Implementing Heating Systems

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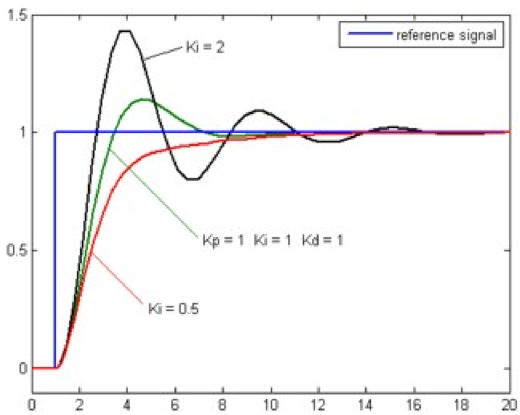
In our four years of existence we've gone from mostly lighting solutions to a stage where we are accepted as reliable enough for heating control. We now have some of our first implementations of underfloor heating under way.

PID control

All systems have a thermal inertia effect. For radiators and air based systems this is very low, as soon as heat energy is stopped so does temperature rise. This has meant that the simple thermostat approach has been acceptable.

Many systems, for example underfloor heating and thermal buffers inertia is high, and therefore there is a temperature overshoot:



The black line showing the most pronounced effect. A room that changes temperature in this way is both wasteful of energy and uncomfortable.

The green line shows the most efficient and fastest acting system.

Solar and Ground Source heating

Ground source heat energy tends to have a different cost depending on two factors:

a) the delta required
b) time of day (or availability of cheap rate electricity)

In essence a heat pump is a delta creator connected to a storage scheme. In some cases the storage schemes are an implementation of underfloor heating, and in other cases vessels filled with water or a phase changing material.

The important factor here is that energy is stored before it is used. For maximum efficiency a system should predict what is needed over a period slightly longer than that of the energy/time storage capacity of the vessel, otherwise waste is inevitable.

This situation becomes more complex when solar energy may or may not be available during the period of use.

A typical system would have:

- Solar (cheapest)
- Ground Source (cheap at night but needs storage)
- Oil/Gas (cheaper than ground source for top-up)

We are promoting ourselves as integrating renewable s. To do this properly we mush be able to determine how much energy has gone into a system from Solar, how long it will last, how much is needed in the next period and what is the cheapest way to fulfil demand.

Therefore we need to be able to:

- Measure energy input
- Know the relative costs and availability of energy sources
- Know the predicted local weather conditions
- Build an estimate of energy requirements
- How long it takes to store and deliver the energy

We ought to be able to keep a record of the decisions made and the effectiveness of their outcomes. This of course leads on to how are we going to present those decisions. There is a link here to the requirements we've had for logging and graphing.