E-Notes

Energy Efficiency Notes

Reducing Energy Use for Potable Hot Water

Background

Potable hot water use in buildings includes the hot water used for wash basins, showers, baths, dishwashers, clothes washers, cleaning, and other uses. The energy used for producing hot water is often the second or third highest consumer of energy in Saskatchewan buildings.

Wise use of hot water involves both **efficient heating and transport** of the hot water, as well as **efficient water using devices.**

The sketch in figure 1 illustrates a hot water heating system that has been retrofitted for energy efficiency.

Figure 1. A hot water heater system that has been retrofitted for energy efficiency

Efficient Heating of Water

There are a number of technologies that can be used to lower the energy cost of hot water. These include:

a. Conservation technologies - improved tank thermal insulation, heat traps, efficient circulating systems, pipe insulation, and controlling the water temperature
b. Heat pump electric water heaters -- exhaust air, outdoor air source, or ground source
c. Solar water heaters
d. Recovery of heat from condensers of refrigeration systems

Most existing water heaters in Saskatchewan are either natural gas or electric units. Heat pumps, solar water heaters, and heat recovery systems have all been used in Saskatchewan, but their use is not widespread. Under some circumstances, their use can be cost-effective.

This E-Note focuses on conservation technologies for hot water.

The main conservation measures include:

a. **Improved tank insulation.** Most existing hot water tanks have only about one or one and half inches (25 to 38 millimetres) of glass fibre insulation with a thermal resistance of about R 3.5 to R 5.2 (RSI 0.6 to RSI 0.9). Additional insulation can be added to the tank to reduce heat loss. One relatively inexpensive way of adding additional insulation to the tank is to use R20 (RSI 3.5) batts placed vertically around the perimeter of the tank. The batts should be cut in a barrel-stave fashion so as to fit neatly around the tank. Foil backed insulation can then be used to cover the batt insulation. Duct tape backed up with metal wire should be used to hold the insulation on the tank walls. ***It is very important that the air supply to the burners and the air supply to the draft hood of the water heater are not obstructed. Carbon monoxide can readily form if the air supply to the water heater is blocked. As a safety precaution, a carbon monoxide detector is recommended for use with all combustion equipment.***

b. **Heat trap.** The purpose of the heat trap is to reduce the heat loss by convection out of the piping leading to or from the water heater. Heat traps on both the inlet and outlet pipes on the water heater are shown in figure 1.

c. **Improved pipe insulation.** The new Canadian National Energy Code for Buildings recommends a minimum of 25 mm of insulation on new piping systems for water temperatures between 41 and 60°C. Higher insulation levels can often be justified.

d. **Timer on the circulation pump.** In commercial, industrial, and multifamily buildings, a circulation pump as shown in figure 1 is often used to distribute hot water throughout the building, and to reduce the length of time for hot water to reach the taps. In buildings which are not occupied 24 hours a day, the circulation pump does not have to run continuously. A timer on the circulation pump motor can be used to provide circulation of the hot water only when the building is occupied. By running the pump only when the building is occupied, the heat loss from the recirculation piping is avoided. The life of the pump will also likely be extended. Battery backed clock timers that will control the pump using either daily or weekly schedules are available.

e. **Limiting the water temperature.** To avoid legionella contamination, the hot water temperature should be greater than 50°C (122 °F); to minimize scalding, the temperature should be less than about 60°C (140 °F). Lower water temperatures reduce the standby heat loss from the storage tank, and also the losses from the circulation loop pipes.

f. **Avoiding Pilot lights.** A typical natural gas pilot light on a small water heater will use about 8 million Btu per year (8 Gigajoules). Choose a water heater that does not use a pilot light. If the water heater is not used for part of the year in a building such as a seasonal hockey rink, the pilot light can be turned off for the summer months.

g. **High efficiency water heaters.** The most efficient natural gas water heaters are those that condense the exhaust gases. Although these water heaters are initially more expensive, the incremental cost can often be justified where water use is substantial.

Efficient Water Using Devices

a. **Wash basins** - Spring return valves can be used.

b. **Showers** - Low flow shower heads should be used. The shower head should have a flow less than 9.5 litres per minute. Many older shower heads have peak flows that are double that amount.

c. **Dishwashers** - When selecting dishwashers, choose the brands with the lowest Energuide ratings. The biggest energy use with dishwashers is the water consumption.

d. **Clothes washers** - Front loading clothes washers use considerably less water than top loading machines, and consequently the hot water use is dramatically lowered.