Name(s)	Project Number
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Project Title

Designing an Efficient Home Thermostat (Temperature Controller)

Abstract

Objectives/Goals

My objective was to develop a home thermostat that anticipated temperature fluctuations in advance to control the heater and to test if it was more efficient than a conventional thermostat when used for a radiant heating system.

Methods/Materials

To read the temperature of the subject house, a thermocouple was connected to my computer using an analog to digital/digital to analog converter (ADC/DAC). A program was created to record readings on 5 minute intervals. These readings were used to model the house's temperature. Another program was written that downloaded temperature readings and forecasts from the National Weather Service and took indoor temperature readings. It uses these data to estimate the indoor temperature to turn the heater on or off. To compare the new thermostat with the old, they were run under similar conditions and the standard deviations of the temperatures were calculated.

Results

The designed thermostat created a more stable environment when compared to the original one. It controlled the evening and night temperature very well even though there wasn't much improvement in the stability of the morning temperature with the new thermostat as opposed to the older thermostat .
The standard deviation of the old thermostat was 3.14 F.
The standard deviation of the new thermostat was 2.44 F or 2.37 F not considering extreme outliers.

Conclusions/Discussion

Anticipating the temperature was highly effective because radiant heating systems take 4 to 6 hours after they are turned on to start heating at there maximum rate. The designed thermostat creates a more stable and therefore comfortable temperature. There are many possible improvements to the designed thermostat that could be implemented in the future. A commercial product utilizing this idea is plausible.

Summary Statement

Developed a thermostat that anticipates temperature fluctuations with the help of downloaded readings and forecasts for improved perfomance.

Help Received

Conocophillips engineer Jeff Ruszler provided used equipment. Mother implemented computer's instructions to turn off or turn on the heater at night. Father insulated high voltage connection.