CASE STUDY

On-load furnace cleaning using SMART Cannon at RWE npower's coal-fired Didcot power station

The situation

Didcot A is a dual-fired power station, owned and operated by RWE npower. The power station is located in the town of Didcot in Oxfordshire and has been operational since 1970. The station has 4 x 500 MW coal-fired boilers which were modified to burn approx 2% biomass, three of which can also burn natural gas. In 2007/8 the units were fitted with low NOx burners and boiler Over Fire Air (OFA) to ensure the units met the EU NOx emissions targets.

In common with many other boilers Didcot purchases coal on the world market. This in itself can affect boiler performance, but combined with the low NOx burners and OFA system slagging in the upper part of the boiler resulted in a high furnace exit gas temperature which has knock on effects with controlling the steam temperatures in the superheater and reheater.

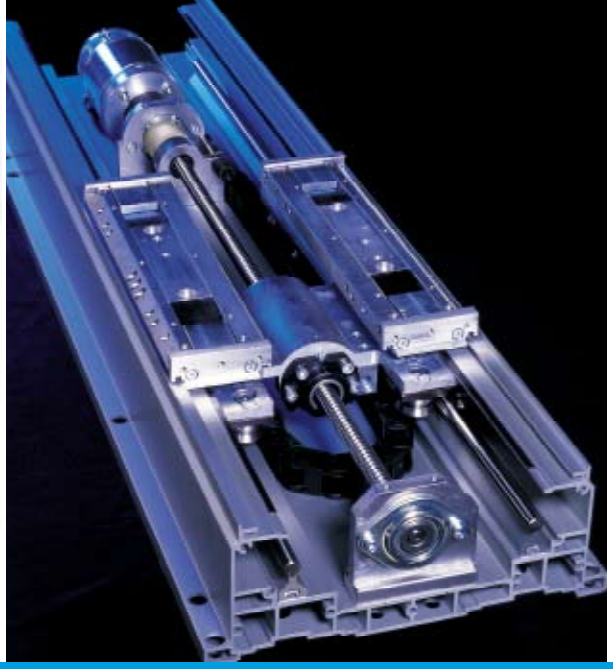
A need was identified to lower the furnace exit gas temperature. This would normally be achieved with furnace cleaning devices which would ensure the heat absorbtion in the furnace. The existing cleaning devices did not cover the upper part of the furnace above the 86 foot level.

Our solution

Clyde Bergemann proposed the SMART Cannon technology designed to reduce slagging in the furnace of the boiler which would lead to a reduction of the furnace exit gas temperature and subsequent decrease in spray water flow rates, opening of the reheater bypass dampers and an increase of reserve margin capacity of the ID (Induced Draft) fan. Burning less fuel to achieve a required heat transfer would also lead to a reduction in CO_2 produced by the boiler.

Fitting the SMART Cannons would reduce maintenance and operating costs by making a proportion of the existing water lance blowers and wall deslaggers redundant. This would allow them to be removed thereby saving money associated with their maintenance, spares and operating (steam/water electricity) costs.

CLYDE BERGEMANN



Increased boiler efficiency with improved heat flux and reduced furnace exit gas temperature

Results

A first set of tests of the SMART Cannon system were carried out on Unit 2 in February 2009 at a load of 450 MW. After furnace cleaning an estimated reduction in the furnace exit gas temperature (FEGT) from 1600°C to 1485°C has been calculated (Fig.1). The X axis shows the SMART cannon areas. From the chart below we see that there is a bigger drop in FEGT when cleaning area 2 on the furnace rear wall compared with cleaning the other areas.

A second set of tests were carried out on Unit 3 in December 2009, the main variations observed following the operation of the SMART Cannons were a drop in the furnace gas exit temperature and attemperator spray water flow rates. The ratio of heat transfer in the reheater convective pass was also improved.

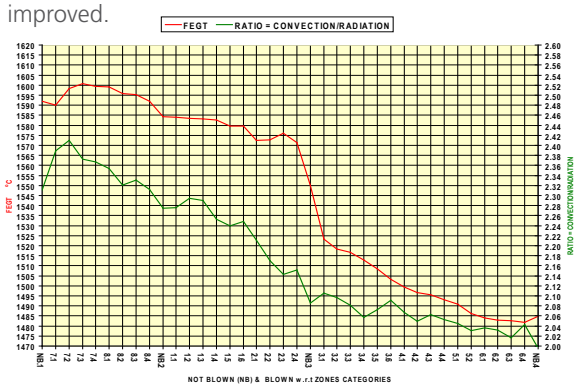


Fig 1: Furnace exit gas temperature against areas of the boiler cleaned

Advantages

- Increased heat absorbtion in the furnace
- Decrease of furnace exit gas temperature
- Reduction of spray water attemporator flows in the superheater and reheater
- Reduction of costs for manual boiler cleaning
- Increased capacity of ID fans thereby reducing the possibility of derating the unit.
- Increased boiler efficiency
- Safe operation and proven performance

SMART Cannon Reference List (extract)

Country	Installation	Fuel	Capacity (MW)	SMART Cannons
Turkey	Soma TPP	HC	4 x 165	32
Germany	Reuter West CHP	HC	2 x 300	24
S. Africa	Kriel TPP	HC	6 x 500	24
Poland	Belchatow TPP	LIG	3 x 370	24
Germany	Boxberg TPP	LIG	900	16
Bulgaria	Maritza East TPP	LIG	4 x 210	16
Russia	Berjozovskaja GRES-1	LIG	800	16
Germany	SaarEnergie Weiher TPP	HC	700	14
Slovakia	Bocamina TPP	HC	370	8

(HC = Hard Coal, LIG = Lignite)

Clyde Bergemann Ltd

47 Broad Street, Bridgeton
Glasgow G40 2QR
Scotland UK

T: +44 141 550 5400
F: +44 141 550 5402

Website: www.clydebergemann.co.uk
eMail: info@clydebergemann.co.uk