



Office of
Energy
Conservation

Improving Storage Tank Water Heater Performance and Life

In most homes water heating is the second largest energy consumer behind space heating. Therefore, it is important to ensure that your water heater is operating efficiently. Proper and regular maintenance can have the additional benefit of extending the life of your water heater.

There are many makes and models of water heaters available on the market that are suitable for providing domestic hot water in residences. These water heaters can be grouped into two categories; storage tank water heaters, and tankless (or instantaneous) water heaters. The following sections provide information on ways to improve the performance and extend the life of storage tank water heaters.



Storage Tank Water Heaters

The water heaters in this category include standard electric tank units, naturally vented, power vented, and direct vented natural gas / propane / oil fired units, heat pump units, and solar water heater units. There are many things that can be done to improve the performance of these types of water heater.

PERFORMANCE IMPROVEMENTS

- Reduce the temperature setting for the water heater

The heat lost from the storage tank to its surroundings when the water is not being heated is called standby loss. The rate at which heat is lost from the tank is dependent on the temperature difference between the temperature in the tank and the temperature of the surroundings. Therefore, reducing the temperature setting of the water heater will reduce the amount of heat lost from the tank between uses. Reducing the temperature also reduces the risk of scalding accidents.

It is important that the temperature in the storage tank is not reduced overly low though as this can cause bacterial growth in the tank which can be a health risk.

For this reason it is recommended that for natural gas, propane, and oil fired water heaters that the water temperature be in the range of 50 C to 55 C (122 F to 131 F) and for electric, or heat pump water heaters that the water temperature be in the range of 55 C to 60 C (131 F to 140 F). Measure the water temperature with an accurate thermometer at a hot water tap once the tap has run for at least a minute.

- Reduce the use of hot water

The most effective method to reduce the amount of energy used to heat water in your home is to reduce the amount of water that needs to be heated.

Here are just a few of the low-cost measures that can be performed in your home to reduce the hot water that is consumed. Low-flow showerheads that are currently on the market use less than ten litres per minute of water while still providing acceptable performance. When buying low-flow showerheads, look for units with both low-flow and a well-designed spray pattern. Installation of faucet aerators is another good opportunity to reduce the amount of hot water used in your home, especially if you tend to run the water when you are rinsing dishes.

Leaking taps can also represent a significant draw of hot water over the course of a year and should be repaired as soon as they are noticed.

A few higher-cost upgrades that can be performed to reduce the amount of hot water used in your home include the installation of a front loading clothes washer and the installation of a dishwasher with a water temperature booster heater. Most front loading (sometimes called horizontal axis) clothes washers use less water to wash clothes than comparably sized top loading clothes washers. It is recommended when washing clothes to use warm or cold (not hot) water settings and when rinsing, to use cold water settings. Dishwashers with booster heaters allow you to keep the temperature of your water heater at a lower setting (as previously recommended in this article) while still providing acceptable cleaning performance.

- Add tank insulation

The storage tank of a water heater continually loses heat to the surrounding space since the surroundings are usually cooler than the storage tank. The rate of this heat loss is dependent on the temperature difference between the water in the tank and the surroundings. One way to reduce the amount of heat lost from the tank to its surroundings is to install additional insulation (RSI 3.5 or greater [R 20 or greater]) to the tank (all certified water heaters come with some insulation built in).

For natural gas and propane-fuelled water heaters, make sure that the water heater insulation kit is certified by the Canadian Gas Association (CGA). Keep the insulation cover clear of the inlet for the burner, the temperature controls, and the draft hood (if your water heater has one).

For electric water heaters use insulation kits that are certified by the Canadian Standards Association (CSA). Avoid covering the electrical wiring where it connects to the water heater.

It is not recommended to add insulation to a water heater that is fuelled by oil.

- Insulate the water pipes

Insulating the pipes leading into and out of the water heater is recommended for all tank-type water heaters. Although the greatest savings will be achieved by insulating the first two metres (approximately six feet) of the hot and cold pipes attached to the water heater, it is strongly recommended that all of the accessible hot water lines be insulated. Insulating the hot water lines reduces the length of time that it takes before warm water is available at the tap, reducing the heating load and the amount of water that is wasted while waiting for warm water.

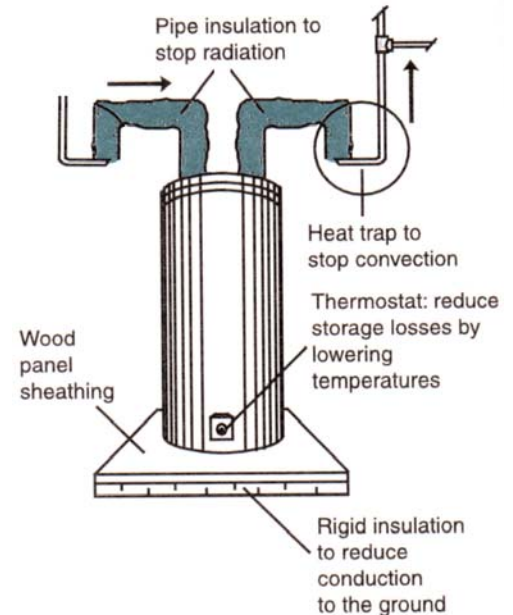


Figure 1: Typical Heat Trap on a Water Heater

Many hardware and lumber stores sell foam pipe insulation that fits different diameter pipes. **Remember to check the size of your pipes before going to buy pipe insulation.**

- Install heat traps (anticonvection loops)

A heat trap, or anticonvection loop, is a loop in the pipes close to where they connect to the water heater. These loops of pipe stop convection currents from occurring in the water lines connected to the water heater. Convection currents are caused by warm water rising and cool water falling, which transfers heat along the pipes. Figure 1 shows a typical installation method for a heat trap. A plumber could install heat traps on both the cold water supply and the hot water outlet pipes (recommended) relatively quickly.

