

Powering Ndolela

A Gilkes HCTI Twin Jet Turgo Impulse Turbine is providing cost effective hydropower to the Ndolela Estate agricultural farm in Tanzania.



Pumping station.

The Ndolela Estate is a commercial agricultural farm in the Ruvuma Region of southwestern Tanzania. The estate is not connected to the Tanzanian national grid, and has in the past been wholly reliant on large numbers of diesel generators, at significant cost in fuel. A large expansion of the estate irrigation system and installation of grain silos has increased the peak demand for power to around 1.5MW. To help meet this demand the Estate owners decided to harness the power of water from the Ruhuhu River and install a hydropower scheme.

A series of pump stations move water from the River Ruhuhu around the farm via canals. The hydro generator powers a 33kV island mini-grid network across the farm powering all of the pump stations as required during the summer season, reducing the reliance on diesel generation.

The Turgo-type Turbine design (invented by Gilkes in 1919) was used at Ndolela due to its suitability for silt and debris-laden water, and its simplicity of maintenance in a remote location. The turbine speed governs to 50Hz, with a tolerance band of 2Hz when accepting and rejecting 90kW load. The control panel and control philosophy have been designed with the option of installing both a second turbine and/or a direct connection to a national grid.

The equipment is designed to run autonomously, and will idle at low-power until a demand is made, at which point it will increase its output and remain ready for another increase in load. The turbine only requires weekly or monthly visits to monitor its running and perform basic maintenance. With the powerhouse on the river bank at the bottom of a steep slope, prone to mudslides, and effectively inaccessible in very wet weather, the benefits of low maintenance really come into their own.

Challenges overcome

The Ndolela turbine was commissioned using the mini-grid network and pump stations to provide proof load, instead of a more commonly used load bank arrangement. The untested nature of the load system and delays caused by severe communications difficulties proved challenging for the commissioning team. Despite this, and several days spent working around ongoing electrical installation works, the machine was commissioned on schedule.

Gilkes' commissioning engineers were supported by estate operations staff and an electrical installation team. They were very kindly accommodated on the estate, and over the three-week commissioning period were able to spend time with their hosts explaining the operation of the turbine in detail, as well as providing support on network issues. Once the machine was up and running, two days of operator training were provided, supported by a day and night of continuous running with the machine under the control of Ndolela operators. Post-commissioning, Gilkes commissioning engineers provide one month of remote support from the UK for minor troubleshooting, before handing these responsibilities to the Gilkes service team.

The Turbine is currently generating up to 600kW of clean renewable power, supplying irrigation pumps and further loads as they are connected. The customers need for Diesel power is significantly reduced.

"Gilkes have installed over 20 turbines in Tanzania over a 100 year period. This is the first one we have installed here since 1977 and it is great to have had the opportunity to continue our long standing presence in East Africa," commented Andy Eaton, Gilkes, International Sales Manager. "Gilkes continue to be fully committed to working in Africa and installing Hydro in remote rural areas." ■



Turbine during commissioning.



Turbine.



Case and top spear.



Runner & Spear Valves inside the case.

Key statistics

Customer: Silverlands Ndolela Ltd
Turbine type: HCTI Twin Jet Turgo
Number of Turbines: 1
Power (kW): 792
Net Head: 65m F
low: 1550 l/s
Runner Dia: 25"
Speed: 600 rpm

Scope of supply

Gilkes HCTI Twin Jet Turgo Impulse Turbine
 Synchronous Generator including Lube Oil pack and Flywheel Set of Inlet Pipework
 Main Inlet Valve & Double Flanged Butterfly Valve
 Hydraulic Actuators
 Control & Switchgear Panel Governor
 110v DC Battery Panel
 Installation & Commissioning