WHITE PAPER – ELECTRONIC THERMOSTATS

Electronic Thermostats: Efficient temperature control for optimal energy and cost savings

The 21st century has seen myriad changes in consumers' mindset regarding the environment, with an increasing emphasis on reducing technological footprints, reduction in burning fossil fuels, and a shift toward eco-friendly devices and technologies. In this day and age of heightened environmental consciousness, consumers expect and demand energy-saving "think green" alternatives that reflect their mindset and financial realities.

As much as 54% of the energy used by Canadian homes is directly related to heating and, because homes are now much larger than they were in previous decades, this figure is continuing to rise. This, in addition to the fact that more electrical devices are being used in the home than ever before.

Energy efficiency is top-of-mind for homeowners wishing to upgrade their existing system to a state-of-the-art alternative, as well as those considering new construction. Electronic thermostats offer several important heating system advantages over bi-metal controls which were the gold standard at the time they were introduced, but have now been replaced by devices promising a greater measure of efficiency and convenience.

Bi-metal thermostats: Facts and figures

Mechanical bi-metal thermostats are less energy efficient and practical than their electronic counterparts for a variety of reasons:

First, the amount of hysteresis, or temperature swing is known to be +/-2 degrees F, and may actually be as high as 3 or 4 degrees F. According to ASHRAE, a person can detect a temperature swing of 2 degrees, prompting them to continually adjust the temperature, which is inconvenient and results in increased energy consumption as the temperature set may be above or below the desired level.

Second, a line voltage control the heat sink (metal casting or stamping) may be adversely impacted by higher or lower amperage loads on the heating system. Maximum amp load could give a false heat to the bi-metal plate and cause early cycling, possibly resulting in a cold room requiring the control to be adjusted. Too low an amperage and the unit may delay its cycle period and cause temperatures in the rooms to exceed the desired set point.

Third, over time the bi-metal control degrades in performance and causes material stress with even greater swings in temperature, given the fatigue of the bi-metal plates.

Electronic thermostats: Advancing to leaner and greener heating systems

Today, digital electronics form the basis of heating and cooling technology, offering proven advantages in commercial and residential settings.

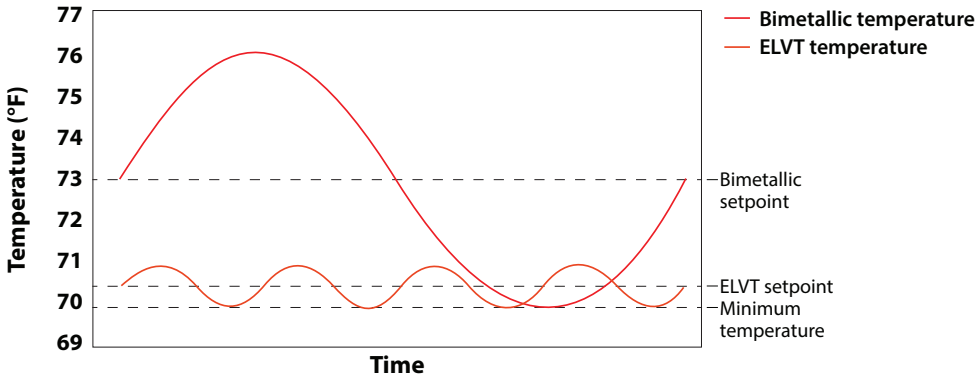
Programmability

Single and multiple programming electronic thermostats offer a practical solution to rising heating bills: With the ability to program temperature controls depending on the time of day, lowering the thermostat temperature 4.5 °C (8 °F) once in the day and once at night translates to a savings of over 30%.

Tests performed by Hydro Quebec, Ranco Controls and the Electric Power Research institute (EPRI) speak to the improved performance and reduced energy consumption of digital electronic thermostats, both basic and programmable, in the areas of efficiency, consumption, heating uniformity, and economics.

The test findings carried into several areas:

- The performance of the bi-metal thermostat showed a greater than 4 degree swing in temperature
- The electronic thermostat, using a triac and thermistor sensor kept the room temperature within .5 degrees of set point*
- The heater performed at a reduced operating temperature while achieving these set points.*
- Infrared photo imaging demonstrated that the same heater utilizing a bi-metal wall thermostat reflected higher temperatures on the outside wall, as well as in the ceiling area. This was also confirmed by the thermal couple sensors.
- The wattage input or consumption of the test with bi-metal thermostat reflected an added usage of over 10%, and as much as 15%. This was under normal 24/7 operation and without a setback mode.
  Note: Setbacks could be modified or manipulated by human intervention; thus, realized saving may be less than in a controlled test.



(Caption) An additional test was performed by Les Lambert, President of Lambert Engineering Inc., Bend, Oregon in 1997 with similar findings. The diagram above appeared in Home Energy Magazine Online, March/April 1997.

*According to a laboratory test under controlled conditions with a STE302P+ thermostat. Analysis of daily consumption between a fixed set point of 21°C, compared to the preprogrammed mode No.12 with lowering the temperature 4.5°C (21°C to 16.5°C) once in the day and once at night. **A lowering of 4.5°C is the standard used in the test for ENERGY AWARE certification.**

Furthermore, there is a **safety consideration**, both for users and the environment: Older mechanical units contain the highest amount of mercury contained in household objects; digital thermostats help reduce the six to eight tons of mercury deposited in landfills each year. (Richard: Ref. http://visual.ly/5-benefits-having-digital-thermostat-your-home)

Less maintenance: Digital thermostats require less servicing: Because they contain no moving parts, the need for recalibration by a technician is eliminated.

Advancing the science of heating through technologies that meet consumers' needs in commercial and residential environments is the primary concern of manufacturers worldwide. Electronic thermostats have been shown to result in an energy savings of up to 30%, signifying a timely payback on energy dollars with a simple upgrade requiring a nominal investment.