

How to implement oxygen trim control

Air to fuel ratio is one of the main factors affecting boiler efficiency. Although the ratio is set during commissioning, it tends to drift after a while. Oxygen trim controls ensure the ratio is always at its best, saving you around 5% on fuel costs.

The business case

If you have large, continuously operating boiler plant, you're likely to save at least 5% and recoup your costs in less than two years.

Here's an example. An oxygen trim control system is installed as part of a broader digital combustion control package on a 6,350kg/hr steam boiler at a cost of £20,000. The boiler operates five days a week, 24 hours a day and uses 15,716,000kWh/year of gas.

Trim control gives a 6.4% saving, equivalent to 1,005,824kWh/year of gas and 44,352kWh/year of electricity. At a gas price of 2.5p/kWh, you save £25,145 a year. You save an extra £3,992 on electricity at 9p/kWh.

The extra cost of retrofitting a variable speed drive on the fan would be around £700, and you'd recover this in under a year.

The technology

The air to fuel ratio on your boilers is set during commissioning. Over time, though, this falls away from the optimum because of changes in the fuel's calorific value, changes in the combustion air temperature and wear in the control linkages.

Oxygen trim systems overcome these problems by continuously measuring the free oxygen concentration in the boiler flue – an accurate indicator of the air to fuel ratio. The controller then regulates the air rate to maintain the best combustion conditions at all times.

An oxygen trim control system is made up of:

- an oxygen sensor in the boiler flue
- an electronic controller
- a control device that varies the quantity of air going to the burner. This is usually a server motor-driven air damper or an inverter variable speed drive on the combustion air fan.

Applications

To be cost-effective, oxygen trim control systems are really designed for large boilers of over 500kW output. They can work with natural gas, LPG, oil-fired and dual fuel burners. They give the most benefit on fully modulating burners that decrease the heat output as the boiler reaches its required demand, reducing the number of stop and starts.

Oxygen trim control systems can be fitted on their own, but are now more commonly installed as part of a broader digital combustion control package, sometimes along with new burners.

Specification checklist

These are the points to discuss with your supplier:

- boiler type and rating
- burner type and rating
- fuel type – natural gas, LPG, fuel oil or dual fuel.

Commissioning procedure

The system needs to be commissioned by a specialist, usually the equipment supplier. They will programme the system controller with the best air to fuel ratios for all firing rates.

Common problems

Oxygen trim control systems rarely have problems, but you will need to maintain the equipment, especially the oxygen sensor.

Finding a supplier

Oxygen trim control comes under the Government's Enhanced Capital Allowances scheme. You can see a list of ECA approved suppliers at <http://etl.decc.gov.uk/etl>