

CASE STUDY

QUAIL CREEK MODERNISATION, WASHINGTON COUNTY, USA



KEY STATISTICS

Customer: Washington County Water Conservancy District

Turbine type: Twin Jet Turgo

Power (kW): 2375

Net Head: 234 ft

Flow: 139 cfs

Dia: 38"

Speed: 400 rpm

Original Installation: 1983

MODERNISATION OF EQUIPMENT

Bespoke control system housed in existing cubicles interfaced with original switchgear. Including Digital Governor and PLC.

415V UPS to provide backup power for spear valve actuators

Hydraulic control module for Deflector Control

New Hydraulic actuator for Turbine Deflectors.

Bespoke control philosophy as dictated by operators requirements.

The Quail Creek turbine is 38" twin jet high capacity Turgo impulse. It was originally supplied to Washington County Water Conservancy District (WCWCD) in 1984. Water that flows from the Zion National Park down the Virgin River is piped to the plant. The outfall from the turbine is fed by gravity into a nearby water treatment plant providing potable water for the city of St. George. Turbine availability is critical to ensure the supply of clean drinking water to the city, the turbines generation also provides an important revenue stream.

In 2014 Gilkes visited the site with a view to proposing upgrades to the original control system which was due for replacement. The original hydraulic governor had become unreliable and operators had concerns about the system completing shutdowns in fault condition. The controls had also lost its automatic function meaning restarts required operator attendance and manual synchronising. Gilkes were then commissioned to update the turbine governing and controls with a bespoke package.

A new hydraulic control module was supplied to provide control of a new hydraulic ram attached to the deflectors. The new hydraulic power unit features accumulators for storing hydraulic pressure. In the event of a loss of ac supply the pressure from these will be used to close the turbine deflectors removing water from the runner and ensuring a safe shutdown of the system.

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Attention was given during the design phase to integrating the new controls with the existing system. Installation in the existing cubicles was preferred to give the tidiest powerhouse layout and make use of the existing space. The controls were manufactured on new back plates and doors that were secured into the existing cubicles. Pre wired sockets provided speedy interconnection between the different parts following installation.

An uninterruptable power supply was also included to provide backup power for the spear valve actuators in the event of a loss of mains supply.

The new controls package returned the plant to fully automated operation. The system can automatically start the turbine, synchronise the generator and generate according to the amount of water available at the intake. The control system is continuously monitoring the health of all aspects of the turbine and generator. Should any fall out of tolerance then an automatic shutdown is issued to protect the plant. Depending on the severity of the fault operators are automatically alerted via email and the WCWCD SCADA system.

With the Quail Creek plant returned to fully automatic operation operators anticipate increased generation and reduced downtime. They are now able to focus on other duties and attendance monitoring and supervising the turbine is now dramatically reduced allowing them to be more productive maintaining other parts of the infrastructure.



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