HYDRONIC ALTERNATIVES HEAT UP IN CANADA

NEW SYSTEMS OFFER INNOVATIVE METHODS TO CONSERVE ENERGY, MAXIMIZE COMFORT

As an increasing number of people look to improve the energy efficiency of their homes and businesses, geothermal and Hydronic heating systems are becoming increasingly prevalent throughout Canada. First used by the Romans, Hydronic heating reduces much of the noise, cost, energy, dust and maintenance associated with other heating solutions such as forced air or electric.

Some Hydronic systems are installed with radiant in-floor heating units, particularly in new construction builds. Using a boiler as the heat source, these systems circulate hot water through a complex web of pipes located inside concrete floors. The energy from the hot water transfers through the concrete and into the room to heat the space.

In-floor heating systems or "radiant" heating systems are known for their sustainable profile and compatibility with renewable energy sources such as solar and geothermal systems. For many users, they are a great alternative to heating systems developed within the last few decades because they use a renewable energy source and improve indoor air quality. However, these systems are also prone to waste energy as they take a long time to heat and cool. As engineers, architects and builders look to further improve energy efficiencies, they are finding new Hydronic heating alternatives that reduce the amount of water and energy required to heat a building. One such technology is Low-H20 radiator technology that is now being implemented into more Canadian construction projects.

FASTER, MORE EFFICIENT HEATING

When the first radiators were manufactured in the 1930s, they were made of steel and took a long time to heat. A traditional 6800 BTU/hr (2000 watts) radiator weighs around 88 pounds (40 kg) and absorbs about 2000 BTU/hr (600 watts) of energy before it starts to emit heat at full power (see figure 1.1).

Over the years, enhancements in both building insulation and radiator technology have led to new innovations, including the Low-H20 system. Compared to traditional radiators, Low-H20 radiators are much more energy efficient, aesthetically appealing and compatible with contemporary building designs. In addition, they can be used in conjunction with condensing boilers, heat pumps, solar energy and other low-temperature systems. While the concept behind Low-H20 technology is relatively new in North America, it is the result of more than 40 years of continuous research throughout numerous European universities. The heat exchange system is comprised of corrugated aluminum plates to maximize the surface area. These plates are evenly separated and held together by a copper tube through which the hot water is circulated. It is based upon the principle of a cross flow heat exchanger, whereby the temperature difference between the water and air is always optimal.

Up to 16 copper tubes can be used in a heat exchanger to maximize output. The increased contact area between copper and aluminum gives optimum heat emission, even with lower water temperatures of 35° C. Since Low-H2O elements are designed to work at cooler temperatures, they allow the condensing boiler to work always in condensing mode.

By comparison, traditional fin tube elements are designed for temperatures of up to 88° C, have more distance between the fins and a smaller surface area on each plate so less heat is produced. In addition, these units are composed of steel which takes much longer to heat.

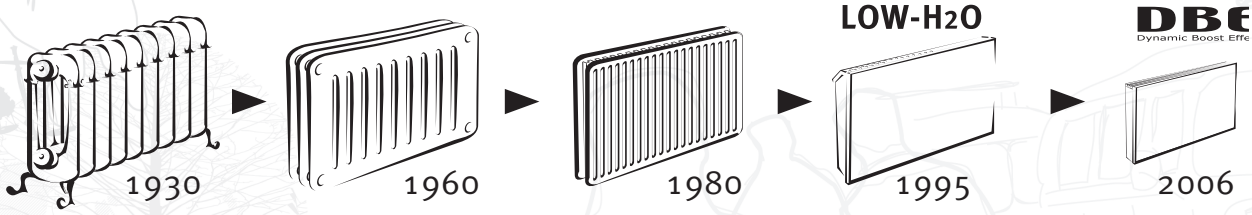


FIGURE 1.1

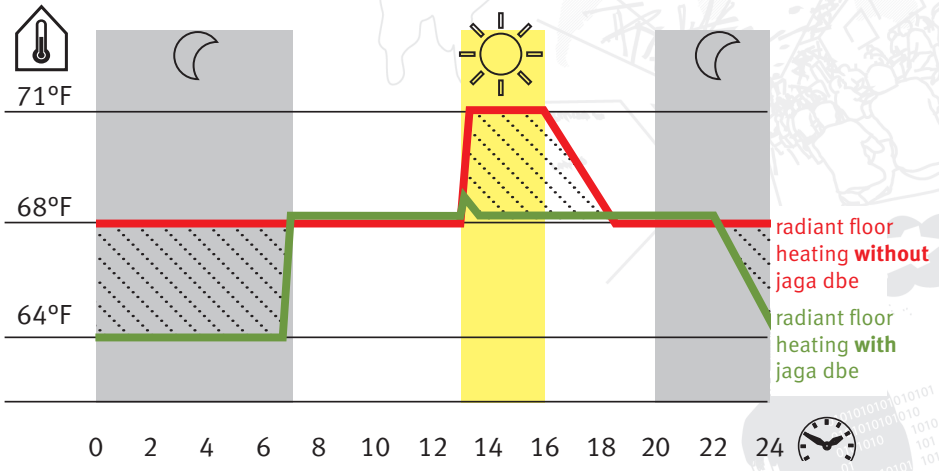
ENHANCED COMFORT

In order to respond quickly, the mass of the radiator has to be as low as possible. The lower the water content and weight, the lower the inertia and the more controllable it becomes. Compared to traditional two-gallon radiators of the 1980s and most in-floor radiant heating systems, radiators equipped with heat exchange technology are better heat conductors and have a lower overall mass.

