GFX heat recovery system installed at CCHT

(Testing Complete)

The GFX greywater heat recovery system works on the premise of recovering heat from shower water. As hot shower water passes down the drain, heat is exchanged with incoming cold water from the water main en route to the water heater. The result is energy savings on the water heating bill.

The GFX system was installed and tested in the Test House in late 2002. For more information on this product visit their website at www.gfxtechnology.com.

GFX heat recovery system installed at CCHT→

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Canada

Natural Resources Canada   Ressources naturelles Canada

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From: **http://www.ccht-cctr.gc.ca/gfx_e.html**

Canada's R-2000 Energy Credits For GFX Compared To U.S. Evaluations

Climate Zone[1]	R-2000 Energy Credits[2] for GFX G3-60	Annual GFX #G3-60 Savings -- Medium Use: 3764 kWh/yr[4]	Annual GFX #G3-60 Saving -- Heavy Use: 6618 kWh/yr[4]	Average Savings Measured by PP&L for GFX #S3-60[5] (kWh/yr)
CZ1	1760 kWh[3]	1696 kWh	3068 kWh	
CZ2	N/A	1507	2700	1660 Max: 2347 (8 showers/day)
CZ3	N/A	1304	2250	
CZ4	N/A	1131	1928	
CZ5	N/A	1044	1730	
U.S. Average	N/A	1280 kWh	2250 kWh	
Canada	Natural Gas: 2,815 kWh = 96 Therm = 9.6 MBtu	N/A	N/A	N/A

1. Canada and Alaska[1] fall within Climate Zone #1 (CZ1), as defined by the U.S. Department of Energy (DOE). These cities & water temperatures typify DOE's 5 Climate Zones: CZ1: Minneapolis -- 45.8 ^{O}F, CZ2: Detroit -- 49.9 ^{O}F, CZ3: NYC -- 57.6 ^{O}F, CZ4: Atlanta -- 62 ^{O}F, CZ5: New Orleans -- 64.9 ^{O}F. They were used in a comprehensive study for DOE on seven types of water-heating systems. (See www.gfxtechnology.com/bundles.html)

2. See Natural Resources Canada's R-2000 Web site: www.oee.nrcan.gc.ca/r-2000/english/.

3. R-2000 Energy Credits computed for a GFX Model #G3-60 feeding preheated water to the water heater and cold supply to the shower with daily hot water consumption of 59 gal @ 131^{O}F; incoming cold water temperature of 49.1^{O}F.

4. See DOE-funded report by AD Little; summarized @ www.gfxtechnology.com/bundles.html.

5. See "**1st Low Income Housing Program By PP&L**" link @ www.gfxtechnology.com/contents.html.

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1. ***R-2000 is also being used beyond the Canadian border. Japan's 2 x 4 Home Builders' Association entered into an agreement in 1990 to use R-2000 technology. The Alaska Craftsman Home Program is based largely on R-2000 as well. Even an organization in Poland is considering R-2000 standards.***

Most recently, the Minnesota Department of Public Service adopted a new building energy code requiring that in 1998, residential buildings must be built to standards that are no less stringent than R-2000 standards. "Our motivation was state legislation mandating that the Minnesota energy code be at least as stringent as the most stringent energy code in the nation," said Bruce Nelson, senior engineer with the department. "But when we looked around, the best we saw was across the border in Canada." The 1989 R-2000 standards are what Minnesota is currently considering; however, as a rulemaking occurs to incorporate specific requirements into state code, the 1994 standards will be considered. Nelson said Minnesota's current standards for insulation are already similar to R-2000, but air tightness and ventilation requirements would represent major changes for the state code.

(Quoted from:"***Canada's R-2000 Standards Get Tougher, Others Copy Older Program Measures***", Home Energy Magazine Online, May/June 1995 @ http://hem.dis.anl.gov/eehem/95/950505.html#95050501)

Test House: Click for the video story from Daily Planet (Oct. 31, 2002)

Home, High Tech, Home

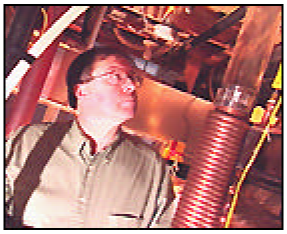
By: EXN Staff, October 30, 2002

Testing for efficiency

Two twin homes on a quiet suburban street are actually a remote lab for the **Canadian Centre for Housing Technology** (CCHT). One of the tastefully appointed houses is the experiment control, while the other serves as testing ground for a whole range of new, energy-efficient technologies.

