



# GLENFIELD INVICTA'S KEY ROLE IN £35M 'FISH FRIENDLY' PUMPING STATION UPGRADE

Glenfield Invicta has designed, supplied, installed and commissioned all of the penstocks, flap valves and associated control mechanisms which are an integral part of the Environment Agency's £35m investment to upgrade Keadby Pumping Station.

Completed in 1940, Keadby Pumping Station plays a vital role in the drainage and irrigation of the area known as the Isle of Axholme which takes in parts of North Lincolnshire, South Yorkshire, and North Nottinghamshire. The 80-year old pumping station is part of a Four-hundred year legacy of drainage activity in the area that dates back to Charles I's appointment of Dutch drainage engineer Cornelius Vermuyden in 1626.

Keadby Pumping Station is located alongside the tidal River Trent near Scunthorpe. A lagoon at the pumping

station receives water from the Hatfield Drain, South Drain and the River Torne. These three waterways, collectively known as the 'Three Rivers', are fed by a network of tributaries and drainage channels some of which date back to the time of Vermuyden. The pumping station drains excess water from the Three Rivers into the River Trent, maintains sufficient water for irrigation of the fertile farmland upstream of the Three Rivers, and prevents excess water from the Trent flowing into the Three Rivers during high tides and flood events.

## The project

The upgrade of the pumping station is being led by GBV, a joint-venture between Galliford Try and Black & Veatch. In addition to the penstocks and flap valves, all six pumps are being replaced and the outfall headwall rebuilt.

Both the flap valves and the pumps have been designed to be 'fish friendly' to allow safe navigation for fish and eels on their natural migration. The Environment Agency consulted with a specialist to ensure the design of the flap valve and pumps met the necessary standard.



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# Case Study

## Penstocks



### Flap valves

The twelve flap valves are fabricated from HDPE (High-density polyethylene) with neoprene seals. The valves are large with the valve's aperture itself measuring 1980mm x 1580mm. The flap valves incorporate a 'fish friendly' spring damper system, each consisting of 8 individual stainless-steel springs, which control the closure of the valves. The system ensures that the flap valves remain open for a short duration as the tide rises, so as to ensure that the valves are not a barrier to fish and eels migrating into the Three Rivers. The use of a spring damper system is a novel technology for this type of application where rubber dampers would traditionally be used. Glenfield Invicta's engineers chose the spring dampers to provide greater operational consistency over time and for ease of adjustability on site.

### Penstocks

The eighteen penstocks designed by Glenfield Invicta, feature EPDM resilient elastomer seals and are manufactured from stainless steel grade 316Ti; a titanium stabilised austenitic stainless steel that is highly resistant to corrosion, making it ideally suited to the brackish water environment in which the penstocks operate in. With 1600mm x 2000mm and 1700 x 1900mm apertures, the penstocks are large. On the 12 outfall penstocks, vertical 8m long extension spindles connect the penstocks to Auma electric actuators, positioned over a mesh floor for access, 2m above the top of the chamber.

The six forebay penstocks are equipped with Auma variable speed actuators, complete with integral uninterruptible power supplies (UPS), mounted directly to their extended frames and feature safety guards to safeguard the operator.

#### Alex Philo, Product Manager, Penstocks is Glenfield Invicta's lead on the project:

'Keadby Pumping Station is a fascinating project. The Environmental Agency subjected the penstocks to one of the most intensive and thorough Factory Acceptance Tests I have experienced. At the factory we recreated the conditions under which the penstocks will be working, including subjecting the penstocks to a head of water equal to the maximum that the penstocks will ever experience in operation. The emphasis was on ensuring that the leakage rate was within the allowable standard and that the actuator was capable of opening the gate whilst the maximum differential head of 8.3m was across it. All tests were passed with flying colours, with virtually no leakage experienced during the tests.'

Despite the initial order for penstocks and flap valves, everyone involved in the project has adeptly adjusted to the challenges brought about by the pandemic. Throughout, the Glenfield Invicta installation team has consistently maintained progress, to complete the project.'



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