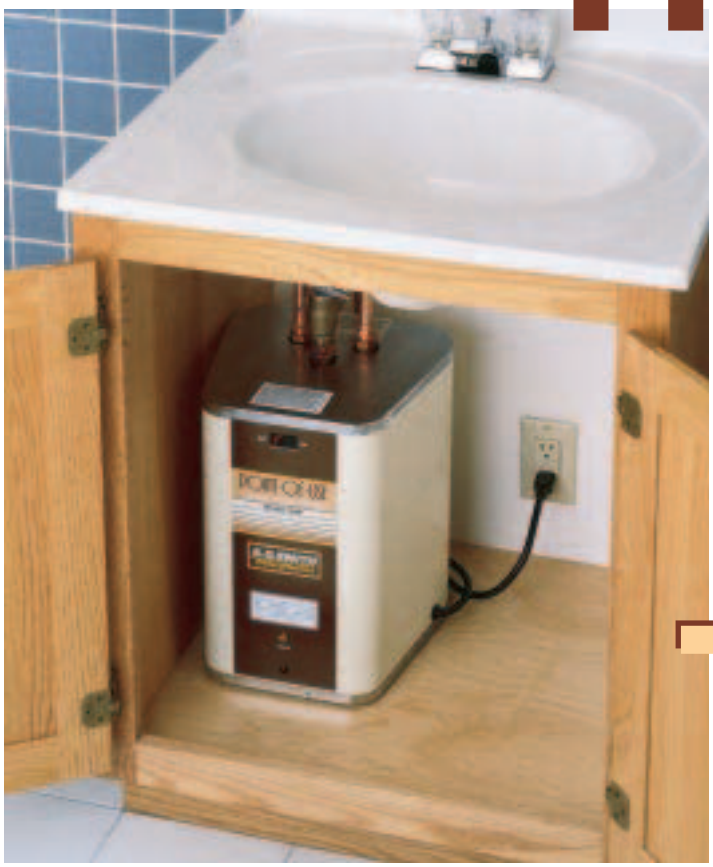
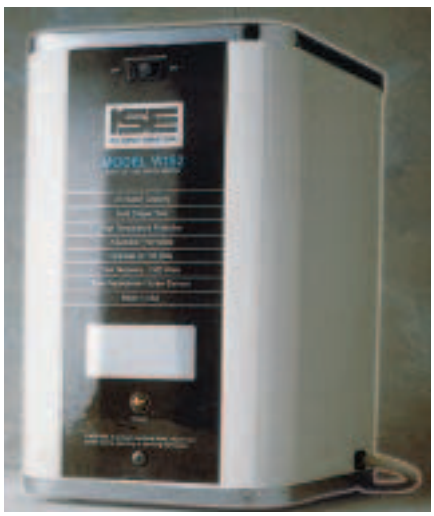
by John D. Wagner

On-Demand Water Heaters



Tankless and point-of-use heaters are an economical way to supply hot water to remotely located sinks and showers



Point-of-use water heaters have a small reservoir (2.5 to 4 gallons) and will fit in a sink cabinet. Most, like ISE's model 152 (left) and A.O. Smith's ELC-2 (above), simply plug into a standard outlet with a 3 1/2-foot cord.

The standard plumbing package for most homes includes a single domestic water heater with a capacity to heat and store between 40 and 80 gallons of water at temperatures up to about 140˚F. While this volume of hot water can easily supply several fixtures and appliances simultaneously, the cost of heating and storing such a large volume of water is high. And while most water heaters are centralized, some fixture groups, such as kitchens or second-floor bathrooms, are located comparatively far away from the heater. This results in long piping runs and a wait of 30 to 45 seconds at the faucet or shower before the cool water standing in the lines is replaced by hot water.

In situations like these, a point-of-use or tankless water heater can be more economical — and sometimes more convenient. Point-of-use heaters use electricity to heat a small reservoir of water (usually between 2.5 and 4 gallons), and will fit in a sink cabinet. Gas-fired tankless and electric instantaneous heaters use no tanks or reservoirs; instead, they heat water as it is used.

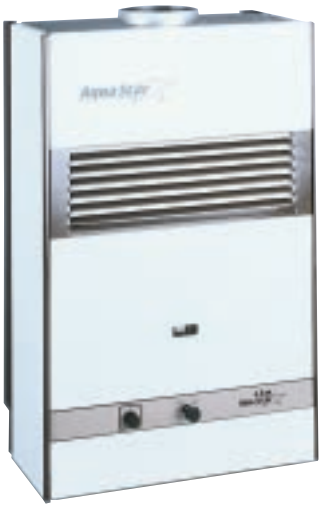
While these on-demand water heaters are generally more efficient, easier to repair, and longer lasting than full-sized storage heaters, they are best used to supplement conventional systems. To fully replace a storage heater would be prohibitively expensive, because it would be impossible to supply sufficient amounts of hot water to more than one fixture with a single heater — and on-demand heaters cost more than twice as much as conventional heaters.