The control home is set up to consume a typical amount of energy for a four-person Canadian family. Even though no one's living there, four lamps approximate the heat given off by four human residents, and appliances come on and off on their own to equal the amount of energy and water an average family would use.

Next door, in the experimental house, the same kind of behaviour takes place, but specialized energy savers are installed and tested in the basement.



Mike Swinton demonstrates the Shower Heat Recovery System.

One such gadget, the Shower Heat Recovery System, takes the warm water going down the drain and uses it to heat the cold water going up in the copper coils. It's not recycling the water, but the heat, so the person in the shower doesn't need as much hot water.

And in this case, the technology proves its worth in the test house. "What we found was that this system can save between 40 and 50 per cent of the heating required to supply hot water for the shower," says Mike Swinton, the centre's research manager.

Humidity testing: Click for the video story from Daily Planet (Nov. 4,

Hassels with humidity

Even if you don't live in a high-tech home like the CCHT's test lab, there are some lower tech things you can be aware of to make your dwelling place as cozy as possible. First off, keep the relative humidity at a comfortable level.

For tips on this, check out these pages from the Canada Mortgage and Housing Corporation's web site:

Information on humidity in your home

Natural Resources Canada
Ressources naturelles Canada

CANMET Energy Technology Centre (CETC)
Le centre de la technologie de l'énergie de CANMET (CTEC)

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Energy Credits for the Use of Drainwater Heat Recovery System for Houses

The drainwater heat recovery system offers opportunities for reducing the energy loads associated with domestic hot water requirements for a house. The drainwater heat recovery system (DWHRS) consists of a heat exchanger which transfers heat from warm drain water (running from showers and kitchen sinks) to incoming cold water to the showerhead. The estimates of energy credits can be used for meeting the energy target established by R-2000 Standard and/or the EnerGuide for Houses Energy Rating System.

Product Definition

A typical drainwater heat recovery system consists of about 1524 mm long (60"), 76 mm (3") or 101 mm (4") in diameter copper drain water pipe connected to the main drain system. The fresh water supply is connected to a 13 mm (1/2") copper coil. The drainpipe confirms to ASTM B306 and the fresh water is type L tube confirming to ASTM B88 specifications. The DWHRS system is approved for use in Canada with potable water according to ULC file # MH26850. Drainwater heat recovery system comes in various lengths such as 762 mm (30"), 1016 mm (40"), 1220 mm (48") and 1524 mm (60").

The drainwater heat recovery system must be installed as per the manufacturer's installation guidelines.

Criteria for Energy Credits

On the basis of field test data obtained for drain water heat recovery system, the following are standard occupancy and operational conditions used for energy efficiency evaluations:

- four occupants (two adults and two children);
- a temperature set-point of 21 °C for the main floor and 19 °C for the basement;
- consumption of 225 L/day of domestic hot water supplied at about 55 °C; and
- the portion of hot water consumption for showers is about 70%, about 157.5 L/day.

Canada

Steps for Determining Energy Credits

The drainwater heat recovery system can be installed in several ways, including:

- Option 1. Cold water to shower and water heater preheated by the DWHRS
- Option 2. Cold water to water heater preheated by the DWHRS

Energy Credit = 4745 * W * (55-Tw)/(55-9.5) * Heat Recovery Factor * Size Factor

Where,

Tw = local water mains temperature - for simplicity, it is assumed as 9.5 °C.

W = 1.72 kilowatt hours (kWh) or 6.19 megajoules (MJ) for fuel-fired DHW systems

W = 1.075 kilowatt hours (kWh) or 3.87 megajoules (MJ) for electric DHW systems.

