EMERSON
Industrial Automation

applied
To Natural Resources & Energy

ARCHIMEDES SCREW POWERS RIVER DART COUNTRY PARK

First UK hydrodynamic screw generator is sited in Dartmoor National Park

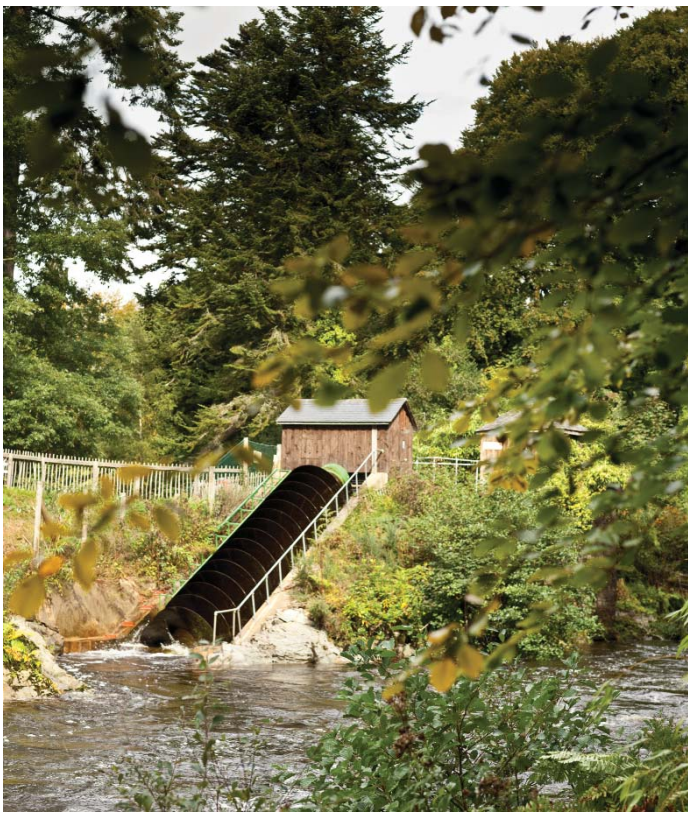
The UK's first hydrodynamic screw generator, modeled on the ancient 'Archimedes Screw', is providing power for the River Dart Country Park near Ashburton in Devon. With no adverse affect on the river's protected and diverse wildlife, the renewable energy generated by this innovative installation is sufficient to power the entire site for more than eight months of the year, even generating excess to export back to the electricity grid when the river is in full flow.

The turbine produces an estimated £35,000 worth of electricity a year.

At the heart of the installation, designed and installed by local company GP Electronics of Bovey Tracey, Newton Abbot, is a control and regeneration system comprising two variable speed AC drives from Control Techniques.

Unlike Archimedes' original design, which was used to raise water, in this case the screw is reversed so that water flowing downhill turns the screw. About 1.5 tonnes of water flows through the device to turn it at an average of 30rpm, driving a 75kVA generator (with a substantial disk brake) via a 30:1 gearbox and belt drive. The brake prevents the screw over-speeding in the event of system failure.

The first of the 55kW Unidrive SP AC drives



KEY BENEFITS

- GENERATES £35,000 WORTH OF ELECTRICITY PER ANNUM
- EXTREMELY EFFICIENT INVERTER SYSTEM
- INTELLIGENT SPEED/LOAD CONTROL WITHIN THE INVERTER

0115-0175

CONTROL TECHNIQUES

CONSIDER IT SOLVED™

Network Power • Process Management • Cimate Technologies • Storage Solutions • Industrial Automation • Motor Technologies • Appliance Solutions • Professional Tools

controls the speed of the system, constantly in braking mode, to maintain the 4.5 metre head of water within ± 5-mm at all times, to maintain maximum efficiency. Because it is a positive displacement machine, the slower the screw is allowed to run, the less water runs through and the head is maintained. This means that the level of water throughout the screw is at the centre level, experience showing that this gives the best efficiency. A level meter (head sensor) sends a signal to the controlling computer, which then determines the required drive speed.

The second drive, in regenerative mode, produces clean power to the park's power system, providing electricity for Holne Park House, offices, caravan-park, kitchens and café. Any excess power, over and above that required, is fed back to the main electricity supply grid.

"The system replaces an earlier propeller turbine at the same site, but this is very much more efficient," says Gerry Pope, owner of GP Electronics.

"To some extent this is a test-bed for this type of Archimedes Screw system. We spent most of a year putting a range of sizes and types of fish through the system to demonstrate that they would not be harmed in any way, which eliminated the need for a fine screen, which had the potential for blocking.

"After running the system now for over 3 years, we have shown that it will run and generate, even when the River Dart is fairly low, because our system maintains the head of water – although we have shown in tests that this type of Archimedes Screw will operate with as little as 1-metre head, which makes it viable in a wide range of sites. This system at the River Dart Country Park runs at around 50kW for most of the year and never drops below about half that, even in the driest period.

Potentially, it could do a lot more, but that would entail changing the whole electrical infra-structure. We have similar systems producing 130 kW elsewhere."

Mark Simpson, from the River Dart Country Park, says "There are so many sites in the south-west where small hydro-power schemes like this could be utilised. The screw has proved that it is very environmentally-friendly with regards to migrating salmon, eels and other fish."

"We chose Control Techniques drives because of their flexibility," adds Gerry Pope. "They are very easy to control, very responsive and very accurate. We have had good support and it's good that it is a British product!"

AWARD WINNERS

The River Dart Country Park has won the prestigious Business Commitment to the Environment Award because of the business's commitment to reducing its environmental impact. The Award was partly for the installation of the Archimedes Screw hydro-generator that reduced the site's carbon footprint and partly for the park's high level of recycling.

CONTROL TECHNIQUES

For further information please visit www.controltechniques.com

EMERSON Industrial Automation

CONSIDER IT SOLVED™

Network Power • Process Management • Cimate Technologies • Storage Solutions • Industrial Automation • Motor Technologies • Appliance Solutions • Professional Tools