

## RESIDENTIAL PROPANE APPLICATIONS: HIGH EFFICIENCY BOILERS

### FACT SHEET

*High efficiency propane boilers are lowering costs and adding value to homes across the country. They serve a variety of space- and water-heating applications, allowing today's homeowners to customize their residential energy use.*

High efficiency propane boilers offer efficiency, space savings, and the versatility to provide heating, hot water, and even snow melt. This versatility also extends to the type of heating delivery system propane boilers serve, including hydronic baseboard systems, in-floor hydronic systems, or even forced-air systems where the hot water from the boiler (instead of a furnace) acts as the heat source.

Propane boilers are available in a wide range of heating capacities with inputs reaching as high as 299,000 BTU per hour. Multiple boilers can also be banked together for even greater capacity, redundancy, versatility, and performance. A residential high efficiency propane boiler also takes up little space in the home, whether a floor or wall-hung model.

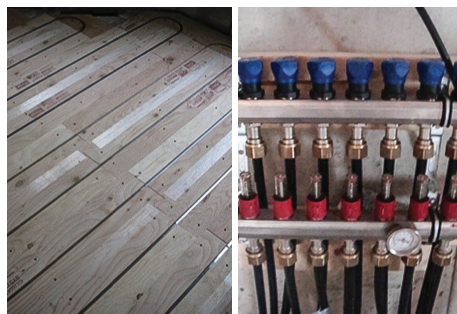
Their ability to supply domestic hot water makes propane boilers ideal candidates for residential installations. Additional end use options for boilers include snow melt systems or separate heating zones in spaces like the garage. Treating these additional applications individually allows homeowners to use them as they see fit, conserving energy while still providing added value.

### PERFORMANCE

New high efficiency boilers are often used to supply hot water to hydronic (meaning hot water-based) heating systems. In-floor hydronic radiant systems eliminate the use of forced-air ducts to distribute heating — which

can waste significant amounts of energy. In-floor hydronic systems are also easily zoned using manifolds, so the homeowner can heat different parts of the home to varying set points — optimizing comfort and saving energy too.

Many homes in the U.S. also use air conditioning for the warmer summer months. With hydronic heating, non-ducted air conditioning options include high efficiency window or wall units or a mini-split system. High velocity ducted central A/C is another option which may be used in climates with more significant cooling loads or larger floor plans.



Examples of in-floor hydronic radiant tubing (left) and a distribution manifold (right).

Propane boilers have an expected lifespan of up to 30 years, according to the EPA, but many boilers can last much longer if serviced and maintained properly. Thus, the initial investment in a hydronic heating system provides long-term value well beyond other heating alternatives.



### APPLICATIONS FOR USE

- New Construction
- Replacements/Retrofits

### AT A GLANCE

- Available in a wide range of heating capacities with inputs reaching as high as 299,000 BTU per hour.
- Additional end use options include snow melt systems and separate heating zones.
- Many Energy Star-rated propane boilers have an efficiency rating of at least 85 AFUE.
- The EPA's "Most Efficient" propane boilers offer up to 19 percent savings over standard efficiency boilers.
- Systems may also qualify for a variety of federal, state, and utility credits or incentives.
- High efficiency propane boilers result in significantly reduced CO<sub>2</sub> emissions compared with those fueled by heating oil.

## ENERGY EFFICIENCY

In addition, propane boilers offer high efficiency and energy cost savings. Roughly 350 propane boiler models qualify for the Energy Star label. This means that the boilers have an efficiency rating of at least 85 percent, as rated by their AFUE. An 85 AFUE rating is actually just the start, as 33 of these boilers are also rated as “Most Efficient” within the Energy Star program — achieving efficiency ratings  $\geq$  95 percent AFUE. By contrast, only six high efficiency oil boilers are listed on the EPA’s “Most Efficient” product listing, allowing a wider range of options for high efficiency propane boilers. “Most Efficient” propane boilers offer up to 19 percent savings over standard efficiency boilers and represent the best-in-class levels of boiler technology.

