Novel, inexpensive, high efficiency dual water and space heating system

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EXECUTIVE SUMMARY: the complete report is available electronically at www.consol.ca (Publications link)

Efficiency is a key consideration when chosing new appliances. The cost of upgrading to high-efficiency heating appliances is expensive, from 3000 to 4000 $ (uninstalled price in Canadian dollars) for a high efficiency furnace and from 1500 to 2500 $ for a high efficiency hot water tank. While the initial high cost does pay off over several years, there is an alternative high efficiency heating system at a fraction of the cost: *a high efficiency on-demand water heater to dually provide domestic hot water and space heating for 3500 – 4000 $.*

Appliances that operate continuously — like hot water tanks and boilers — waste energy keeping water hot. Alternatively, hot water can be generated when required using an on-demand water heater system (ODWH). While not common in North America, ODWHs have been used in europe and asia for over 30 years. The technology is proven and robust and, because of their high efficiency and on-demand nature, save money. The Okaloosa Gas District in Florida conducted a study in 2002 and found that ODWHs uses 45 % less energy than hot water tanks (www.okaloosagas.com/ appliances/waterHeaters/waterheatertest.cfm).

This article introduces an advancement to existing heating technology by replacing both the conventional furnace and hot water tank with a high efficiency ODWH. This system employs a single heater in the ODWH to supply hot water for domestic use and to heat air for space heating. Home heating is accomplished by circulating hot water through a fan-coil (effectively a radiator style heat exchanger that replaces the furnace). This combined system has numerous benefits over the conventional appliances:

- without the high thermal stresses of furnaces,
- without the wasteful hot water reservoirs of hot water tanks and boilers,
- with the ability to provide an unlimited supply of hot water,
- with up to quadruple the life expectancy,
- with efficiencies of 80^{+} percent,
- requiring less space and less venting,
- about half the price of separate appliances.

Figure 1. A typical on-demand water heater (Paloma Waiwela PH28CIFS).

The dual heating system presented in figure 2 was installed in an Edmonton bungalow (176 m^2 total), built in 1959, and has performed flawlessly since Fall 2005, successfully providing hot water and space heating even with winter temperatures hovering around –30 °C. Energy usage is 67 MJ/m^2/HDD (HDD = heating-degree day), 39 % of the national average of 170 MJ/m^2/HDD and in the top 15 % of all single-family homes in North America.

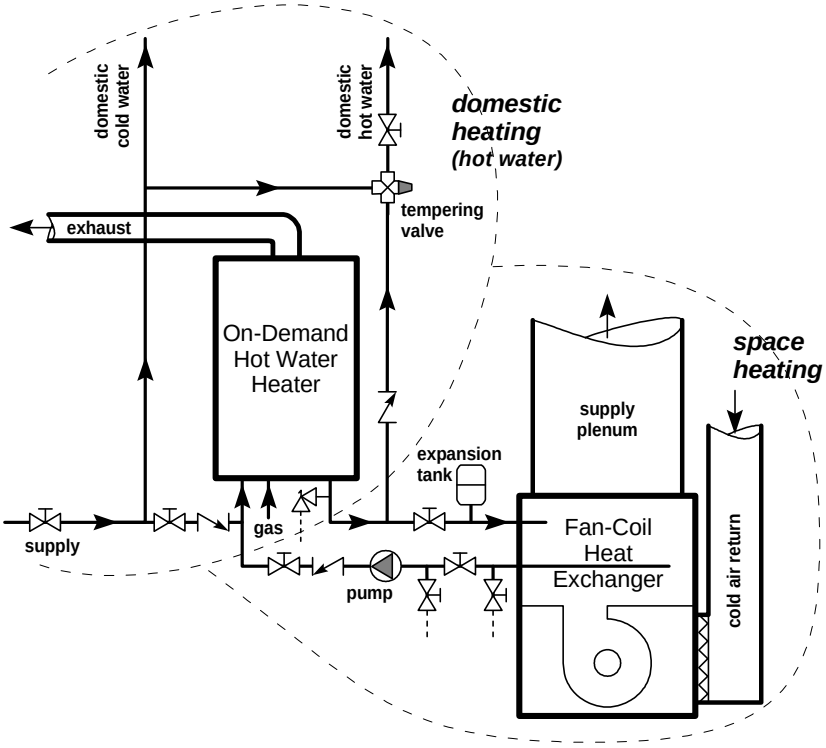

Figure 2. Schematic of the dual domestic hot water and space heating system.

In facilities where more heat is required (very large homes or commercial buildings), additional ODWHs can be added in parallel to supply additional energy.

Full benefits and details are given in the full report available at www.consol.ca.