Pros and Cons

The principal selling point for on-demand heaters is their energy efficiency. Unlike conventional tanks, which must maintain temperatures of up to 140˚F in as much as 80 gallons of water, on-demand units heat water as it is used. The amount of energy needed is reduced because the quantity of water heated is smaller and there are no standing heat losses. And with no tank, there is no opportunity for the calcification and alkali buildup that shortens conventional tank life and reduces efficiency.

As for convenience, on-demand heaters supply an "endless" stream of domestic hot water at a temperature of about 105˚F. Flow rates vary between .5 and more than 5 gallons per minute (gpm), depending on the temperature of inlet water — usually assumed to be 50˚ or 55˚F — and heater output. On-demand heaters also save space: Some are as small as a college dictionary, and few are larger than a suitcase.

Drawbacks. On the downside, on-demand systems are more expensive than conventional heaters, and gas-fired models often require upsizing to 4-, 5-, or 6-inch-diameter vents. In addition, all water taps require aerators to limit the flow to 1.5 gpm. Otherwise, users will draw too much water too quickly. And because on-demand heaters provide less hot water at lower temperatures than conventional heaters, standard antiscald valves must be fitted with special "tankless" parts. The standard antiscald valves are made for higher flows and admit too much cold water in tankless setups. Whole-house water filters may also be required if water quality is lacking, since impurities can clog heating coils.



Aquastar units increase efficiency with a "modular heating" feature. Instead of being either fully on or fully off, the expansion and contraction of a rubber diaphragm adjusts the height of the gas flame to the volume of water being drawn.

Most important, on-demand heaters require a change in water-consumption habits, something your clients may resist. Most homeowners are accustomed to using more than one hot-water appliance at a time, which demands a relatively high house-wide flow of ready hot water. For example, a shower demands 2.5 gpm of water at 120˚F to supply a 3 gpm flow at about 104˚F; washing dishes demands an additional 2.5 gpm. Most conventional tank water heaters can easily supply enough hot water for both activities, and once the hot-water reservoir is exhausted, most homeowners don't mind waiting 30 or 40 minutes till it reheats. But domestic-sized on-demand heaters cannot supply water at such high volumes (unless two or more are hooked in tandem), which prevents users from using two or more hot-water appliances simultaneously.

To counter this perceived inconvenience, most on-demand heater manufacturers point to savings from energy efficiency. Estimates vary from $100 to more than $450 per year, depending on the type of on-demand heater and the type of conventional heater it replaces.

Hot Water by the Cup

For occasional use, several manufacturers make electric instantaneous hot-water dispensers that are small enough to fit in the kitchen sink cabinet and plug into a standard duplex receptacle. Most come equipped with a 1/2-gallon reservoir and with an integral spout that mounts in the sink deck or countertop. Although some models can also supply cold and warm water, most dispenser thermostats are adjustable between 140˚ and 200˚F, and most models can produce from 40 to 60 cups of 190˚F water per hour. That's hot enough for instant coffee, tea, hot chocolate, and powdered soup, but flow rates are too low — and the water too hot — for general-purpose use. In fact, many spout handles protect against scalding by springing back into the off position unless held open.

The Sinkmaster Instant 190 hot-water dispenser (also called Quick and Hot) fits under the kitchen sink and has an integral spout. The heater provides up to 60 cups of 190˚F water per hour.

Water Heater Specifications

GAS-FIRED

Manuf.	Model	Btu's (max.)	Flow Rate (gpm/°F rise)	Vent Size (inches)	Dimensions (inches)* hxwxd	Cost**
Aquastar						
	AS80	77,500	2.3/50°F; 1.3/90°F	4	28x12x10	$500
	AS125	125,000	3.8/50°F; 2.1/90°F	5	28x17x10	$600
	AS170	165,000	5.3/50°F; 2.95/90°F	6	36x23x14	$1,000
Bosch						
	W125-K	40,000	1.3/45°F; .6/100°F	4	26x11x10	$458
	WR400-1K	117,000	4/45°F; .5-1.8/100°F	5	31x18x9	$679
Myson						
	CF-324-NG/LP	100,000	3/50°F; 2.15/70°F	5	35x17x11	$748
	DV-325-NG/LP	100,000	3/50°F; 2.15/70°F	12x12	30x17x11	$842
Paloma						
	PH-6D	43,800	1.4/50°F; .7/100°F	4	30x11x10	$660
	PH-12MD	89,300	2.85/50°F; 1.43/100°F	5	36x14x12	$1,117
	PH-24MD	178,000	5.7/50°F; 2.85/100°F	6	41x19x15	$1,614
Vaillant						
	MAG 325	100,000	3.43/45°F; 1.72/90°F	5	34x17x9	$530

ELECTRIC

Manuf.	Model	Power Consumption	Flow Rate (gpm/°F rise)	Dimensions (inches)* hxwxd	Cost**
Chronomite					
	Instant-Temp E90	40a@240v	1/61°F	11x7x3	$520
Controlled Energy					
	Powerstream RP1	40a@240v	.75/84°F	7x13x3	$265
	Powerstream RP3	27a@120v	.5/41°F	7x13x3	$265
Eemax					
	SP3512	29a@120v	.5/48°F	11x6x3	$170
	EX95T DR	40a@240v	.7/86°F	10x9x3	$350

