

'Right-sized' heating for low-load homes



The Dettson and IBACOS research project demonstrated that a small-capacity, propane-fueled heating and cooling system can improve comfort and efficiency in low-load homes.

Small-capacity HVAC technology fueled by propane or natural gas offers a solution to the comfort challenges presented by modern, energy-efficient construction.

By Jeffrey Lee

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At a home in Pittsburgh stocked with 300 sensors and a propane-fueled furnace, a research project was underway that could change the way American homes are heated. The subject of the study: In an energy-efficient home, can small-capacity heating and cooling equipment actually improve comfort while saving energy?

It's a question that's taken on added urgency as new energy codes demand that homes have tighter, better-insulated enclosures. Builders and product manufacturers have stepped up their game, exceeding code and reducing the heating and cooling demand for their dwellings. But the heating and cooling technology used to condition these energy-efficient homes has remained largely unchanged.

Furnace manufacturer [Dettson](#) aims to provide a path forward with an innovative, small-capacity propane or natural gas furnace that fits the way builders are constructing their homes today. Rather than the traditional minimum heating capacity of 45,000 British thermal units (Btu) per hour of heat, Dettson's [Chinook](#) furnace line is available with a heating capacity as low as 15,000 Btu/hour, with single-stage, two-stage, or modulating controls.



Builder Doug Tarry poses with the Dettson Chinook furnace, which is available with capacities as low as 15,000 Btu for homes with low heating loads.

Going with low flow

In concert with 2.5-inch-diameter smart ducts, the system meets the need in today's homes for a small-footprint heating and cooling system with lower air-flow rates and longer runtimes, says Marc Chénier, general manager for Dettson.



At its laboratory home in Pittsburgh, IBACOS tested the performance of a heating system that utilized 2.5-inch-diameter ducts for branch runs.

"We see a benefit, depending on the climate zone, of 7 to 10 percent [lower energy use] with longer cycles rather than short cycles," Chénier says. "And reducing the size of the sheet metal ducts will help builders with their floor plans. When you can do away with bulkheads,

it's a better environment for the homeowners and it's less cost to the builder to carry these ducts."

At the home in Pittsburgh, Dettson partnered with building innovation company [IBACOS](#) to test the performance of the system in a 2,800-square-foot home with a highly efficient enclosure.

"We were looking at not only the appliance, but what's the ducting strategy that's compatible with small heating and cooling equipment that can maintain comfort?" says Anthony Grisolia, director of product innovation for IBACOS. Dettson and IBACOS ran a yearlong test, through a heating and cooling season, and used hundreds of sensors to measure temperature and humidity throughout the house, as well as the runtime and energy consumption of the furnace and the static pressure at the air handler.

The results showed a number of advantages of the small-capacity design. "We were able to maintain comfort better than traditional large-capacity heating and cooling equipment," Grisolia says, "and we were efficient, in that the energy consumption of the appliance was as good as any energy-efficient appliance that's on the market today."

The improved performance comes from the longer runtime of the unit. The Dettson furnace can modulate its fan speed and the amount of propane it consumes, so it has a lower airflow than traditional heating and cooling equipment. Rather than spurting large amounts of air into a room and then quickly shutting off, it can maintain a steadier flow of air between all the rooms in a home. "So we were getting better mixing, better comfort, and that helped a lot," Grisolia says.

Reducing the footprint

Although efficiency and comfort are perhaps the most important goals, designing a modern home with a "right-sized" heating and cooling system has a number of ancillary benefits, Chénier says. In the cooling season, longer cycles allow for more dehumidification in humid climates. Lower air flow through the ductwork also creates less noise, a growing concern as indoor noise becomes more evident in tighter homes. In the test home, noise at the furnace was measured at below 50 decibels, while traditional systems run at about 70 to 80 decibels.

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The small-footprint furnace and ductwork can also provide cost savings and standardization in HVAC design. Sheet metal ducts can come in a variety of sizes and often need to be accommodated with expensive and unsightly bulkheads. While the Chinook works with traditional ducts, it can also use the 2.5-inch-diameter ducts more commonly associated with high-velocity cooling systems. In the IBACOS home, the research team used the same small-diameter ducts for the heating and cooling branch runs to every room.

"That makes things simpler in sizing ducts and ordering materials for a builder," Grisolia says. "If you can make it easier for the HVAC contractor and standardize layout and use less SKUs [of ductwork], that should help them build a better home."

While Dettson has been an early innovator in the development of small-capacity heating and cooling equipment, Grisolia predicts that larger manufacturers will soon join the market. Propane and natural gas heating will play a critical role in fueling the equipment that heats the home of the future, he says. "With gas heat, we can modulate it, and it's pretty cost-effective. On the heating side, in my mind, propane or natural gas is the technology that we should strive for."