

How to implement condensing boilers

Boilers used for heating have become much more efficient over the last 10 years; largely due to stricter building regulations. These regulations set minimum standards for new and replacement boilers. However, if you opt for an even higher level of efficiency, you could cut your energy bills by up to 30%.

The business case

Companies can usually save between 10% and 30%, depending on the efficiency of their existing boiler.

Take a single, 200kW boiler heating an office with a single-shift system. The boiler uses around 300,000kWh of gas a year. A condensing boiler should save around 10%. With gas at 2.5p/kWh, this would save £750 a year. The extra cost of a condensing boiler would be around £1,500, giving a payback in around two years.

The technology

Boiler efficiency depends on good combustion of fuel, good heat transfer to the hot water and low standing losses (achieved by compact, well-insulated boilers).

Condensing boilers are the most efficient designs available. These use large heat exchangers to extract as much heat from the waste flue gases as possible.

With a large enough heat exchanger, the temperature of the flue gases can be reduced to below 60°C (the point at which the water vapour in the flue gases starts to condense). This releases the latent heat from the water vapour, significantly boosting the boiler's efficiency.

Building regulations now require boiler efficiency to be expressed as a seasonal figure, to reflect the efficiency likely to be achieved over a full heating season.

The best condensing boilers can give a seasonal efficiency of around 90%, compared to around 80% for modern, non-condensing designs. Boilers more than 20 years old have seasonal efficiencies of 70% or less. It's clear that upgrading can bring real savings.

Applications

All heating systems can potentially benefit from high-efficiency boilers, but the biggest savings are usually made on systems with output water temperatures below 50°C. These low water temperatures are only suitable in specific circumstances such as in underfloor heating systems and where weather compensation controls are used.

Condensing boilers are more expensive than non-condensing designs and if you have a number of boilers, it can often be more cost-effective to install just one or two condensing boilers to act as the lead boilers. The rest can be non-condensing types for back-up and peak load top-up.

Specification checklist

The following table outlines the points to discuss with your supplier when considering replacing an older model with a condensing boiler.

Figure 1 Cross-section of a condensing boiler

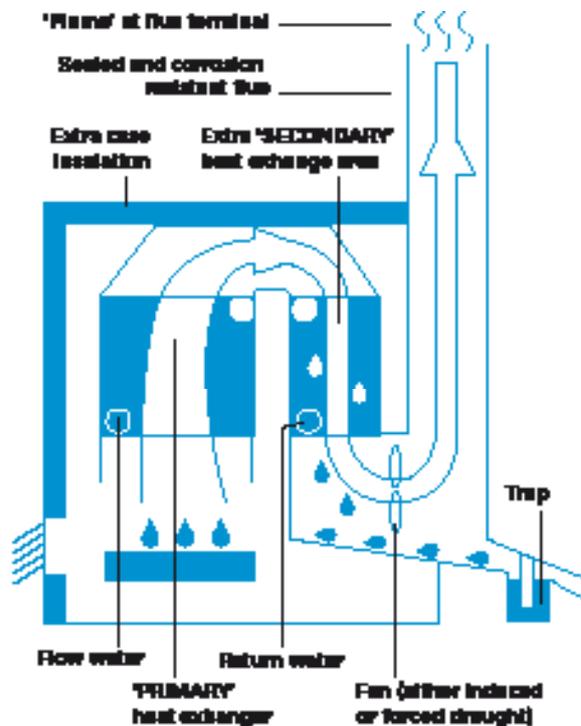


Table 1 Specification checklist

Considerations	Comments
Fuel type	Gas or oil, single or dual fuel capability.
Maximum heat output needed	Expressed in kW. Don't go for more heat than needed, or you'll increase costs and reduce efficiency.
Number of boilers	More than one boiler can be useful for load-matching – allowing only one or two boilers to be operated in mild weather – and to give you a back-up in case of breakdown or maintenance.
Seasonal efficiency	Minimum requirements for each boiler.
Maximum flow temperature needed	Dictated by the heating system design – usually 82°C for radiator and convector systems and around 40°C for underfloor heating.
Minimum return water temperature	Dictated by the heating system design.
Flue arrangements	Including position of terminal, length and height of flue, materials and insulation.
Availability of local drainage	Required for condensing boilers.
Access to plant room	If access is limited, you may need modular boilers that can be assembled on site.
Space available	This could be an issue in existing boiler houses.
Connection arrangements	Connecting to an existing installation could cause some disruption.

Commissioning procedure

For boilers over 500 kW it's almost always a good idea to have the boiler commissioned by the manufacturer. They should:

- confirm water flow rates
- measure combustion efficiency and give you a copy of the results
- give you the commissioning certificate and warranty forms
- provide training to the facilities staff during handover.

In installations with more than one boiler, it's also important to commission the sequence or step controls to make sure the number of boilers operating match the heat load. This is particularly important when one or more is a condensing boiler. In these cases, the sequence controller needs to make sure the condensing boiler always operates as the lead.

Many high-efficiency boilers, because of the compact design and the resulting short internal pipe runs, especially in the heat exchangers, are liable to get blocked if the water going through the boiler contains contaminants in the form of solids. This is applicable to both heating and hot water. All heating systems need to be dosed with water treatment chemicals, and levels need to be tested and maintained regularly. Ask the manufacturer for advice on the chemicals to use and the dosage required.

Common problems

Most problems can be avoided if the boiler is selected, installed and commissioned by a qualified contractor. These are some of the most common issues:

Flue plume – because the flue gases from a condensing boiler are saturated with water and low in temperature, they tend to emit a plume from the flue terminal. While it's not dangerous, it can be a nuisance if too close, for example, to neighbouring windows.

Flue specification – flues for condensing boilers need to be corrosion resistant, free draining and insulated to maintain as much flue gas buoyancy as possible. These requirements limit where boilers can go – basement boiler houses below multi-storey buildings may not be suitable, for example. When the flue is being designed, you also need to take account of restrictions on linking condensing and non-condensing boilers with shared flues.

High pressure drop – high-efficiency boilers, because they tend to be more compact, can have a higher resistance to water flow than older designs. When fitting new boilers into existing systems, you may need to upgrade heating pumps or install dedicated boiler circulation pumps.

Water cleanliness – the internal water passages in high-efficiency boilers are comparatively narrow and can be prone to blockage from water-borne dirt. Flush out the heating system or provide dirt separation facilities when installing.

Finding a supplier

High-efficiency boilers come under the Government's Enhanced Capital Allowances scheme. You can see a list of ECA approved boilers at <http://etl.decc.gov.uk/etl>

High-efficiency boilers should always be fitted by a reputable heating contractor. You may already know of a good contractor; if not, try contacting a recognised trade association or call our advice line on 0800 085 2005.

The Heating and Ventilating Contractors' Association (HVCA)

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