

Improve Energy Efficiency with Desuperheaters

Builder Guide



DESCRIPTION

Desuperheaters save homeowners money by providing free water heating whenever the central air conditioner is operating. A homeowner may not be aware that a desuperheater is there, but they will notice lower summer electricity bills. A desuperheater, or heat recovery unit (HRU), takes heat from air conditioning equipment that would normally be rejected to the outside, and uses it to heat the water in the hot water heater. Thus, a desuperheater only works when the air conditioner is running.

Three types of desuperheaters are commonly available. **Active** systems use a small pump to circulate water from the hot water tank, through a heat exchanger, and back into the water heater tank (see diagram.) Active systems are typically installed inside, somewhere close to the outdoor condensing unit.

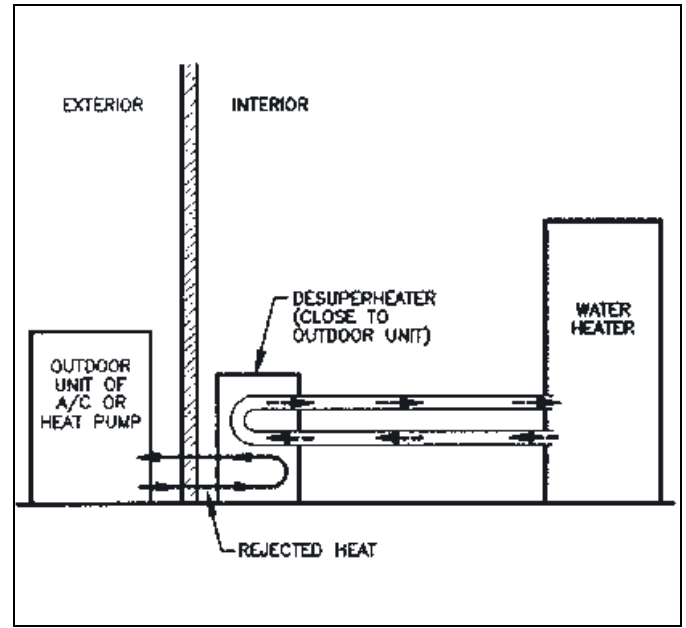
Passive, or thermosyphon, systems use natural convection to move cold water from the bottom of the water heater tank, through the heat exchanger, and back into the top of the water heater. Passive desuperheaters must be installed adjacent to (below, above, or beside) the hot water tank.

Direct systems radiate heat directly into the water heater. They are installed inside the water heater, through an existing opening in the top of the tank.

Desuperheaters are most effective in cooling-dominated climates where the air conditioning system is on for many hours of the day and the cooling season is long. Desuperheaters are also more cost-effective in homes with electric resistance water heaters, because they are generally more expensive to operate than gas water heaters.

Desuperheaters are an established technology, with a 15-20 year history in residential applications. They are most common in Florida, which has hundreds of

“Active” Desuperheater Operation



thousands of homes with desuperheaters. Installed costs for desuperheaters in new homes ranges from \$400 to \$700, depending on home configuration and model chosen. Retrofit installations usually cost more.



BENEFITS

Look for home buyers to appreciate your attention to detail, capturing otherwise wasted energy for “free” hot water.

Desuperheaters can save money.

Homes in warm climates can get all or most of their hot water almost for free during the cooling season. Desuperheaters typically provide about 5-8 gallons of hot water per hour, per ton of cooling capacity. For a typical 3 ton central air conditioning unit, a desuperheater could provide a full tank of hot water every 3 hours. In moderate climates with above

average electricity prices, HRUs may still be a cost-effective option. Desuperheater savings estimates are shown in the table below, for a typical household and an electric rate of 8¢ per kWh. Savings in bold indicate the desuperheater is cost-effective at an installed cost of \$600; savings in italics indicate cost-effectiveness at an installed cost of \$400. In southern climates, the desuperheater is cost-effective at the higher installed cost. In northern climates like Chicago, the desuperheater is only cost-effective when installation costs are low (\$400) and electricity prices are high (>10¢ per kWh).

City	(kWh/yr)	(%)	Annual Savings
Tampa	1910	40%	<i>\$153</i>
Las Vegas	1410	32%	<i>\$113</i>
Fort Worth	1210	25%	<i>\$97</i>
Atlanta	910	18%	<i>\$73</i>
Raleigh	820	16%	<i>\$66</i>
Washington	790	15%	<i>\$63</i>
Chicago	580	10%	<i>\$46</i>

Source: Lawrence Berkeley National Laboratory. Estimates assume a family of four, 52 gallon electric water heater, and a 3 ton central air conditioner. Air conditioner efficiency is 12.5 SEER in cooling-dominant climates and 10.4 SEER in heating-dominant climates.

Desuperheaters can reduce peak power use.

Desuperheaters keep electric water heaters from operating on hot summer days when the air conditioner is running and electric power is most in demand. For many utilities, peak summer electric rates are higher than the rest of the year, so savings are even greater. In addition, many electric utilities offer incentives for the purchase HRUs.



INTEGRATION

The HVAC contractor installing the desuperheater must be licensed to recover refrigerant.

Since desuperheater installation requires the use of refrigerant recovery equipment, it is important to ensure the contractor is licensed. Depending on local codes, a plumber may also be required to connect the water side. The HRU manufacturer's installation instructions should be carefully followed.

Ensure that desuperheater installation will not void the air conditioner warranty.

While most central air conditioner manufacturers honor their warranties following installation of a desuperheater, certain requirements and conditions may be imposed. Consult with the air conditioner dealer prior to installation.

Ensure the desuperheater is equipped with adequate safety features.

In order to operate safely, a HRU should come with the following safety devices: high temperature limit control on the hot water output, avoidance of low condenser pressure in the air conditioner and freeze protection for the water side of the system. Most good manufacturers include such controls in their units.



RESOURCES

- For more information on ENERGY STAR HVAC Program and qualifying equipment, call 1-888-STAR YES.
- Analysis of Air Conditioning Heat Recovery Units*, LBNL-39383, Lawrence Berkeley National Laboratory. Contact LBNL at (510)486-4557 for more information.
- Residential Heat Recovery Installation Guide, 1st Ed.*, Jan 1988. Contact the Association of Refrigerant Desuperheater Manufacturers, Inc. at (305) 671-2612.