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AC drives breathe new life into Severn Trent sewage treatment

Over 65% energy saving and a payback of only seven months has been achieved by Severn Trent following the replacement of three, 37kW AC drives on water process pumps.

As a result the water utility has now set up an Energy Saving Project Group to look at replacing and upgrading existing drives as well as installing new drives throughout its network of sewage treatment plants. The initiative is part of an on going cost efficiency programme aimed at combating rising electricity prices. This is part of the asset management programme the company operates to meet the requirements by OFWAT and the Environment Agency on the industry during 2005-2010.

DrivesAdvantage
The catalyst for the drives overhaul is a new service scheme introduced by the ABB Drives Alliance. Called DrivesAdvantage, the scheme is particularly aimed at water utilities and offers several bespoke programmes aimed at upgrading or replacing drives.

Brian Dick, part of the ABB Drives Alliance explains: “Many drives were installed some 15 years ago. Since then, drives have become smaller, more efficient, more reliable and less costly to purchase, install and run. So it makes good business sense to check up on our installed base and dig out the massive savings that are right under our noses.”

Severn Trent’s Dan Hulse, Instrument and Electrical Engineer, was introduced to the scheme during a free one day training seminar provided by the ABB Drives Alliance. “The day opened our eyes to the real benefits offered by using variable speed drives. I reported the findings to our management and without hesitation the funds were found to invest in drive technology. We could see that our investment would be rewarded virtually immediately and this has proved to be the case.

“We had not appreciated just how far drives technology had advanced in recent years. After experimenting with ABB’s demo drive and seeing how easy it is to use – particularly the keypad, designed like a mobile phone, with its clear text and simple language – we knew it was time for us to change. There is so much more that we can do with the drive.”

REPLACING OLD DRIVES
Following the training, ABB Drives Alliance was invited to Severn Trent’s Wanlip Sewage Treatment Works in Leicestershire to log the power consumption on various applications including aerators, tertiary pumps and process water pumps. “We have lots of different pumps, such as centrifugal, screw and dry weather flow pumps, all doing different jobs and with variable heads and various loading. AC drives can help enormously in all these applications,” explains Hulse.

The first three drives purchased replaced 20-year-old Heenan drives at the Wanlip site, which were proving inefficient, unreliable and noisy. The ABB standard drives, rated IP 21, are used on water process pumps which pump the water back into the sites system for applications throughout the Wanlip works.

Energy audit
ABB Drives Alliance undertook an energy audit to determine typical levels of energy saving. “We estimated a return on investment of about 20 months and an energy reduction of about 30%,” says Dick.

“This was based on a total investment in the drives of under £7,000, and an energy saving of nearly £4,000 each year.

“In fact, we were overly cautious and the actual saving is nearer £10,000 per annum as the old drives were consuming some 18 kWh of energy compared to the equivalent ABB drive which consumes some 6 kWh. This is a saving of over £46,000 over the ABB five year warranty period of the drives.”

Since the installation, Severn Trent has uncovered additional benefits that it had not expected, including a significant reduction in the noise levels within the plant and less wear on the pumps. The drives also take up less space, have simpler control wiring and generate less heat.

Extending the scope
Following the success of the Wanlip process pump drives, Severn Trent turned its attention to other applications including the installation of ABB standard drives on two aerators.

The installation was suffering from a failed brush unit and large inrush currents caused by the star-delta starter, both of which contributed to high running costs. Using star-delta starting, the average energy consumption was just over 90kWh. Following the installation of an ABB standard drive, the energy consumption fell to a little over 70kWh.

“For an investment of only £5,000, Severn Trent saved over 167 kWh resulting in annual savings of £5,800 and a payback of only 11 months,” says Dick. “This is a saving of over £29,000 during the ABB five year warranty period of the drive.”

At the nearby Lake Terrace pumping station in Melton, star-delta starters were replaced with ABB drives to combat the spikes infiltrating the power network when the pumps were started up and exceeded demand. Following the installation of six, 75kW ABB standard drives, it is possible to slow the pumps down to 42Hz, thereby keeping the process running slower rather than the severe starting and stopping that was experienced previously. This eliminates the peak demand being exceeded whilst giving better control performance.

A surprise advantage of installing drives was the reduced maintenance and wear of the large non-return valves. The one metre diameter hinged valves would clatter to a close when the water flow ceased. This constant crash closing of the valve damaged the seal and wore out the hinge mechanism. But by ramping down the flow gradually, the non-return valves are gently lowered.

Commitment and knowledge
“We were very impressed with the commitment and knowledge of ABB Drives Alliance,” says Jeremy Jones, Area Maintenance Manager, Leicester and Melton Area. “The installation was not easy as cabling need to be channelled through an existing concrete floor. The ABB Drives Alliance partners accepted the challenge without question, drilling long and laborious channels and manufacturing aluminium covers to further protect the cables.”

Although a competitor’s drives had been widely used on the site, ABB Drives Alliance forward thinking and new approach convinced Severn Trent of the merits of using its drives and service and support network. “ABB was the first company to put forward a comprehensive service scheme with its DrivesAdvantage,” says Jones.

“Coupled with free training; its enthusiasm to strike up a partnership; and the drive features including a five year no-quibble-warranty, we felt that ABB was well ahead of its competitors.

“DrivesAdvantage scheme parallels the successful model used by Severn Trent under the MSP programme.

“We had already struck up a partnership with ABB Motor Service Partners (MSPs). This organisation has completely revolutionised the way motors are supplied, installed and maintained. Their technology, their experience and their set-up is a breath of fresh air. They are most definitely high-tech and not 100 years behind the times. They are continually looking for new solutions that will improve our process.

“And then along comes ABB Drives Alliance who actually want to help us and deliver all the technical support at our local level and they want to save us money as well!”

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Caption: Severn Trent has set up an Energy Saving Project Group to look at replacing and upgrading existing drives, following the replacement of three, 37kW AC drives on water process pumps which gave energy savings of over 65% and a payback of only seven months.

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