CASE STUDY
BALMORAL - UK

Invergelder Sawmill Hydro Refurbishment
Feasibility, Turnkey Refurbishment and Modernisation Of Existing
Client: Balmoral Estate, Braemar, Scotland

Equipment Details

Turbine Serial No: 3390
Installation Date: 1927
Turbine: Francis
Original Manufactuer: Gilbert Gilkes and Gordon Ltd
Output: 35KW

The turbine installed at the Invergelder Sawmill on the Balmoral Estate was originally installed in 1927 for King George VI to provide motive power for the estate sawmill. This installation itself was a rehabilitation of a previous Gilkes hydro installation installed in 1900 for Queen Victoria replacing two Vortex turbines on the same civil arrangement and penstock.

It was envisaged that as the sawmill was only being used for a few days each month that the turbine could be refurbished and fitted with an AC electrical generator and automated control system that would enable the power generated to be exported to the grid. Power generation would be optimised by use of an ultrasonic head level sensor feeding water level data back to the control panel thus allowing the PLC to automatically open or reduce the guide vane position in accordance with available water at the intake. The customer also wanted to maintain the ability as and when required to switch between power generation and providing the motive power to drive the sawmill.

The turbine was originally supplied with auxiliary equipment including a Gilkes Type ‘A’ oil pressure governor, a Gilkes dashpot controlled surge relief valve and a flat belt drive pulley to allow the turbine to be used for mechanical drive of a circular saw. Our solution allows operation of the turbine to drive the saw and also allows the turbine to be used for driving a generator for power generation when the saw is not required.

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Scope of Work

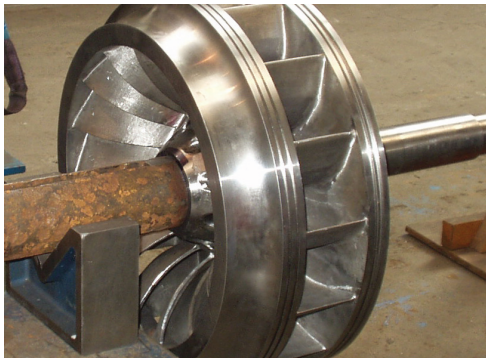
- Feasibility Inspection
- Engineering & Design
- Complete Stripdown of the Turbine and Dashpot Relief Valve
- Removal of Redundant Plant (Gilkes Oil Pressure Governor)
- Manufacture of a Replacement Stainless Steel Runner
- Modification of Turbine Shaft Assembly to Accommodate an Electro-Magnetic Clutch Assembly for Saw Mill Operation
- Modification of the Turbine Guide Vane Control Mechanism to Accommodate a Small Double Acting Hydraulic Servo Ram
- 42kW Induction Generator
- 104bar Operating Pressure Hydraulic Control Module
- Generator Control & Protection Panel (Grid Connected)
- Electronic Speed Control Governor
- Wind / Solar Remote Intake Pond Level Control System and Weather Proof Housing
- All Sitework (Dismantling, Installation & Commissioning)

End Result

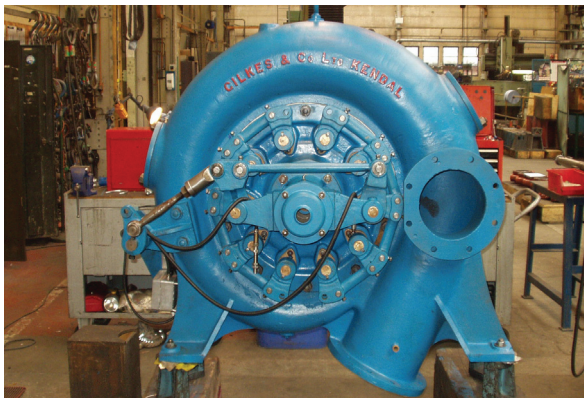
- Plant is Eligible for ROC's Accreditation
- Plant is Capable of Unsupervised & Automated Operation
- Optimised Power Generation

Intake pond head level sensor

Condition of old runner



Replacement Stainless Steel runner on original/modified turbine shaft.



Refurbished Turbine on assembly in Gilkes factory

Refurbished dashpot relief valve in Gilkes factory

Sawmill in operation, powered by turbine

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