

An often overlooked technology in Australia, condensing boilers are perhaps energy-efficiency's best-kept secret. HVAC&R Nation explores the history of condensing boilers and dispels some popular myths.

CONDENSING BOILERS: OPERATION, BENEFITS AND MYTHS

THE HISTORY

After the first oil crisis in 1973, higher energy prices caused manufacturers to look for solutions to reduce energy consumption in boilers. These solutions included introducing ambient outdoor sensing (where the water temperature of the boiler adjusts to the outdoor temperature) and running boilers at a lower water temperature. The energy losses became smaller and efficiency went up.

During the 80s, when the environment became a topic of concern, manufacturers reassessed the principles of combustion in boilers, leading them to develop the first condensing or high efficiency boiler.

Today, condensing boilers have a range of advantages: they don't heat up the boiler plant room (low radiation losses), hot water is supplied when needed (low stand-by losses) and minimal energy is lost via the flue.

CONDENSING IN AUSTRALIA

The take-up of condensing boilers has just started in Australia, and remains a relatively unknown cost-saving "greener technology".

Most boiler plant rooms around Australia house relatively old equipment. Thirty-year-old boilers are not uncommon and building owners often forget that the older the equipment, the less efficient it is. Maintenance is sometimes neglected – in Australia, there is a tendency to repair rather than maintain a good working plant. In these cases, boiler efficiency is often lower than 65 per cent, and would benefit greatly from an upgrade.

Data from upgraded Australian boiler plants is currently being collated – so far, the numbers are promising and consistent with overseas findings.

HOW IT WORKS

Condensing technology uses "latent" heat from the flue gases, which in turn lowers the temperature of the flue. By doing this, the flue gases emit 90 per cent less CO and 80 per cent less NOx (acid rain) compared to already clean conventional boilers (relative to brown coal and electricity).

Condensing boiler technology works on the principle of recovering as much as possible of the waste heat that is normally rejected to the atmosphere from the flue of a conventional (non-condensing) boiler.

This is accomplished by using an extra-large heat exchanger (double-pass) or sometimes two heat exchangers within the boiler. The exchangers



maximise heat transfer from the burner, as well as recovering useful heat which would normally be lost with the flue gases. A condensing boiler will always be more efficient than a conventional non-condensing one, due to its larger heat exchanger.

BOILER MYTHS

MYTH

They are only efficient when fully condensing.

Not true. Due to its larger heat exchanger, a condensing boiler does not have to condense in order to be more efficient. Typically, a new gas condensing boiler will have a thermal efficiency of between 88 per cent and 92 per cent, compared with a new non-condensing boiler at 78-82 per cent, or an older boiler at 55-65 per cent. These efficiencies are measured at a design temperature of 80°/60° C.

MYTH

They are less reliable.

Not true. This was true with the early models of condensing boilers, but through improvements introduced as a result of this early experience, the components in modern condensing boilers are as reliable as those in the equivalent non-condensing models.

MYTH

They are harder to maintain.

Not true. The only minor difference is the need to ensure that the condensate drain is clear when servicing.

MYTH

They cannot be fitted to existing systems.

Not true. Condensing boilers are suitable for replacing most existing boilers. As with any replacement boiler, the effectiveness of the control system and type of hot water cylinder should be assessed when conducting a site survey.

To avoid boiler problems, a hydraulic separator or heat exchanger is fitted to separate the old from the new.

Consideration should also be given to cleaning and flushing the system before fitting a new boiler. Wall-hung condensing boilers are readily available, with extended fluing options if required.

MYTH

The plume is a nuisance.

Not true. Because the flue gases leaving a condensing boiler are cool, they tend to produce a noticeable mist or plume of water vapour around the flue terminal itself (as it condenses upon contact with the atmosphere), especially under cold conditions. This is not a problem and in fact indicates that the boiler is working as intended. However, consideration should be given to boiler and flue location prior to installation so that the plume will not be too close to neighbouring properties or windows, doors and paths regularly used in the winter.

MYTH

The condensate is a problem.

Not true. With modern systems, only about a small amount per hour of condensate is produced, which has a pH in the range of 3.5 to 5 – about the same acidity as tomato juice. This is carried to a normal sewer drain by means of a simple plastic overflow pipe (as per AS 3500).

It is advisable to introduce condensate treatment in the drain to sewer from the boiler(s) in installations greater than 200kW. This size of system will produce on average around 11L/hr of condensate. ▲

About the Author

Information used in this article was supplied by Hydroheat Supplies managing director Jan Voorham, with information from *Domestic Condensing Boilers – The Benefits and the Myths*, available here: <http://www.west-norfolk.gov.uk/pdf/CE52.pdf>