

Tankless Water Heaters



Since tankless units heat water only as needed, they are also referred to as Demand, Instantaneous, or Flash heaters. While they've historically been popular in Japan and Europe, the market for tankless units in the United States is now heating up. People like tankless water heaters because they take up less space, generally last at least 20 years, and can truly provide "endless hot water" if they are specified properly. Conventional storage water heaters, on the other hand, require more space, generally last only 10-15 years, and can run out of hot water. Also, because tankless units do not have the standby heat losses of storage tank heaters, they are expected to consume less energy and thus cost less to operate.

Tankless heaters are available in natural gas, propane, or electric models. They can be used similarly to conventional tank types: located centrally for whole-house use, or at individual points of use.

However, smaller gas models and all electric models are best suited for one-person households or point-of-use applications due to their limited flow capacity. When a tankless unit replaces an existing tank type water heater, both venting and gas line size (for natural gas or propane units) or power supply (for electric units) will probably need to be increased.

For tankless water heaters to perform as expected, units must be specified correctly and users must understand that a unit is limited by its minimum and maximum flow rate. For example, most tankless units require a hot water flow of at least 0.5 gpm (gallons per minute) to operate. And, if a unit is not sized to accommodate desired simultaneous uses, such as for two showers, the showers will probably need to be staggered. Otherwise, excess demand will override the heating capacity of the unit.

Facts at a Glance

Pros

- Eliminates standing heat losses
- Can reduce water heating bills
- Generally last at least 20 years
- Takes up less space
- Can provide limitless hot water

Cons

- Is typically more expensive to install than tank type units
- Might lead to more hot water usage
- Can increase wait for hot water

Environmental Considerations

Use Phase

According to the [U.S. Department of Energy](http://www.energy.gov), "for homes that use 41 gallons or less of hot water daily, demand water heaters can be 24%–34% more energy efficient than conventional storage tank water heaters. They can be 8%–14% more energy efficient for



homes that use a lot of hot water—around 86 gallons per day. You can achieve even greater energy savings of 27%–50% if you install a demand water heater at each hot water outlet.”

Because tankless units do not have the standby heat losses of storage tank heaters, their energy consumption is expected to be lower as described above. However, case studies do not always support this expectation. First, some tankless units have a constantly burning pilot light, which wastes energy. This can be avoided by specifying models equipped with an electronic ignition switch. Also, since tankless water heaters can provide limitless hot water, users must be conscious of the potential to use more hot water and thus more energy.

The term “Instantaneous” can be misleading. Tankless water heaters can take up to 10 seconds to completely fire up and fully raise the water temperature. This can cause a longer wait for hot water and more cold water to be wasted down the drain. An [on-demand hot water circulation pump](#) can help to address this issue.

Lifecycle

Tankless water heaters are generally expected to last 20 years or more, and most models have easily replaceable parts that can further extend their life. Using longer lasting appliances can reduce both replacement frequency and pressure on landfills.

Furthermore, many components of tankless water heaters, in addition to conventional storage tank types, can be recycled. In the San Francisco Bay Area, recyclers for water heaters can be found by exploring the [Recycling Wizard](#) at StopWaste.org (choose “Metal” under “Where Can I Recycle?”)

Functional Considerations

Cost & Incentives

Tankless units are typically 2-3 times more expensive than conventional storage tank type units. Smallest gas units, which have low maximum flow rates and are appropriate for single points of use, start around \$200. Larger gas units with flow rates of 3-5 gallons per minute range from \$550-1200.¹ Also keep in mind that most tankless retrofits require installation of a larger gas line, which will add to the overall installation cost. However, some of the cost can be offset through a \$300 tax credit available from the federal [Energy Policy Act of 2005](#) for water heaters that have an Energy Factor of at least 0.8.

Given historical price trends of natural gas and electricity, gas units should cost far less to operate than electric units in most situations.

Specification

Because cold water needs to be heated rapidly, tankless water heaters demand more gas flow or power than storage tank heaters. A single gas unit sized for a typical household will require a larger gas line than is usually found for domestic uses ($\frac{3}{4}$ ” as opposed to $\frac{1}{2}$ ”). Similarly, electric units demand a lot of power and generally require larger cable and a larger capacity main electrical panel.

For whole-house use, a single large capacity gas unit or two smaller units connected in parallel is often adequate. However, as with many tank type water heaters, even the

¹ <http://www.toolbase.org/ToolbaseResources/level4DG.aspx?ContentDetailID=74&BucketID=1&CategoryID=9>



largest tankless unit cannot supply enough hot water for simultaneous multiple uses. Activities that demand a lot of hot water, such as clothes washing and operation of a dishwasher that does not heat its own water, might need to be staggered. Alternatively, separate demand water heaters can be installed to meet individual hot water loads. A single electric unit does not have the capacity to meet the needs of most households, so two or more units are generally required.

Tankless water heaters are rated by the maximum flow rate at which a desired temperature rise is met. The maximum hot water output rate from a particular unit is dependent on the model and input water temperature: the colder the incoming water, the less water can be heated to the design output temperature. If too much demand is placed on a tankless unit, water at the fixtures might not reach the desired water temperature; if simultaneous uses tax a unit, the fixture(s) with the lowest hot water demand could be left completely in the cold.

Tankless units should be sized based on a household's required hot water flow and the temperature rise required for the fixture with the largest demand. Key specifications that apply to tankless water heaters include:

1. Energy input
2. Temperature rise attainable for a given flow rate, or maximum flow rate for a given temperature rise

When comparing models, be aware that manufacturers often list these variables differently, which can make it challenging to easily compare products. For example, while one manufacturer might list the flow rate of a model given a 100°F temperature rise, another might list the flow rate given a 70°F rise.

Green Tips:

- Purchase a unit with an electronic ignition
- Don't lengthen your showers since you have "endless" hot water

Green Building Guidelines References

Tankless water heaters may correspond to specific measures, points, or credits in various Green Building Guidelines and Rating Systems:

Home Remodeling Green Building Guidelines (Build It Green)

F3 – Upgrade Standard Water Heater to $\geq .60$ EF or greater

LEED-H Rating System (U.S. Green Building Council)

EA7 – Water Heating

LEED-NC Rating System (U.S. Green Building Council)

EA Credit 1 – Optimize Energy Performance

To learn more about these [Green Building Guidelines & Rating Systems](#), visit:

www.builditgreen.org/guidelines



Resources

Tankless Water Heaters (U.S. Department of Housing and Urban Development):

www.toolbase.org/Technology-Inventory/Plumbing/tankless-water-heaters

Demand Water Heaters Consumer's Guide (U.S. Department of Energy):

www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12820

Energy Cost Calculators (U.S. Department of Energy) - estimate the energy cost savings from buying a more efficient product:

www1.eere.energy.gov/femp/procurement/eep_eccalculators.html

Federal tax credits - save money on high-efficiency products:

www.energytaxincentives.org/consumers

For current product, manufacturer, and supplier information, search the Green Product Directory: www.builditgreen.org/products.

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This program is funded by California utility ratepayers
under the auspices of the California Public Utilities Commission.