As a result of its low mass, the overall inertia of the system is lower so it only requires .25 gallons of water to heat. In addition, since the systems only have to heat up 10 percent of the mass of a traditional panel radiator, the reaction time is much faster. Unlike in-floor radiant heating systems, the Low-H2O system is more controllable because it reacts more quickly to the thermostat, enhancing occupant comfort (see figure 1.2).

Due to the many variables that can increase the temperature in a room, it is important to maintain optimal control over room temperature to reduce potential energy loss. Cooking can give off as many as 6800 BTU/hr (2000 watts) and can have a substantial affect on the comfort level of someone in the room. Sunlight that suddenly enters a house through double glazing can add more than 3400 BTU/hr per 11 square feet of glass to a room. Oftentimes, this extra energy literally goes out the window.

For example, if a woman is sitting in



Underfloor heating: room temperature 68°F

DBE convectors in combination with radiant floor heating: the radiant floor heating provides a base temperature of 64°F, while the responsive DBE radiators ensure a perfectly regulated and stable comfort temperature of 68°F. With this combination, **energy savings of 33% are achieved!** *Test conducted in the Jaga Experience Lab (www.heating-studies.org)*

FIGURE 1.2

side a glass-paneled room that uses radiant in-floor heating and the sun is shining, it will gradually increase the temperature inside the room. As the room begins to warm, she will likely turn down the thermostat and open a window so she does not overheat. This results in unnecessary energy loss.

REDUCED ENVIRONMENTAL IMPACT

In a study performed by the Building Research Establishment, a British independent research laboratory, a house with Low-H2O elements annually emits 220 pounds less carbon dioxide than a traditional system. Therefore, Low-H2O has a greatly reduced impact on the environment. If all homes were fitted with Low-H2O the Kyoto Protocol, a United Nation treaty for Climate Change, would immediately be much more achievable.

Hydronic heating systems also benefit the environment since fossil fuels are not being consumed. Using units that are made of fully recyclable materials such as copper, aluminum and steel that have a reduced mass saves up to 90 percent of raw materials compared to traditional radiators. Using radiators with a reduced mass also reduces waste. It is estimated that for every pound in radiator, approximately eight pounds of waste are generated.

A SAFE ALTERNATIVE

In addition to comfort and environmental savings, increased safety is another benefit to Low-H2O technology. Unlike panel radiators, Low-H2O heating is based on convection. This means that heat emission begins long before the cabinet gets hot. The principles of convection heating allow the surface heat of the unit to stay cool, so the maximum heat of the exterior casing is only 43° C and remains safe to the touch even with water temperatures of 88° C. This feature makes it particularly good for use in nurseries, schools, homes for elderly people, health authorities, government departments, leisure centers and public buildings.

Low-H20 also reduces the impact of the heating system on the building's indoor air quality (IAQ). New building regulations have improved the amount of insulation used in buildings. While this can be positive from an energy-savings standpoint, improved insulation can also increase the amount of mold in a building, due to poor circulation. Low-H20 systems reduce the opportunity for mold or condensation to build because it improves the distribution of heat within a room.

A good example of this is with floor-to-ceiling windows. With a radiant floor heating system, the cold air coming off the windows collides with the warm air from the floor. This leads to a build-up of condensation on the windows, which can eventually lead to mold growth.

Low-H20 radiators installed next to the window will help facilitate the flow of heat evenly throughout the room, preventing condensation from developing and improving IAQ.

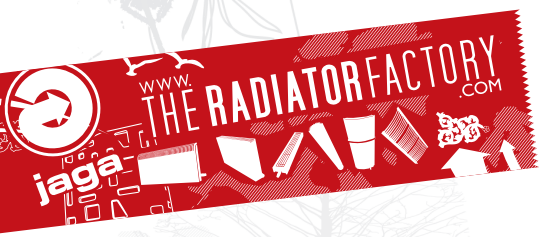
A BUSINESS DIFFERENTIATOR

The demand for green building materials is on the rise. More companies are realizing the impact of the "triple bottom line" on their operations, which includes people, planet and profit. As a result, products and materials that help reduce costs and environmental impact while improving the health of their building occupants will continue to grow.

As Hydronic heating systems become more widespread, architects, engineers and other building and construction professionals will need to identify differentiators that separate them from the competition. Everyone claims to have environmental credentials, but really how green are they? For example, if a heating system makes tenants in an office building so uncomfortable that they don't renew their lease and the space becomes vacant for the next two years, is that a sustainable solution?

Low-H20 technology is new to Canada. By understanding the benefits of low-H20 systems and communicating its impact on costs, energy and occupant comfort to customers, construction professionals can diversify their expertise, giving them an edge on the competition. More importantly, it ensures that buildings are constructed with the most sustainable heating technology available.

By Chris Heerius, executive director of Jaga Climate Systems. For more information on low-H20 technology, please go to www.jaga-canada.com.



More Information:

Jaga Canada Climate Systems Inc.
University Ave. E.
Suite 4A
Waterloo, Ontario N2K 3M7
Canada

E: info@jaga-canada.com
W: www.jaga-canada.com

Cyrus Kangarloo P. Eng.
Western NA Operations Manager

T: 604 355 6262
E: ckangarloo@jaga-canada.com

Alex Naja Jr. Eng.
Eastern NA Operations Manager

P. 514 240 0703
E. anaja@jaga-canada.com