DRY BASEMENT, SAFE BASEMENT

When Drax Power Station in the United Kingdom found that standing wastewater in its sub-basements was causing problems for workers, it needed a solution that would both improve safety standards and meet environmental regulations.

TEXT LOUISE CLARKE
PHOTOS SCANPIX

DRAX POWER STATION in Yorkshire is the largest, cleanest and most efficient coal-fired power station in Western Europe, providing enough power to meet 7 percent of the UK's electricity needs. With an output capacity of 4,000 MW being produced by six generators, Drax is twice the size of the next largest coal-fired power station in Britain.

As well as being an important strategic asset nationally, Drax is also vital to the local economy. Drax Power employs around 700 people and indirectly supports local employment.

Most people are familiar with power stations, instantly recognising the gigantic cooling towers, an ever present feature of the landscape. The production of coal-fired power involves the use of six single furnace natural circulation boilers with a furnace volume of 1277 m^3 (45,000 cubic feet) and six 660 MW turbine-generators. Put simply, the boilers generate steam which turns the turbines which produces electricity.

The plant creates a lot of heat which has to be cooled with water. Condensing steam produces large quantities of water which are pumped back into the boiler. Cold water from the cooling towers is pumped through a condenser. It absorbs heat from the steam which is reused in the boiler.

The cooling towers are designed to create a natural draft of air. They contain a honeycomb of plastic over which water is sprayed and cooled by an upward draft. Each cooling tower has a water capacity

There are twelve cooling towers at the Drax Power Station, with a maximum capacity of 112.92m^3/s (29,900 gallons/s). Each cooling tower has a water capacity of 9.41m^3/s (2,500 gallons/s).

DRAX'S SUMP PUMP SOLUTION PROVIDED BY ITT WATER & WASTEWATER

THE FLYGT HS8000 series pump, constructed of Ni-Hard 4 metal, offers a vortex hydraulic design providing high non-clogging performance and is capable of pumping liquids containing abrasive solids of up to 100mm in diameter.

Ni-Hard 4 is a chrome nickel alloy providing excellent resistance against abrasion and shock impacts, commonly found when pumping abrasive solids and slurries. It also provides far better resistance to corrosion than cast iron.

"It's a little pocket rocket: small, compact and easy to move around in a safe and controlled manner. In this application, water washes everything into the basement and sumps at the bottom of the power station. Typical solids contents range from coal, ash, grit and dust through to pieces of plastic and bottle tops. Before installing the Flygt HS8000, these solids would commonly cause blockages in the original pumps and systems," says Neil Siddons of ITT Water & Wastewater UK Ltd.

The Flygt HS8043.180 pump model being used at the Drax Power Station is fitted with a 7.5 kW motor and pumps at a rate of 30.0 l/s (7.9 gallons/s). It transports the wastewater from the sub-basement to an on-site treatment plant and oil separator one kilometre (0.6 miles) away. Once any oil and solids have been removed and environmentally disposed of, the remaining wastewater is treated and then pumped a further 3 kilometres (1.9 miles) to the River Ouse.

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Inevitably, the use of so much process water means there is wastewater to dispose of and frequent leaks are unavoidable. Regular cleaning and washing of plant with pressurised water also produces a lot of wastewater.

The boilers are seven floors high and all the excess water falls down to the power station's sub-basements from where it has to be pumped out. The oily water mixture produced by the boilers and turbines is routed to a separator where the oil is skimmed off and disposed of. The clean water is processed and returned to the river in line with environmental legislation. In theory this process sounds quite straight forward, but in practice there have been more than a few problems. The pumps in the sub-basement were installed in the 1970s and in recent years started to break down, leading to regular flooding.

Paul Marshall is the power station's fire technician. He is responsible for the 240 fixed fire systems, safety of oil storage and the availability of water for extinguishing fires.

"The dangers of flooding and risk of injury were issues that needed urgently addressing," says Paul Marshall. "The sub-basements have low ceilings and are full of cable racks and pipework. With poor lighting and the build up of dust and coal, the flood water soon created a slurry on the ground and a greater slip and trip hazard."

As many as 50 people go in and out of the sub-basements in one day, many of them external contractors maintaining pumps and fans and repairing cables and pipework. Unable to see the ground because of the flood water, people were twisting ankles in drainage holes, falling over and knocking their heads and straining their necks. A lot of valuable working time was being lost through injury and it was time to find a solution to the flooding problem.

"We approached ITT Water & Wastewater, discussed our pump requirements and it was decided that the Flygt HS8043 pump was the answer," says Paul Marshall. "This is a machine that could pump semi-solids and had superior control technology, using ultra sonic power to detect water levels rather than the float method used by our old pump systems."

Drax trialled the Flygt Ni-Hard 4 hard metal HS8043 pump from ITT Water Wastewater in 2007 and were impressed with the performance. "The sub-basement floors were drier and it was clear that these pumps were going to be a lot more reliable than our previous ones," says Paul Marshall.

However, installing the new pumps did involve a few teething problems. They had to be located below the sub-basement floor, but the existing holes in which the pumps were to be inserted were not big enough.

"We had to drill through 18 inches (0.46 m) of reinforced concrete to enlarge the holes," says Paul Marshall. "It was not an easy job. It's a difficult working environment with water on the ground all the time and cleaning and maintenance work continually being carried out. We ended up getting an external contractor in to carry out the work."

During 2008 eighteen pumps have been installed in nine locations in the boiler and turbine halls. The last pumps are due to be up and running by January 2009.

ITT Water & Wastewater has had an on-site presence at Drax for eight years and a good working relationship has developed between the two organizations. Neil Siddons is the local ITT Water & Wastewater representative. "I was there right at the start so I have an insight into some of the problems experienced. We work closely with the Drax team and this has generated trust between both parties which we hope will continue in the future," says Siddons.

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