CASE STUDIES
UNILEVER Plant Modernisation, Kenya

KEY STATISTICS

Customer: Unilever, Kericho Estate

Tagabi 1
Installation Date: 1988
Turbine: 500mm Francis
Power Output: 852kW

Jamji 1 & 2
Installation Date: 1948
Turbine: 2 x 27" Francis
Power Output: 313kW (each)

Kerenga 1 & 2
Installation Date: 1929 & 1932
Turbine: 2 16.5" Francis Series II Turbines
Power Output: 235kW (each)

PLANT MODERNISATION

Detailed Design & Engineering / New Control Panel / Digital Governors / New Hydraulic Power Unit / New Hydraulic Actuator

Gilkes have supplied a number of Francis turbines to the Unilever tea estate near Kericho in Kenya. The oldest turbines date back to 1929 and the most recent was supplied in 2009. The oldest turbines were supplied with mechanical governors. Over time the condition of these has degraded and spare parts have become difficult to obtain. Electricity generated from these turbines is critical for the processing of tea grown on the estate and security of supply is important. With this in mind Gilkes were approached in 2014 to upgrade five of the turbines in 3 separate power houses on the tea estate. Detailed design & engineering was required for each turbine and in early 2016 a full upgrade to digital governors with new control panels and hydraulic control modules was carried out.

Guide vane control on the older turbines involved linkages coupling them directly to the mechanical governor. These governors were powered by a belt connecting it to the turbines shaft. Gilkes designed new fabrications to interface with these linkage arrangements and permit operation with a new hydraulic actuator.

A new hydraulic power unit was supplied for each turbine. This provided the hydraulic pressure for movement of the new hydraulic cylinders. Each pack featured a small accumulator providing stored hydraulic pressure to ensure safe shutdown of each turbine in the event of a loss of mains supply.

Position of the guide vanes for each turbine is now controlled by a digital governor. The turbines speed is provided by a toothed wheel retrofitted to the shaft of the turbine. The digital governor is housed in a control panel that also controls the hydraulic control module and interfaces with the existing switchgear.

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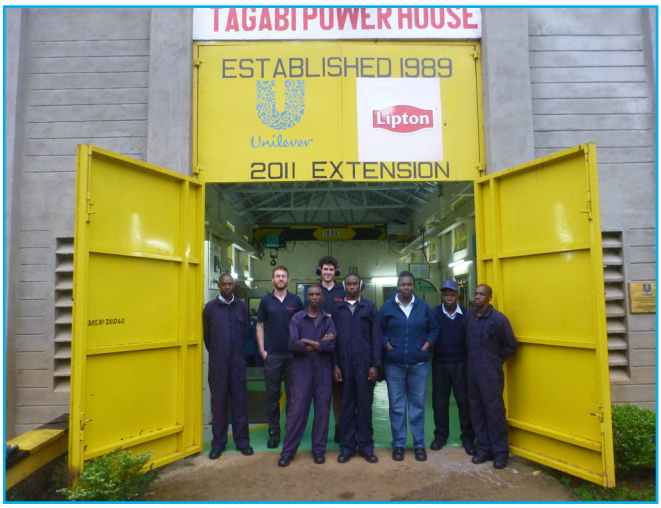
Originally many of the turbines could only operate in parallel to a wider power network. The Re-Governing process has added additional flexibility. Each turbine is now capable of being black started with no AC supply required. They can then be operated in isolation with a local consumer. In the event of a continued loss of supply from the national grid it is now possible for all five turbines to connect to the local network and load share through droop.

The new controls feature a range of self-protective functions that when triggered will shut the turbine down automatically. Operating parameters including power, turbine speed and guide vane position are also displayed on a Human Machine Interface on the control panel. This displays real time data and records it for later analysis in logs. There is also the capability to access this information and change settings remotely through the internet.

The scope of works has increased the flexibility Unilever have in operating their hydro turbines. They can be assured of a stable electricity supply even during utility outages using the load sharing capability of the digital governors. The refreshed mechanical and electrical components will prove reliable for many years and plant supervisors can have confidence that spare parts will be available if required.



Tagabi Powerhouse after extension


Jamji after upgrade


Karenga Turbines after upgrade

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