

Most plumbing supply houses and solar professionals carry replacement anode rods, but they might be tough to find at a home center. They come in both magnesium and aluminum, and can be found at many locations on the Web. Almost all tanks have magnesium rods. In certain areas of the country, the tanks are sold with aluminum rods because magnesium has been known to cause some noxious odors in the water.

If you can't find an anode rod replacement, I have heard of people using small pieces of magnesium dropped into the tank through one of the openings. If you try this, make

Old and new anode rods.



Installing a new rod in the tank.

sure you take the pipe nipple out of the tank. Otherwise, you might clog the dip tube or hot entrance above the anode rod.

I have never used aluminum as an anode rod, but they are available and it makes good sense that they will work fine. I have seen solar hot water systems with aluminum collector absorber plates that developed leaks quickly in systems with copper tubing. This doesn't happen if oil is used as the fluid in the system—only with water or solutions of water and glycol. This indicates that the aluminum absorbers are acting as a sacrificial anode.

One thing I've noticed over the years is the premature failure of tanks with internal heat exchangers. These include stone lined tanks that are the top of the line in tank quality. Why, we asked for many years? My educated guess is that the accelerated anode corrosion occurs because of the copper heat exchanger's placement, which is right in the middle of the tank. With this in mind, those with internal heat exchange tanks may want to be a little more vigilant in monitoring the solar storage tank's anode rod.

Worth the Cost

Hiring a plumber or solar professional to replace the anode rod might cost you from US\$150 to as much as \$400. To do it yourself, the anode rod will be US\$20 to \$50, and the bloody knuckles if the wrench slips—priceless.

Renewable energy users are looking for long-term, sustainable systems. Regular replacement of anode rods are a great idea to make tanks last longer. Keep your rod in good condition and it will prolong the life of your hot water tank.

Access

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"Water Heater Maintenance—Another Way to Save Energy," by Larry and Suzanne Weingarten in *HP45*

