How to implement boiler sequence control

If your heating system uses a number of boilers, you can save energy and costs by controlling how many fire up at a time.

Boilers lose efficiency when they operate with low thermal load because of heat losses. These could be radiation or convection losses from the hot casing, losses up the flue when the burner isn't firing, or purge losses when the burner starts or shuts down.

Installing an electronic boiler sequence controller means you can regulate how your boilers operate to match the heat load.

The business case

Boiler sequence controllers cost around £700 to install, and how much you could save depends on the size and number of boilers.

Take three 200 kW boilers with combined standing heat losses of around 6kW, for example. A sequence controller could save around half of this, giving an annual saving of 6,000kWh, based on 2,000 operating hours. At a gas price of 2.5p/ kWh (including Climate Change Levy), you'd save £150 and recoup your costs within five years.

The technology

A boiler sequencer is a panel-mounted, electronic control device. Its input comes from a temperature sensor, positioned to measure the temperature of the combined water flow of a multi-boiler installation.

You can buy sequence controllers as standalone devices, or get the same functions through your existing Building Energy Management System (BEMS), if you have one.

The controller has a user adjustable set-point and, once set, it switches successive boilers on and off to maintain the required combined flow temperature.

In new boiler installations, the temperature sensor tends to be fitted in an immersion pocket welded to the side of the heating pipework. Non-intrusive clamp-on sensors can be used with existing installations.

Usually, the controller simply turns the boiler plant on or off electrically. This prevents the boiler from firing, but hot water still circulates through the off-line plant. This means there is still some standing heat loss.

On larger hot water heating boilers (typically above 500kW output), it can be cost-effective to supplement the boiler sequence controller with a motorised isolation valve, fitted to the return water connection on each boiler. When the boiler has been off for a set length of time, the valve automatically closes and lets the boiler go cold.

However, this approach does have some safety and boiler longevity issues, so you should get advice from a specialist controls contractor.

Figure 1 Boiler sequencing control

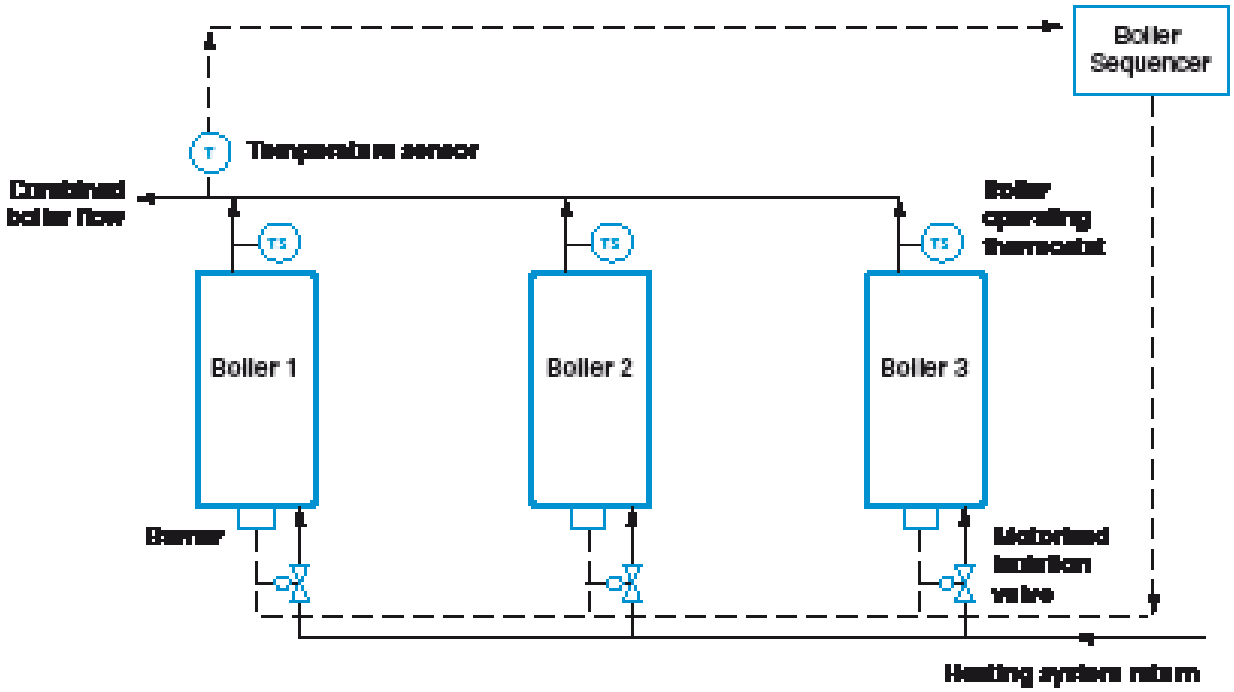

Table 1 Specification checklist

Considerations	Comments
Number of boilers and firing stages to be controlled	Too many control stages (usually more than five) can lead to problems with low flow temperatures at times of full heat load.
Immersion or clamp-on sensor	See Technology section.
Compatibility with the Building Energy Management System	See Technology section.
Are motorised isolation valves needed?	See Technology section.

Applications

You can use boiler sequence controllers in any boiler. The above table outlines the points to discuss with your supplier for two or more boilers connected to a common heating system. They are especially useful in installations that have one or more very high-efficiency boilers, where it's important to ensure the most efficient plant does most of the work – condensing boilers or combined heat and power units, for example.

Specification checklist

The above table outlines the points to discuss with your supplier.

Commissioning procedure

You should use a specialist controls contractor to specify and install boiler sequence controls. During commissioning, they need to show that the controller is doing what you expect of it.

After commissioning, it's a good idea for the boiler plant operator to check regularly that the controller is still operating as it should. Boilers constantly switching on and off in quick succession usually indicate a problem.

Common problems

It's quite common to find sequence controllers performing poorly. The usual cause is that the controller's set-point hasn't been adjusted correctly.

Before the controller was installed, each boiler will have been controlled by its own thermostat. The sequence controller needs to be allowed to take over that function, which entails setting boiler thermostats higher than the set-point of the sequence controller. For a typical low temperature, hot water boiler, the combined flow temperature set-point on the controller would be 80°C, while the individual boiler thermostats would be set at 90°C.

There are special arrangements for boilers with high, low or modulating burners. Check these with your supplier.

Finding a supplier

Boiler sequence controls come under the Government's Enhanced Capital Allowances Scheme. You can see a list of ECA approved sequence controls at http://etl.decc.gov.uk/etl

Specification and installation should be carried out by a specialist controls contractor. You may already know a good contractor; if not, contact the original installer of your boiler control system. Their details should be listed on the control panel or on supporting documents.

For more advice, contact:
Building Controls Industry Association (BCIA)
www.bcia.co.uk