Case Study - April 2001

Optimum combustion of an unusual fuel

With SITRANS FC mass flowmeters from Siemens, Asnæs Power Station gains full utilisation of Orimulsion® - a liquid fuel which is an attractive alternative to coal

power & heat

Clean combustion is not only the prime precondition for the lowest possible fuel consumption. It is also a sure method of minimising waste discharge products. Therefore the way in which a power station regulates the mixture of liquid fuel and air fed to the boilers is not an insignificant factor - especially when a boiler like the one in Block 5 at Asnæs is 65 metres [213 ft] high, has a volume of more than 21,000 cubic metres [742,000 ft^3], and is fed by no less than 48 burners on four storeys.

SIEMENS

From the generator gallery in Block 5: turbine and generator

This huge boiler plant - in fact the whole block - goes right back to 1981 when it was first commissioned with coal dust as the fuel. However, in 1995 the plant was converted so that it could be fuelled with Orimulsion®, a mixture of shale oil and water extracted in the Orinoco river area of Venezuela. This mixture is in every way comparable to coal and, what is more, it is price-competitive with coal.

As one of the first power stations in the world to convert to the relatively new Orimulsion® fuel, Asnæs Power Station had no standards it could refer to - not even on the regulation of fuel/air injection into the burners. Therefore the selection of equipment had to be based, among other things, on the good experience previously gained from SITRANS FC MASSFLO mass flowmeters in a number of fuel oil regulation applications.

A meter for each burner

At the start, eight SITRANS FC MASSFLO meters, type MASS 2100/1000 (Di 40) were installed - two on each storey. These formed part of the block load regulation system and each one weighed/measured the fuel fed to six burners.

It could soon be seen, however, that this dosage was not sufficiently accurate. The problem lay in the air supply: air for all six nozzles supplied with fuel via a mass flowmeter was distributed precisely and uniformly, but the flow of fuel was often different from nozzle to nozzle. One reason was that the nozzles became clogged, which resulted in poor combustion, high costs and an unnecessarily large quantity of waste products.

In 1997, after two years of operating with Orimulsion®, the station decided to install a further 48 MASSFLO mass flowmeters, this time of the type MASS 2100/3000 (Di 25) - one for each burner. These regulate in the following sequence:

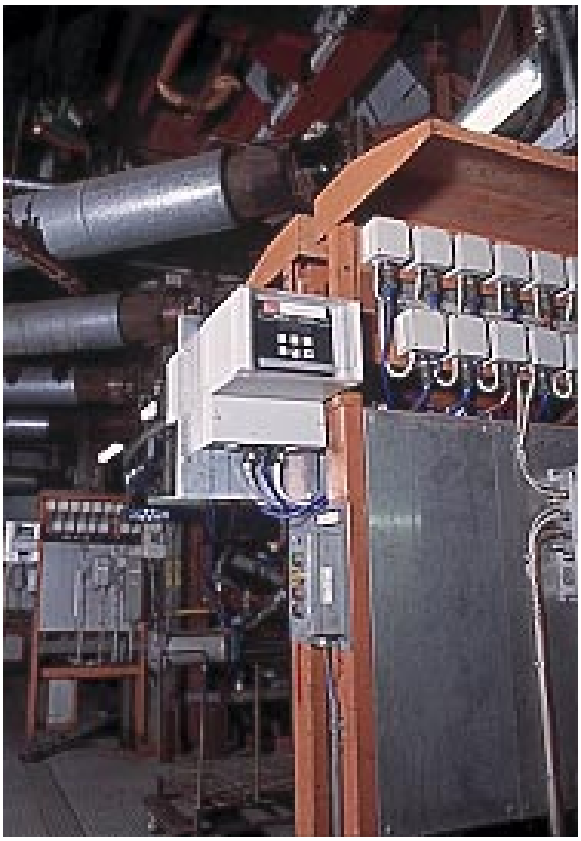
- The mass fuel flow to each nozzle is measured continuously.
- The measuring result is converted to a digital signal.
- The signal is transmitted to the Block 5 central, pc-based control and regulating system.
- The air supply is regulated in accordance with the flow measurement.

Accurate air supply

With this solution the Asnæs station achieved accurate regulation of the air supply and thus combustion (always the objective). The workshop manager, E-service, Mogens Rasmussen, is well satisfied: "The mass flowmeters have never given us any problems.
They have performed just as we expected. They have, for example, never needed servicing and they run 24 hours a day all the year round - except for five or six weeks during the summer."

On the reason for choosing mass flowmeters based on the Coriolis principle, Mogens Rasmussen says, "It is after all the mass flow we measure. To obtain the same result from a magnetic-inductive flowmeter would require a pressure and temperature signal, and an extra calculation algorithm."

A further factor in choosing mass flowmeters is that the conductivity of Orimulsion® fuel is uncertain. This can cause problems with magnetic-inductive meters - even though the medium contains about 30 percent water to ensure its fluidity.



MASSFLO transmitter from which measurements of the flow of Orimulsion® fuel are continuously transmitted to the Block 5 central control system

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Order No.
SFIDK.PA.028.Y1.02