

average of 36 gal/day. The HPWH is losing more standby energy than a 30 or 40 gallon HPWH would lose in an average house of this size with one or 1 ½ bathrooms.

Figure 6 shows the HPWH located in a utility closet next to the refrigerator. The HPWH is linked by ducts and transfer grills to the crawl space and the air space behind the refrigerator. When the house thermostat is set to “cooling”, motorized dampers are energized to allow the heat pump water heater fans

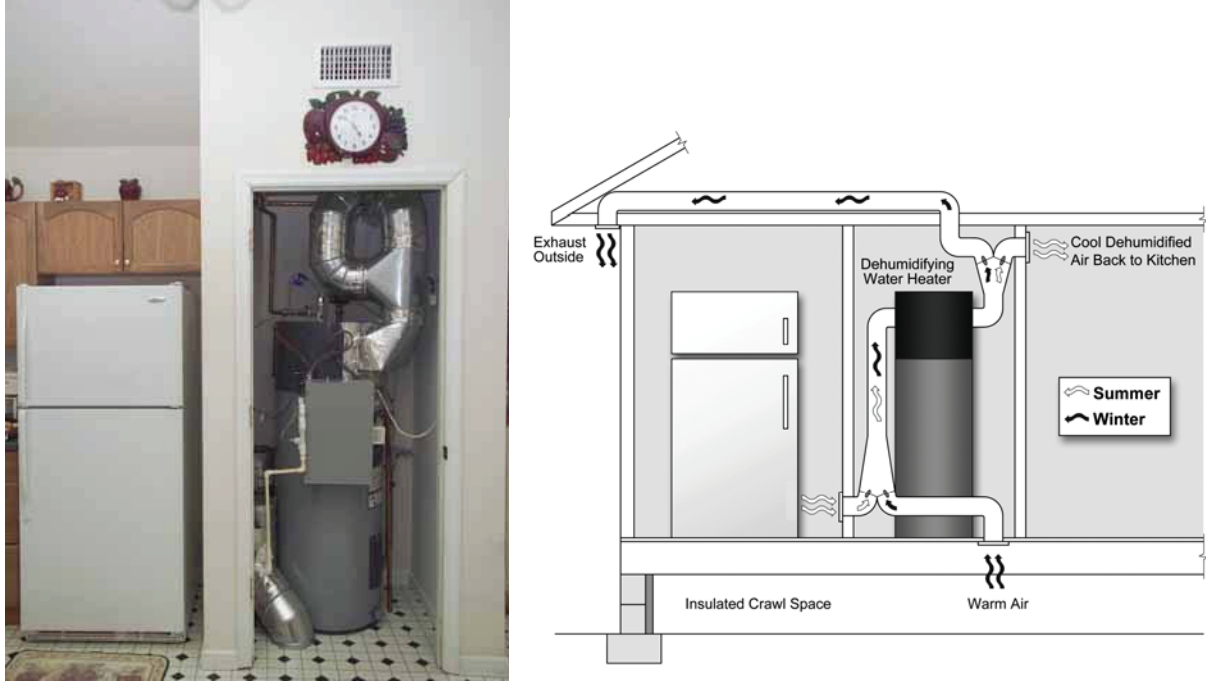


Figure 6 shows a picture of the ZEH2 integrated HPWH with the refrigerator.

to pull air from behind the refrigerator to extract heat for domestic hot water production. The air stream is cooled and dehumidified as it is pushed through the evaporator coil on top of the HPWH and is directed back to the kitchen through the register above the clock in Figure 6. When the thermostat is set to “OFF” or heating mode the duct connecting the HPWH to the kitchen is closed and the duct connected to the crawl space is opened to allow the HPWH fans to pull from the earth-tempered crawl space and reject unwanted cool air to the outside. Taking air from the crawl space avoids stealing valued heat from a conditioned space in the winter. Over an entire year, water heating in this house used 961 kWh. At the rate of \$0.068/kWh this totals \$65.

In December 2003 the homeowner change the HPWH set point to 155°F because they wanted hotter water than the original HPWH set point of 125°F. Even after raising the set point to 155°F the water in the shower was not any hotter; it was then noticed that there was a scorch protector on the shower faucet. This was causing even more cold water to mix with the hot water wasting energy by higher standby losses than necessary. This problem was fixed on February 23, 2004. The thermostat was set by the homeowner at 130°F and has remained at this setting from February 2004 until May 2005. Figure 7 shows that the COP increased to about 2 after the set point was reduced from 158°F to 130°F. The annual reported energy demand for hot water did not include this problem since the performance period quoted above ran from April 1, 2004 until March 31, 2005.