

## FACTORS IN CONSIDERING THE SUITABILITY OF DEMAND - TYPE **WATER HEATERS**

### **INTRODUCTION**

Heating water accounts for up to 30 percent of the average home's energy budget. Conventional domestic hot water (DHW) heaters rely on storage tanks to meet service demands, but maintaining the reserve hot water supply can contribute to standby energy losses. Generally the standby losses are significantly lower for larger families that use a lot of hot water (90 gallons per day or more) and somewhat higher for smaller families that use less hot water (50 gallons or less).

Gas-fired tankless DHW heaters (also known as demand-type DHW heaters) have the potential to save household energy costs because they supply hot water very rapidly by use of high-powered gas burners which transfer heat to water running through a heat exchanger. On-demand supply of hot water eliminates standby losses because there are no hot water storage tanks. Unfortunately, according to an article by Consumer Reports, the average annual energy savings for tankless DHW heaters for typical households may not payback on a life-cycle basis due to their high initial equipment and installation costs.

Tankless DHW electric water heaters are not evaluated here because they cannot supply hot water fast enough to replace conventional water heaters in a typical residential scenario if groundwater temperature is low. Therefore all reference to tankless DHW heaters below are the gas-fired burner type.

### **PROS AND CONS OF DEMAND – TYPE (TANKLESS) WATER HEATERS**

- Tankless water heaters do not have standby energy losses and are 22 percent more efficient than storage water heaters (on average) as long as there is electronic ignition rather than a standing pilot light.
- Tankless water heaters average life expectancy is 20 years compared to 15 years for gas-fired storage models.
- Tankless water heaters cost substantially more to purchase and install compared to gas-fired storage water heaters.
- Tankless water heaters cannot supply enough hot water for multiple high-volume uses at once.

- Tankless water heaters sometimes give inconsistent water temperatures, such as the so called "cold water sandwich" which occurs in pipes between "old" and "new" hot water cycles. Another shortcoming is that very small hot water demand may fail to activate the gas burner.
- Tankless water heaters use electric controls, as such they cannot provide hot water during power outages.

### **WHAT ARE HYBRID TANKLESS-STORAGE WATER HEATERS?**

This is basically a demand-type water heater (made by A.O. Smith and others) that features a relatively small "buffer" storage tank. The buffer tank eliminates two annoying performance issues associated with tankless DHW heaters. The buffer tank always has some stored hot water to deliver right away so the user never experiences the dreaded "cold water sandwich" while in the shower. The buffer tank also eliminates the aforementioned problem of burner activation failure for small water demand. This unit reaches an impressive 90% thermal efficiency because it is designed to capture waste heat from a secondary heat exchanger from heated flue gas which is then routed back to the buffer tank. However the remaining aforementioned pros and cons relative to tankless DHW heaters would also apply to the hybrid tankless-storage DHW heaters.

### **ARE TANKLESS WATER HEATERS MORE SUITABLE FOR INSTITUTIONAL AND COMMERCIAL APPLICATIONS?**

Many schools have domestic hot water requirements that are distinct from typical households. Households can have scenarios that involve multiple, simultaneous hot water demand requirements (shower, dishwasher, clothes washer) and where the hot water appliances and devices are in close proximity. This scenario usually favors a whole house conventional DHW heater with a storage tank to ensure that a relatively high volume of hot water is supplied without interruption.

In contrast, consider a small elementary school which features several small classroom buildings with hot and cold water supplied utility sinks, and separate portable restroom buildings with hot and cold water faucets. Assume that the classrooms and restrooms have little space for a dedicated conventional water heater. Here, the installation of dedicated tankless DHW heaters might prove a viable solution given the following situation. 1) Space is too restricted in the portables for bulky hot water tanks, 2) Hot water demand is low volume and from a single source and 3) Hot water demand is widely separated in several buildings. Here the installation of several very compact point-of-use tankless DHW heaters could prove a more feasible and cost-effective design solution compared to piping hot water to several buildings from a remote central DHW heater.

## SUMMARY

Consumers should carefully consider installing tankless DHW heaters. While the later can offer better energy efficiency without standby energy losses, they do not perform as well as conventional systems with storage tanks if multiple hot water demands are needed at the same time. For most households, either the conventional water heater or the hybrid tankless-storage DHW heater is probably a better choice. The use of tankless DHW heaters may be preferable in settings that are remote, have space restrictions and have smaller point-of-source hot water demands.



## REFERENCES & RESOURCES

*Consumer Reports* [www.consumerreports.org](http://www.consumerreports.org)  
"Tankless Water Heaters, They're Efficient, But Not Necessarily Economical"

*U.S. Department of Energy* [www.energy.gov](http://www.energy.gov)  
"Tankless or Demand-Type Water Heaters"

*GreenSpec* [www.greenspec.buildinggreen.com](http://www.greenspec.buildinggreen.com)  
"A.O. Smith's Innovative Hybrid Tankless-Storage Water Heater"