Natural Gas Heat Pumps Offer the Best of Both Worlds

Natural gas heat pumps offer the next generation in energy-efficient space heating and cooling for commercial building applications, such as office buildings, nursing homes, hospitals, hotels, apartment buildings, schools, and retail stores. When used in moderate outdoor temperatures, natural gas heat pumps can deliver significant operating cost savings over conventional heating or air conditioning.

Heat pumps transfer heat from a lower temperature to a higher temperature. This transfer of heat is what happens in a refrigerator or an air conditioner and occurs by circulating a refrigerant through a coil and compressor. Even in winter, there is still a small amount of warm air outside that can be captured and moved inside. During the summer, a heat pump works in reverse to offer cooling. This allows you to use a single piece of equipment for both heating and cooling.

Natural gas heat pumps operate similar to an air-source heat pump, except that, instead of using electricity to fuel their operation, they rely on natural gas, which is highly abundant, domestically produced, and less costly than electricity. They are good for the environment because they don’t use ozone-depleting refrigerants.[[1]](#footnote-1) Another key advantage of a natural gas heat pump is that it can reduce costly electric demand or time-of-use charges. Natural gas heat pumps also reduce the carbon dioxide and other harmful emissions resulting from power generation. Nearly 50 percent of all electricity in North America is generated from the burning of coal, which accounts for 20 percent of the world’s greenhouse gas emissions.

**How natural gas heat pumps work**

Natural gas heat pumps are driven either by an engine or by an absorption cycle. An engine-driven gas heat pump uses an efficient natural gas-powered engine to turn a compressor. The compression cycle turns a low-pressure liquid (refrigerant) into a high-pressure liquid, which then travels to an expansion chamber where it turns into a gas. As it does this, it absorbs heat from surrounding air. Because it can operate in reverse, it can provide both heating and cooling. An engine-driven gas heat pump works the same as an electric heat pump, except that the natural gas-driven engine doesn’t consume electric energy. This offers an operating cost advantage due to lower energy costs and electric demand charges.

Absorption heat pumps use an ammonia-water absorption cycle to provide heating and cooling. An ammonia refrigerant is condensed in one coil to release its heat; its pressure is then reduced and the refrigerant is evaporated to absorb heat. If the system absorbs heat from the interior of a building, it provides cooling; if it releases heat to the interior, it provides heating.

The latest gas heat pump technology on the market uses generator absorber heat exchanger technology, or GAX, which further boosts the efficiency of an absorption unit by recovering the heat that is released when the ammonia is absorbed into the water.[[2]](#footnote-2)

A key advantage in absorption heat pumps is that the evaporated ammonia is not pumped up in pressure in a compressor, but is instead absorbed into water. Because absorption heat pumps heat and/or cool water to condition the space, they offer precise temperature control and enhanced indoor comfort.

**The natural gas advantage**

Case studies conducted by Oak Ridge National Laboratory (ORNL) have shown that the most efficient natural gas heat pumps have a heating efficiency 38 percent higher than a comparable electric heat pump, and that the natural gas heat pump may be 7 percent less efficient in cooling mode. The cost of cooling efficiency loss can be recouped from savings in peak electric demand, which ORNL found could be reduced by as much as 80 percent. ORNL determined that these natural gas heat pumps could cut carbon dioxide emissions by 20 to 30 percent and often pay for themselves through energy savings in four years or less. Gas heat pump systems also qualify for Leadership in Energy and Environmental Design (LEED) certification points.[[3]](#footnote-3)

1. [*http://www.cibsejournal.com/cpd/2010-10/*](http://www.cibsejournal.com/cpd/2010-10/) *and* [*http://www.gasairconditioning.org/heatpump\_how\_it\_works.htm*](http://www.gasairconditioning.org/heatpump_how_it_works.htm) [↑](#footnote-ref-1)
2. [*http://www.energysavers.gov/your\_home/space\_heating\_cooling/index.cfm/mytopic=12680*](http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic%3D12680) [↑](#footnote-ref-2)
3. [*http://www.ornl.gov/sci/btc/apps/gax.htm*](http://www.ornl.gov/sci/btc/apps/gax.htm) *also see page 2 of:* [*http://www.nwcleanair.org/pdf/GHG%20Mitigation%20Grant/RFI\_Responses/CNGC-RFI.pdf*](http://www.nwcleanair.org/pdf/GHG%20Mitigation%20Grant/RFI_Responses/CNGC-RFI.pdf) [↑](#footnote-ref-3)