MAINTENANCE IMPROVEMENTS (LIFE EXTENDERS)

- Replace the anode rod

Almost all storage tank water heaters require a device called an anode rod. This rod (often made of magnesium) is installed inside the tank to prevent the tank from corroding. The rod prevents corrosion by interacting with the minerals in the water quicker than the sides of the tank do. Over time this rod gets worn away and needs to be replaced. New advances in water heater technology now include cold water supply tubes (dip tubes) that act as anode rods.

It is recommended that the anode rod be replaced every six years, unless the water used in the water heater is softened - in which case it should be replaced every two years. As the anode rod gets used up, it contributes to the formation of sediment at the bottom of the tank. Please read the following section on cleaning the inside of your water heater to find out how to deal with this sedimentation problem.

- Clean the inside of the tank

Over time sediment collects at the bottom of water heater tanks. This sediment comes from the intentional break down of the anode rod and from minerals in the water supply. The sediment reduces the efficiency of the water heater and may cause the water heater to wear out prematurely. It also has the potential to promote the unhealthy growth of bacteria (especially in electric water heaters). Some water heaters are designed with a swirling dip tube to minimize the amount of sediment that develops in the tank. For other water heaters, it is recommended to clean out the sediment at least once a year (preferably every six months).

There are two procedures to clean the sediment out of the bottom of your water heater.

Procedure #1

Follow these steps:

1. Mark the current location of the temperature control on the water heater and then turn the temperature control to its minimum value (this is to prevent the water heater from firing while you are working on it).
2. **Wearing heavy gloves for protection**, slowly open the water heater's bottom tap allowing the water to run into a pan or pail (an alternative is to hook up a garden hose to this tap and have the water run through it to a convenient drain). **Caution: The water you drain will be very hot!**
3. Run water through this tap until the water runs clear, then firmly shut the tap.
4. Return the temperature control on the water heater to its original location.

Note: Do not force the tap open, as you may not be able to fully close it afterwards.

Procedure #2

Follow these steps, which are more involved (yet safer):

1. Mark the current location of the temperature control on the water heater and then turn the temperature control to its minimum value (this is to prevent the water heater from firing while you are working on it).
2. Turn on the tap in your bath or shower and run the water until it is no longer hot, then turn off the tap.
3. If the cold water pipe supplying the water heater has a valve or tap on it - close it off, otherwise turn off the water supply to your home (first checking to make sure that no appliances are attempting to draw water at that time).
4. Open (turn on) a hot water tap at the closest sink.
5. Slowly open the water heater's bottom tap allowing the water to run into a pan or pail (an alternative is to hook up a garden hose to this tap and have the water run through it to a convenient drain).
6. Once you notice a decrease in the rate of the water flowing out of the tank (many pails full of water or many minutes of flow through the garden hose), turn the cold water supply to the water heater back on for a full minute and then off again. Depending on how you turned it off initially, this will mean either opening the valve on the supply line to the water heater or turning the home's water supply back on.
7. You may notice more sediment in the outflow from the water heater after doing this. Once the flow out of the tank has slowed down again, repeat step six above. Repeat these two steps until the water coming out of the water heater flows clear.
8. Close the water heater's bottom tap and open the cold water supply to the water heater.
9. Allow the water heater to fill with water. The water heater is full once water starts coming out of the tap that you have open in the nearby sink. At that point you can close that tap.
10. Return the temperature control on the water heater to its original setting.

- Have the water heater inspected

To ensure safe, efficient operation of the water heater, it is recommended to have it inspected at least every two years. These inspections will indicate if the burners and heat transfer surfaces in fuel-fired water heaters are dirty. Dirty burners and heat transfer surfaces reduce the performance of the water heater.

It is also recommended to have the dip tube inspected every time the anode rod is replaced or if there seems to be an inadequate hot water supply. If the dip tube breaks off due to thermal cycling, the cold water supplied to the water heater will mix with the hot water near the top exit of the water heater, reducing the amount of hot water available.

- **Check the temperature and pressure relief valve**

The temperature and pressure relief valve on tank-type water heaters is a safety feature designed to prevent catastrophic failures of the water heater. This valve will open if the temperature or the pressure in the tank exceed certain limits. Because these valves are seldom used, it is quite common for them to stick closed - increasing the problems that could arise if the water heater should fail. To avoid this, it is recommended to check the temperature and pressure relief valve at least once a year, preferably every six months.

New safety rules require a drain pipe to be connected to the temperature and pressure relief valve of all water heaters when installed. If your water heater does not have a drain pipe installed, ask your heating contractor or plumber to install one for you.

Place a small container at the end of the drain tube to catch the water that will be expelled from the tank during the test. To test the valve, lift the lever on the valve and allow about a litre (approximately four cups) of water to escape down the drain pipe. Return the lever to its starting position to stop the flow of water. If the flow of water does not stop completely when the valve is closed, open and close the valve a few more times. A small amount of water may continue to escape from a closed valve for a few minutes until the valve has cooled.

If the valve fails to completely stop the flow of water after it has been opened and closed, repeatedly and allowed to cool, then the valve will need to be replaced. **If no water flows from the drain pipe when the valve is opened, it is important to have the valve replaced immediately.**

- **Place the water heater over a layer of protected rigid insulation**

To reduce heat loss from the bottom of the tank, have the water heater installed on a piece of plywood securely installed over rigid insulation (see Figure 1).