### Some of the key features in high efficiency propane boilers include:

- Electronic Ignition — meaning no standing pilot light.
- Condensing Operation — which allows more heat to be extracted from the combustion process.
- Sealed Combustion Operation — so all combustion air is ducted directly from outdoors.
- Modulation Operation — which allows the boiler to adjust its output rate.
- Outdoor Reset — letting the boiler adjust its temperature in response to the outdoors, while also improving comfort and reducing distribution losses.

## ENERGY CONSUMPTION & COSTS

High efficiency propane boilers provide energy, cost, and carbon savings in both new and existing homes. As an illustration of these savings, the table below compares a standard efficiency oil boiler [84 AFUE] with an Energy Star “Most Efficient” propane boiler [95 AFUE] in a typical new 2,400-square-foot home. The propane boiler saves about 18 percent in energy costs and reduces CO<sub>2</sub> emissions by 4,000 pounds/year.

High efficiency propane boilers used for space- and water-heating systems may also qualify for a variety of federal, state, and utility credits or incentives. For example a homeowner could receive an energy efficient tax credit from the federal government of up to \$500 for a qualifying new propane boiler. Visit the Database of State Incentives for Renewables & Efficiency at [dsireusa.org](http://dsireusa.org) to see what incentives may apply.

## ENVIRONMENTAL

As the example illustrates, a high efficiency propane boiler results in significant CO<sub>2</sub> emission reductions compared with a heating oil boiler. Even for propane and heating oil boilers of comparable efficiency levels, a 2013 heating systems analysis<sup>1</sup> determined that the CO<sub>2</sub> emissions from a high efficiency propane boiler were 2,749 pounds [~1.4 tons] lower per year than for a high efficiency oil boiler for a new, Northeast home. In that same analysis, the CO<sub>2</sub> emissions for a propane boiler-fed in-floor hydronic system were lower when compared with several other furnace and heat pump systems in the Midwest.

Propane boilers offer environmental value inside the home as well. According to the EPA, poorly designed or maintained HVAC systems can lead to reduced air quality. One benefit of propane boilers heating the home via hydronic baseboard or in-floor heating is the elimination of fans and duct systems which can circulate dust, dirt, and other allergens.

PROPANE SAVINGS IN NEW 2,400-SQUARE-FOOT HOMES

NEW 2,400-SQUARE-FOOT HOME <sup>A</sup> (cold climate)	ANNUAL ENERGY COSTS <sup>B</sup>	CO <sub>2</sub> EMISSIONS (tons per year)
High Efficiency Propane Boiler	\$2,424	8.2 tons
Standard Efficiency Propane Boiler	\$3,419	6.2 tons
Savings from Propane Boiler	\$523	2.0 tons

### Notes:

A. Simulations based on “Energy Calculator” online tool available at [buildwithpropane.com](http://buildwithpropane.com). Simulation used a 2,400-square-foot typical new home located in New York with propane boiler at 95 AFUE and heating oil boiler at 84 AFUE.

B. Energy prices may be entered into the calculator or default prices used. In this example, prices were input with propane at \$2.48/gallon and heating oil at \$4.01/gallon based on the U.S. Energy Information Administration [EIA] March 20, 2013 Heating Oil and Propane Pricing Update — the last EIA report for the 2012-2013 heating season. Available online: [www.eia.gov/petroleum/heatingoilpropane/](http://www.eia.gov/petroleum/heatingoilpropane/).

1. Performance Comparison of Residential Heating Systems: Energy, Economics, Emissions, and Comfort. PERC, 2013. [buildwithpropane.com/html/files/Heating\\_Systems\\_Analysis\\_2011.pdf](http://buildwithpropane.com/html/files/Heating_Systems_Analysis_2011.pdf).

## FOR MORE INFORMATION

To learn more about high efficiency propane boilers and the Propane Education & Research Council, visit [buildwithpropane.com](http://buildwithpropane.com).

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*The Propane Education & Research Council was authorized by the U.S. Congress with the passage of Public Law 104-284, the Propane Education and Research Act (PERA), signed into law on October 11, 1996. The mission of the Propane Education & Research Council is to promote the safe, efficient use of odorized propane gas as a preferred energy source.*