Controlling energy bills

Modern heating controls offer a simple and cost-effective way to keep homes comfortably and, perhaps most importantly, affordably warm. Gareth Ash provides a guide to the options available and how specifiers can optimise the benefits for end-users.

When it comes to improving domestic heating efficiency, replacing an old, out-dated boiler with a new condensing model is often seen as the first step. However, this alone will not necessarily optimise the potential energy savings. The right heating controls can unlock this potential and keep a home at a comfortable temperature without wasting fuel or heat.

According to independent tests carried out in the Energy House at Salford University, installing one room thermostat and thermostatic radiator valves (TRV) to all radiators is essential to achieving the optimum efficiency of most 'wet' domestic central heating systems. In particular, the research highlighted the importance of TRVs to provide satisfactory heat distribution around a dwelling — something that is simply not possible without TRVs, even if the system is balanced.

Optimising efficiency

Energy savings of up to 30% are regarded as the average European saving potential when switching from traditional mechanical radiator thermostats to electronic TRVs. This is based on savings of up to 23% when replacing a +15 years old thermostat with an electronic device, and a maximum potential saving of up to 46% when switching from a manual valve to the latest programmable electronic TRV. This type of sophisticated TRV can be programmed to provide perfectly timed heating, precisely where it's needed, making it possible to control temperature — and energy consumption — room by room.

These advanced heating controls achieve energy savings with features such as open window detection, as well as a two-week holiday function and Proportional Integral Derivative (PID) control. The latter is a highly efficient control algorithm for optimal response and control of room temperature.

Long service life

There are a number of factors to consider when specifying electronic TRVs to ensure consistent performance and a long service life — an important issue for end-users and social housing maintenance teams alike. TRVs work by sensing the air temperature around them and regulating the flow of water through the radiator. It does this by means of a sensor in the TRV head, which is filled with a material that expands as the room temperature rises and contracts when it drops.

A lighter liquid filling will expand and contract more quickly than a heavier material like wax, which is used in some TRVs, and so offers a faster response time.

Another advantage of using liquid in a TRV sensor is greater durability because liquid is less likely to deteriorate over time. The crystals in wax tend to get harder and heavier with constant expansion and contraction, causing a detrimental effect on the TRV's accuracy. This can lead to

Danfoss RASC2 Thermostatic Radiator Valve features a flow selectable bi-directional valve

complaints from tenants and the need for a costly, premature replacement programme.

Chrono-proportional control

Domestic heating systems with a basic mechanical thermostat cannot achieve the full energy-saving benefits of a condensing boiler because the boiler will rarely be running in high efficiency condensing mode with this type of control. Switching to a basic on/off electronic room thermostat can produce a reduction of over 2% in both energy and carbon emissions. However, using an electronic thermostat with chrono-proportional capability provides much closer temperature control and maximises energy savings.

Chrono-proportional control introduces a fixed cycle rate on the system and then uses an advanced control algorithm to determine the duration of the on and off periods within each cycle in proportion to load, increasing both comfort and economy. It offers clear advantages over the other main control types. For example, products with mechanical bellows are slow to react in 'natural convection', making them less effective in maintaining the boiler in high efficiency condensing mode.

Although faster than bellows, an electronic on/off thermostat is slow reacting and is still reliant on natural convection rate. Chrono-proportional control works by ensuring the boiler 'on' time is reduced to a minimum and matching the heat output with the heat loss. This not only maintains the set comfort temperature but also maintains a lower return temperature, keeping the boiler in condensing mode for longer.

There are still far too many social housing properties with either no heating controls or old, ineffective devices. As a result, valuable heat and energy is wasted, and that's bad news for tenants' energy bills and the environment. Properly specified and installed, electronic heating controls are proven to provide accurate temperature control in individual rooms, reducing heating costs and enhancing comfort for residents.

The Danfoss TPOne offers the energy-saving benefits of chrono-proportional control, making it ErP Class 4

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