ELECTRIC POINT-OF-USE

Manuf.	Model	Power Consumption	Flow Rate (gpm/°F rise)	Reservoir	Dimensions (inches)* hxwxd	Cost**
A.O. Smith						
	ELC-2	1,500 watts	.116/80°F	2.5 gal.	14x11x11	$206
	ELC-4	1,500 watts	.138/80°F	4.0 gal.	20x11x11	$204
Controlled Energy						
	Ariston P10S	1,325 watts	.133/80°F	2.5 gal.	14x14x10	$179
	Ariston P15S	1,325 watts	.175/80°F	4.0 gal.	14x14x10	$188
Emerson ISE						
	W-152	1,500 watts	.143/80°F	2.5 gal.	14x11x11	$230
	W-154	1,500 watts	.174/80°F	4.0 gal.	20x11x11	$260
Rheem						
	81VP6S	3,000 watts	.136/100°F	6.0 gal.	16x16 (ht. x diam.)	$205

* Rounded up to full inches. ** Suggested retail. Supplier pricing will vary.

But each system is unique, and initial purchase and installation costs vary, so payback may not be realized for several years. Payback for an on-demand system may be greater, however, if the temperature of the conventional heater has been set at 120˚F or higher to increase the supply of hot water. And the lower temperatures of on-demand heaters reduce the danger of scalding, a leading cause of injury to children in the United States.

Given these limitations, you should alert your clients to the need to adjust their water-use habits to accommodate the lower flows, and to not demand hot water from more than one source at a time. Otherwise, you'll hear complaints that there is "never enough hot water."

Installation

On-demand water heater systems can be troublefree, providing you avoid several common problems.

Venting and clearances. Chimneys may need to be upgraded to prevent blocking. Otherwise, backdrafting may create a carbon monoxide buildup that shuts down the heater and creates a health hazard.

Most gas-fired on-demand heaters also require 4-, 5-, or 6-inch-diameter vents, instead of the standard 3-inch vents used with conventional systems. Since the larger vents may not be readily available at the local plumbing supply house, order well ahead of time.

For retrofits, you may also have to build a chase for the larger vents. Not all gas-fired on-demand heaters are zero clearance, and some wall-mounted units require a 1/4-inch-thick 4x20-inch flat steel mounting plate. Take these extra costs into account.

Combustion makeup air. The large fuel consumption of gas-fired on-demand heaters requires substantial amounts of makeup air. You need a free flow of 50 cubic feet of makeup air for every 4,000 Btu of burner capacity. For example, a tankless heater burning flat out at 125,000 Btu requires more than 1,560 cubic feet of makeup air. That's no problem in a typical basement, but a closet installation must have a louver door.

Gas and water line sizing. Standard 3/8- and 1/2-inch gas lines are inadequate for gas-fired on-demand heaters: Most require 3/4-inch gas lines. It takes about 40,000 Btus per minute to supply hot water for typical domestic use, and it is essential that the gas pressure be consistent. A 10% pressure loss in gas supply will reduce burner output by 13,000 Btu. Since the water is being heated only to about 105˚F (instead of being overheated, then tempered with cold water), gas pressure is crucial.

Installation costs. Expect a standard installation to cost 15% to 25% more than a storage heater. Add to that the cost of chimney upgrades, new gas lines, or new filters. ■

Contributing editor John D. Wagner writes frequently about construction topics from his home in Montpelier, Vt. Thanks to Craig Renaldi of JCR Plumbing and Electric in Everett, Mass., for help with this article.

Sources of Supply

Anaheim Manufacturing
Sinkmaster
4240 E. La Palma Ave.
Anaheim, CA 92807
800/854-3229
Circle #17

A.O. Smith
600 E. John Carpenter Freeway
Irving, TX 75062
214/719-5900
Circle #16

Astravan Distributors Ltd.
123 Charles St.
North Vancouver, B.C.
V7H1S1, Canada
604/929-5488
Bosch
Circle #18

Chronomite Labs
1420 W. 240th St.
Harbor City, CA 90710
800/447-4962
Circle #19

John Condon Co., Inc.
1138 Poplar Place South
Seattle, WA 98144
800/824-7337
Bosch and Paloma
Circle #20

Controlled Energy Corp.
Fiddler's Green, Box 19
Waitsfield, VT 05673
800/642-3199
Circle #21

Eemax
472 Pepper St.
Monroe, CT 06468
800/543-6163
Circle #22

Emerson
4700 21st St.
Racine, WI 53406
414/554-5432
In-Sink-Erator
Circle #23

Myson
9911 Horn Rd., Suite 100-A
Sacramento, CA 95827
800/456-3761
Circle #24

Rheem Manufacturing Company
P.O. Box 244020
Montgomery, AL 36124
334/260-1500
Circle #25

Vaillant
2607 River Rd.
Cinnaminson, NJ 08077
802/225-1770
Circle #26