



## Reliable valve control – the key to improved efficiency for power stations

**In this article, Exeeco Sales Director Ian Elliott looks at the technological and legislative challenges facing fossil-fuelled power generation facilities. He further explains how the introduction of modern electric valve actuators can help plants improve efficiency and limit emissions.**

In the modern fossil-fuelled power generation industry there are many factors driving the quest for increased efficiencies. Changes in the world's climate and global warming demand reductions in harmful emissions, whilst energy companies pursue the advance of automation,

reduced manpower, quick start-ups and maximum plant utilisation. Taking place against the backdrop of an increased global demand for energy, improved efficiency and automation are important ways of getting more out of existing plants, whilst the need to reduce emissions – carbon dioxide in particular – is asserted by legislation that lays down strict targets.

### **The importance of precise valve control**

Improved efficiency and automation affects all areas of existing power station plant, helping to reduce emissions through improved combustion performance. Emission reduction is further enhanced by the installation of additional specialised plant to scrub or convert exhaust gases. In virtually all these areas, the key to better

performance is reliable and accurate valve control with reduced valve maintenance. In a typical 800MW power station you can find over 1500 actuated valves; a large, modern fossil-fuelled station such as Drax in the UK is five times that size.

In the past it was recognised that the isolation and control of high pressure superheated steam, cooling water, condensed water, hot and cold gases, induced and forced draft air and other power generation elements could be a difficult challenge. Simple on/off electric actuators offered a basic level of control whilst the regulating and modulating elements such as boiler fans were usually controlled by hydraulic and pneumatic actuators with instrumentation comprising electro-pneumatic convertors. It was always recognised however that the simplified control systems associated



with electric actuators were advantageous, especially with the emphasis on automation and remote control. The introduction of economical digital bus protocols such as Profibus – whilst not exclusively applicable to electrically operated equipment – has further re-enforced the argument for electric actuation.

The harsh environment of the power station can soon take its toll. Constant exposure to fluctuating temperatures, dusty and humid atmospheres, steam and water leaks, constant boiler washing and long periods of operation between maintenance shutdowns can have a dramatic effect on reliability.

### Advances in electric actuation

Developments in electric actuator design have improved the situation, particularly the introduction of double-sealed, non-intrusive watertight and dustproof enclosures. Standardised electronic actuator controls and a wider range of torque outputs also assist, whilst improved motor controls and the introduction of thyristors has increased the starts-per-hour performance, enabling electric actuators to be used for many regulating and modulating duties.

In the last decade these developments have dramatically accelerated with the introduction of high temperature modulating duty electric actuators. This major advance enables electric actuators to be installed in environments where hydraulic and pneumatic actuators were traditionally specified. This has been a welcome improvement, since hydraulic systems incorporating traditional power packs and hydraulic rams have become unpopular due to high maintenance costs and the risk of oil leaks that can sometimes lead to fires. Instrument air for pneumatic actuators is also expensive to produce and maintain, with leakage, water ingress and vulnerability to freezing all threatening reliability and demanding attention.

The latest electric actuator development has seen the introduction of the Rotork CVA, an innovative compact actuator for control valves, providing continuous, repeatable modulating control, suitable for the most demanding and accurate applications. The CVA range brings the simplicity, user-friendliness and economy



*Closely grouped Rotork IQ actuators on quarter-turn air damper duty at Aberthaw Power Station.*

of electric actuation to these applications, combined with advanced non-intrusive calibration, valve diagnostics and the other advanced features inherent in modern electric actuator technology. The advancing technology of electric actuation has persuaded many power station operators to standardise on a

single manufacturer for all their actuator requirements in order to minimise spares and stockholdings. This policy also reduces training requirements for maintenance staff. Electric actuators, suitable for isolating, modulating and control valve duties, provide a simple, reliable solution and eliminate the need



*Rotork CVA actuator controlling an inlet regulating steam valve at Drax Power Station.*

### Target areas for electric valve actuation

Based on past experiences, the following areas in power stations can benefit significantly from the introduction of electric valve actuation:

- Secondary air damper automation
- Induced draught and forced draught fan vane control
- Superheat/reheat damper control
- Fuel system automation
- Feed water control valve automation
- Cold water control valve automation
- Boiler stop and steam valve control
- Control and instrumentation upgrades.

for secondary compressor or hydraulic systems with complex control and instrumentation.

### The Exeeco experience

Exeeco, a Rotork company specialising in power station actuation and control systems, has been involved in modernisation, automation and upgrade projects for over thirty years, drawing on Rotork's comprehensive and evolving range of electric actuator products to implement improved performance in virtually all plant areas.

In the recent past, the implementation of mandatory directives for environmental improvement has been the major catalyst for actuation upgrade programmes in UK and European power stations. The LCPD (large combustion plant directive) demands accurate control of final operating elements including secondary air dampers, burner shroud and fan vane controls. BOFA, SOFA and OFA (boosted over fire, separated over fire, over fire air) schemes are another major area of investment in coal fired power stations. In these areas, problems with traditional hydraulic rams include seal wear caused by ambient temperatures in excess of 90°C. Consequential leakages can result in fire risks whilst the on-going cost of maintenance is expensive. Exeeco's successful solution has been to replace this equipment with Rotork SM6000 electric actuators. These units offer continuous, modulating duty with a positional accuracy within 0.1% of span in ambient operating temperatures up to 107°C.

Similar problems, including those with induced draught (ID) and forced draught (FD) fans, both critical applications requiring precise positioning and constant

modulation, have been solved with the introduction of the same electric actuators, or in other cases the utilisation of Rotork IQ or Skilmatic SI modulating actuators.

The benefits encompass improved automation and burner management, swift response to plant demand, improved emission control, low running costs, efficient fuel control and improved reliability in high temperature environments. Added to this, features inherent in all Rotork products such as simple commissioning and valve diagnostics, contribute to a low long-term cost of ownership and maximum plant utilisation with minimal maintenance. Exeeco engineers tell a similar story in other power station plant areas, including temperature and pressure control valves. Boiler spray control and feed control valves are amongst those to have traditionally been pneumatically actuated, but here again the electric alternative offers many advantages. Improved efficiency demands tighter control of the combustion process, which can now be achieved through the utilisation of electrically actuated control valves. As mentioned earlier, the new CVA actuator has proved to be capable of providing



Rotork IQ actuators operating quarter-turn dampers at Aberthaw Power Station.

very accurate, repeatable and reliable valve performance without the maintenance requirements of pneumatic operation and with simplified control requirements. The Rotork IQ and Skilmatic SI actuator ranges have provided the same operational benefits on control dampers requiring on/off, regulating, modulating and failsafe control.

### About Exeeco

Exeeco has grown to become the UK's leading specialist supplier of power station actuation services, encompassing upgrades, on-site and off-site repairs and servicing, outage refits and training. The evolution of Exeeco's activities has created a total solutions capability which operates throughout the UK and Europe. Over the years Exeeco has developed close working relationships with the operators of power stations, resulting in framework agreements with some of them that encompass valve actuation issues involving equipment of all descriptions from any manufacturer.

Ian Elliott can be contacted at: [ian.elliott@rotork.com](mailto:ian.elliott@rotork.com)