Case stories

Conjet cleans up at Glenlee power station

The 12MW Glenlee hydro-electric power station in Scotland is part of the 106.5MW Galloway Hydro-Electric power scheme, which was the first large scale integrated hydro-electricity supply complex in the UK when it was built and commissioned in the mid 1930s. A 60km long network of lochs, dams, tunnels, aquaducts, pipelines and rivers interconnect six power stations in a cascade system, which reuses the water several times for power generation. Each station reuses the water that has been discharged by the one above to generate electricity. A dam blocks the natural outflow of Loch Doon and acts as the main storage reservoir at the top of the scheme, which has a drop of 210m over its length.

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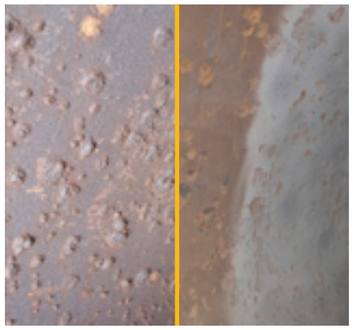
Glenlee - part of an interlinked energy system

Glenlee is the fifth of the six power stations in the interlinking renewable energy scheme that covers a large area of Galloway and South Ayrshire. Water for Glenlee Power Station gathers in Loch Clatteringshaws and flows through a 6km long tunnel to a portal control valve above the power station. From here water plunges 125m down the hillside through a 570m long steel penstock of varying diameter to the station's twin 6MW turbines and out of tailrace valves and into a spillway, for discharge into the River Dee. From here the discharged water combines with natural river flows to the downstream Loch Ken, which acts as the reservoir for the last power station in the scheme at Tongland. Outflow from Tongland Power Station rejoins the lower reaches of the River Dee and flows into the Solway Firth at Kirkcudbright Bay.

Cleaning and repainting for the first time in 70 years

The Glenlee penstock was in need of cleaning and repainting and power station operator Scottish Power Generation Ltd awarded a contract for its refurbishment to the specialist contractor Concrete Repairs Ltd based in Falkirk. The flange bolted steel pipeline had not been cleaned and painted internally for over 70 years, since it was installed in the 1930s. CRL believed the internal cleaning and paint removal could be done with high-pressure water jetting and contacted N.E.T. Waterjet Ltd, a contractor based in Meigle, Perthshire, specialising in ultra high pressure water technology and diamond drilling and sawing.



The inside of the pipes before and after the surface cleaning using Robot 324

The N.E.T managing director gives his point of view

"I believed it was initially feasible to use hand held high-pressure water jetting lances in the penstock's varying diameters and gradients to remove the old paint coating and peat lying in the bottom, but there was a risk for the operators," says N.E.T. managing director Tom Wallace. "So I looked at the possibility of adapting a robot, normally used for the hydrodemolition of concrete, and contacted Castellan, the UK agent for Conjet hydrodemolition equipment in Sweden. Castellan's managing director Colin Jailler arranged for me to visit the Conjet factory and as soon as I saw the compact 324 Robot I knew it would work, using the optional Hammelmann blast or rotor head instead of the normal concrete hydrodemolition lance. CRL accepted my price and I ordered a Conjet 324 Robot from Castellan and it arrived on site in May."

Tom Wallace, N.E.T managing director

Equipment

N.E.T. used its new Conjet 324, with optional rotor head, to remove the build up of debris, old paint coating up to 4mm thick and unexpected original mill scale, back to a clean and smooth metal surface. The company had about 4,200m² to clean from the inner surface of the penstock in diameters from top to bottom of 3m, 2.7m, 2.4m and twin 1.8m and on varying gradients from 1:100 up to the steepest 18 degrees.

Benefits using the robot

CRL removed the flange bolted expansion joints and butterfly valves in the penstock to provide N.E.T. access at several points for the Conjet 324, which was supplied with water at a pressure of 2,500 bar and flow of 25 litres/min from one of N.E.T.'s existing 250kW Hammelmann 120 high-pressure pumps. "We are working a single shift seven days a week and averaging to clean about 200m²/shift, but our best has been 320m²/shift," says Tom Wallace. "The surface of the pipe actually gets cleaned twice as the 180mm diameter blast head is rotated full circle round the inner circumference of the pipe, then advanced 90mm by the Robot and then rotated back in the opposite direction. The sequence is repeated continuously. The Conjet Robot has been superb and worked very well and is a lot safer and about three times faster than using hand lancing. There is no fatigue for the operator and the Robot provides consistent speed and removal. It is also possible to quickly and easily change or adjust the blast head settings and forward step speed to suit the adhesion of the old paint coating."

There is no dust from the paint removal and the waste water and debris from the Conjet Robot cleaning process flows down the penstock and is collected by CRL in a sump in the turbine house. It is then pumped into tankers for off site environmental treatment and disposal. "I am very impressed with the cleaning process and the Robot, which is doing a great job. I am also surprised at how quick it is at taking off the old coating back to the bare metal," says CRL site manager Fran Allan. CRL is following on spraying on a two coat glass flake epoxy coating from a purpose made gantry that will travel down the inside of the pipe.

CRL is also repainting the outside of the pipe with a highways bridge specification four-coat epoxy paint system. CRL started on site in February and is on schedule to allow Scottish Power Generation to bring Glenlee Power Station back on stream in autumn 2010.

Future opportunities

N.E.T.'s first use of a Conjet Robot has gone extremely well and the company believes there are considerable opportunities on other similar projects. "This is the first time I've used a Conjet Robot and can foresee a lot of further opportunities with the 324, mainly working in concrete and steel pipes and tunnels up to about 4m diameter," says Tom Wallace.

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