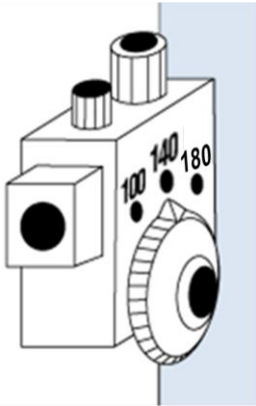


## Saving Energy on Water Heating



You can reduce your water heating costs by simply lowering the thermostat setting on your water heater. As we show below, a 60°F reduction in water temperature can save over 50% in energy costs.

Most households only require 120°F to 125°F water for dish-washing, laundry and showering. These temperatures also destroy any bacteria within the water. Water heated at 130°F to 180°F poses a safety hazard—scalding. Every gallon of water heated to 180°F must be mixed with 0.86 gallons of water at 50°F to achieve a mixed temperature of 110 °F. Why heat water up only to dilute it with cold water later?

### Question

What are the incremental costs of operating a 50 gallon water heater at a rating of **'VERY HOT'** 180°F (82 °C) as opposed to **'HOT'** 120°F (49 °C) with:

- 1) Electricity, and
- 2) Natural gas?

### Answers

#### Electricity

Let's consider a 100% efficient 50-gallon electric water heater, and assume electricity costs 13.6¢ cents per kilowatt hour (kWh).

**At 180°F (82°C)**, it takes 53,950 BTUs (50 gallons of water × 8.3 pounds per gallon × (180°F – 50°F)) to raise a 50-gallon tank of 50 °F (10 °C) incoming water up to 180°F (82°C). As a result, it would:

- Take 81 minutes (53,950 BTUs/40,000 BTUs per hour x 60 minutes).
- Use 15.81 kWh of electricity (53,950 BTUs/3,413 BTUs per kWh).
- Cost \$2.15 per 50 gallons of scalding hot water.

**At 120°F (49°C)**, it takes 29,050 BTUs (50 gallons × 8.3 pounds per gallon × (120°F – 50°F)) to raise a 50-gallon tank of 50 °F (10 °C) water up to 120°F (49°C). As a result, it would:

- Take 44 minutes (29,050 BTUs/40,000 BTUs per hour x 60 minutes).
- Use 8.51 kWh of electricity (29,050 BTUs /3,413 BTUs per kWh).
- Cost \$1.16 per 50 gallons of very hot water.

Therefore, by turning the temperature down from 180°F to 120°F, there would be a 54% reduction in the cost of electricity for hot water.

## Natural Gas

Let's consider an 85% efficient 50-gallon natural gas water heater, and assume natural gas costs \$12 per 1,000 cubic feet (Mcf).

**At 180°F (82°C)**, it takes 63,471 BTUs (50 gallons × 8.3 pounds per gallon × (180°F – 50°F)/85% efficiency) to raise a 50-gallon tank of 50 °F (10 °C) incoming water up to 180°F (82°C). As a result, it would:

- Take 95 minutes (63,471 BTUs/40,000 BTUs per hour × 60 minutes).
- Use 0.061 Mcf (63,471 BTUs/1,034,000 BTUs per Mcf) of natural gas
- Cost \$0.74 per 50 gallons of scalding hot water.

**At 120°F (49°C)**, it takes 34,176 BTUs (50 gallons × 8.3 pounds per gallon × (120°F – 50°F)/85% efficiency) to raise a 50-gallon tank of 50 °F (10 °C) incoming water up to 120°F (49°C). As a result, it would:

- Take 51 minutes (34,176 BTUs/40,000 BTUs per hour × 60 minutes).
- Use 0.033 Mcf (34,176 BTUs/1,034,000 BTUs per Mcf) of natural gas
- Cost \$0.40 per 50 gallons of very hot water (52% reduction).

Therefore, by turning the temperature down from 180°F to 120°F, there would be a 52% reduction in the cost of natural gas for hot water.

Reducing your water temperature to 120°F also slows mineral buildup and corrosion in your water heater and pipes. This helps your water heater last longer and operate at its maximum efficiency.

## Assumptions

- 1) A BTU is the amount of energy required to raise one pound of water by one degree Fahrenheit.
- 2) A U.S. gallon of water weighs 8.3 pounds.
- 3) One kWh of electricity is equivalent to 3,413 BTUs of energy.
- 4) One Mcf of natural gas in northeast Ohio contains 1,034,000 BTUs of energy.
- 5) Water typically enters businesses and residences in the US at about 50°F (10 °C) (varies with latitude and season).
- 6) A 40,000 BTU heater is typical of domestic natural gas fired water heaters. An equivalent electric heating element would be 11.72 kW. We assume excellent insulation with minor heat losses.
- 7) An electric heater is assumed to be 100% efficient. A natural gas heater is assumed to be 85% efficient.

## More Information

If you want to find additional information on saving energy on water heating, you may go to the U.S. Department of Energy's website at:

[http://www.energysavers.gov/your\\_home/water\\_heating/index.cfm/mytopic=13050](http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13050)