

Press Information

METALLOCK EXPERTISE ACHIEVES SUCCESSFUL COMPLEX RUNNER CHAMBER PROFILE FOR SCOTTISH HYDRO STATION TURBINE

Using a single boring bar set up Metallock Engineering UK has recently completed several in-situ machining operations, including a complex new runner chamber profile, on Culligran hydroelectric power station's No.2 turbine in the north of Scotland for Weir Engineering Services. The power station is in a cavern on a Site of Special Scientific Interest (SSSI) and is fed via a dam from Loch Beannachrain, 3½ miles away.

The project was part of a general refurbishment of the 43-year-old 17MW Deriaz turbine which, in particular was suffering from severe cavitation in the runner chamber area. The turbine is the only one of its type in the UK and to enable access to all the surfaces that needed machining Metallock set up its 12 metre long "Big Bertha" boring bar on support beams above the top cover. These beams were fixed in place with rawlbolts into the concrete slab and the boring bar set to the datums provided by Weir.

From this setting Metallock checked the level and flatness of the top cover locating flange and the flatness and parallelism of the bottom cover locating faces. Next the diameters and run-outs on the radial faces of the top cover locating flange and the profile, concentricity and run-out/ovality of the runner chamber profile in relation to the top cover locating flange were checked. All the readings obtained were submitted for review. The 3.635m diameter top cover locating flange was machined using an attachment on the boring bar to achieve a level and flat face. Subsequently, the upper and lower weld preparations and sighting groove into the existing runner chamber were machined. The boring bar was then removed to allow the old runner chamber to be cut out.

Whilst Weir engineers were removing the old runner chamber, Metallock set up their boring bar at the top of the turbine to machine the 3-metre diameter, 262mm wide rotor brake track which was badly scored. The opportunity was also taken at this time to clean up the outer 3-metre diameter flange on the spiral inlet pipe to ensure that when the gate valve was reinstalled, it's flange and that of the inlet pipe were parallel to each other.

After Weir had fitted the new runner chamber, Metallock re-installed the boring bar using the same datums as before and set up to machine the lower cheekplate face to bring it level and parallel to the top cover locating flange. An attachment incorporating a template and profiling device to machine the runner chamber diameter was then fitted to the boring bar and set up to achieve the high tolerance and high surface finish required. A template was required because the profile comprised two convex and one concave radii to accommodate the end profile of the Deriaz angled runner blades.

The need for high precision when machining the runner chamber was due to a requirement for the gap between runner blade and chamber wall not to exceed 1.5mm, otherwise when in operation, with millions of gallons of water passing through, there is a risk of cavitation or even blades touching chamber wall with disastrous consequences. A planned final task using this boring bar setting was to set up and machine 24 guide vane lower bush housings.

By using the boring bar in a single setting situation Metallock was able to machine all the required areas relative to each other and registered to a single datum for accuracy. Being a key element of the whole refurbishment, Weir Engineering Services reported that they were delighted with the runner chamber machining and complimented Metallock for the professional manner with which it approached and fulfilled the difficult task.

Subsequently, the Deriaz turbine has been rebuilt, commissioned and has completed its 30-day reliability run. It is now back in normal unattended operation and will continue to be a renewable source of energy production for years to come.



Metallock successfully machined a complex runner chamber profile at Culligran hydro power station for Weir Engineering Services.

[Photo: Martin Cullimore]

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