Heat Recovery Factor = Depends on the DWHRS configuration. For the option 1, when the cold water to shower is preheated by the DWHRS, the heat recovery factor is 0.345. For the Option 2, when the cold water to the water heater is preheated by DWHRS, the heat recovery factor is 0.269.

Size Factor =
For 1524 mm (60") size factor is 1.000
For 1220 mm (48") size factor is 0.883
For 1016 mm (40") size factor is 0.816
For 762 mm (30") size factor is 0.683

Example

For a 1524 mm (60") DWHRS installed in a house to preheat the fresh cold water supplied to the water heater and the cold supply of the shower, the annual energy credit will be as follows:

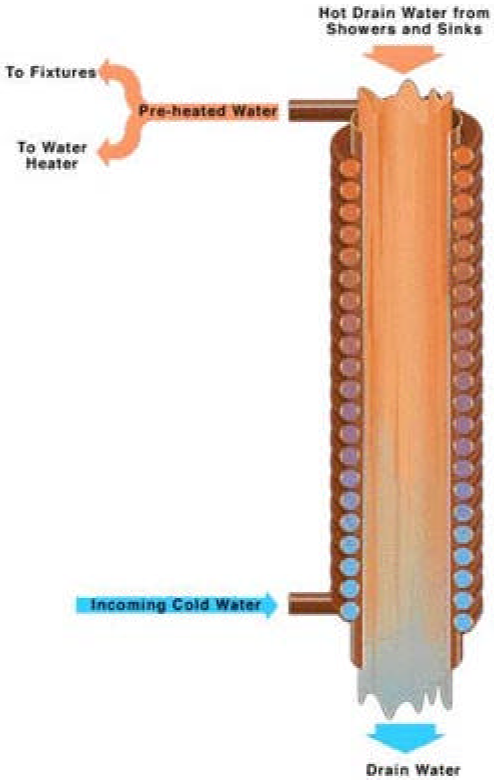
For electrically heated domestic hot water system:
Energy Credit = 4745 * 1.075 kWh * (55-9.5)/(55-9.5) * 0.345 * 1.0
Energy Credit = 1,760 kWh.

For natural gas heated domestic hot water system:
Energy Credit = 4745 * 6.19 MJ * (55-9.5)/(55-9.5) * 0.345 * 1.0
Energy credit = 10,133 MJ = 10.1 GJ

Further Refinement

A full-fledge model is being developed for HOT2000 computer energy analysis software to evaluate energy credits, cost savings and greenhouse gas reductions associated with DWHRS.

Award-Winning GFX Drainwater Heat Recovery Technology Can Upgrade Efficiency & Power of Every Water Heating System Residential - Commercial - Industrial



The Technology

Gravity ***F***ilm heat e***X***changer (***GFX***) technology was developed on a US Department of Energy (DOE) grant to capture heat carried by hot water down millions of drains. According to an A.D. Little report funded by DOE, GFX could reduce residential electric water heating bills an average of 34% with a payback of 1.6-4.6 years @ 8.5-cents/kWh. Much higher savings are possible in commercial applications where larger models can be installed.

The Situation

According to DOE's Energy Information Administration (EIA), electric water heaters provided 45% of US residential water heating needs in 1995. The EIA also estimated that in 1995 residential water heaters in the US consumed 740 billion kWh of energy and commercial water heaters consumed another 320 billion kWh. (1 kWh = 3,413 Btu)

The Problems

Approximately 80-90% of all hot water energy goes down the drain, carrying with it up to 955 billion kWh of energy in the US alone. Efforts to recycle this waste energy have been opposed by many, including the US EPA, which has failed to award an Energy Star label for any water heating or Drain Heat Recovery (DHR) system like GFX to save energy and reduce pollution.

An Award-Winning Solution

It's cost-effective for GFX to transfer over 60% of the heat from drainwater to incoming cold water. Its operation is based upon a natural phenomenon whereby surface tension and gravity create failing water films that spread and cling to the inner walls of vertical drainpipes. The tension is strong enough to cut film speeds to about 1.3-3.9 feet per second and hold their thickness to 12-27 mils at 0.44-3.1 gpm, respectively. This enables very high rates of heat transfer whenever hot water enters a GFX and cold water is rerouted to simultaneously flow up its coil