

# TECHNOLOGY INFORMATION SHEET

## Case Study: Eaton Socon VETT Installation

This VETT installation is located in Eaton Socon, Cambridgeshire, on the river Great Ouse, in a sensitive urban site between two nature reserves. The VETT system is integrated within a disused culvert underground a Grade-II listed historic flour mill, respectfully linked into existing infrastructure. It connects a small marina located upstream and the former mill pond located downstream and exploits a 1.2m net head. The old mill now serves as a restaurant and pub and is powered by the hydro scheme, with excess exported to the National Grid. The river Great Ouse is a navigable stretch of river prone to flooding. VerdErg therefore coordinated the VETT scheme with the management of water levels by Environment Agency controlled gates at Eynesbury Weir.

This is the first VETT installation worldwide and presents a major milestone for VerdErg in the development of this technology. The scheme allowed VerdErg to verify the technology and identify improvements. The system at Eaton Socon generates 14 kW and has the potential to generate 17 kW with integration of lessons learned.

### THE WORKS

The work on site required to open-up and extend the old culvert on the west side of the Rivermill to install the new VETT system. A new intake structure with an incorporated debris screen was constructed within the marina to feed the culvert. Downstream of the culvert, a new concrete turbine tank was built into the mill pond, from which the VETT draws its flow. Within the tank, the turbine, generator and fish screen are installed. Everything is situated below ground level and is not visible or audible.

### FISH-FRIENDLY DESIGN

Careful eel passage design newly opened-up this stretch of water to migrating eels. Installation and operation is designed to protect juvenile coarse fish nursery areas in the marina and mill pond and to accommodate eel passage. The turbine flow is screened with a 6mm aperture wedge wire screen. The remaining 80% Venturi flow is unscreened, as VETT is a fish-friendly technology. Since the VETT turbine was installed, assessments show cleaner, healthier waterways, an improved local ecosystem, and increased fish population.

### VENTURI PIPE

The Venturi pipe is made from GRP (Glass Reinforced Plastic) and was delivered to site in 3m sections. These relatively light-weight sections were then assembled prior to being hung from a galvanised steel frame which sits on piles driven into the mill pond. The Venturi pipe was installed fully assembled, via a single crane lift, onto the steel frame. A sluice gate at the end of the Venturi pipe controls the flow through the system. 3,500 litres of water passes through the VETT installation per second, on average.



Visual 1: GRP Venturi pipe, hung into water from frame

## THE TURBINE

The turbine has a 440mm diameter runner with fixed blades and operates at a 750rpm nominal speed. There is zero noise emission from the turbine or the generator.

To maintain maximum efficiency at different operational conditions, the turbine is designed to operate at variable speed. There is no regulation of the runner or the guide vanes. If the turbine was dynamically scaled to operate without VETT, i.e., with only 1.2m net head and the full design flow, the runner diameter would increase from 440mm to 1,230mm and the speed would reduce from 750rpm to 174rpm. A turbine operating without VETT would require a gearbox and deeper excavations.



Visual 2: Axial Propeller turbine of VETT system in Eaton Socon.

## CONTROL SYSTEM

The control system is located within a small roadside kiosk, which is the only component above ground and visible. The system continually hunts for the highest power output by varying the turbine speed. To ensure the hydro operates within its licenced conditions, water levels are continually monitored and recorded; if the limits are exceeded (usually just before and after summer months), the hydro shuts down until conditions return to those permitted in the abstraction licence.

## KEY FACTS

Net Head	Design flow	Energy potential	Annual Energy potential	CO2 savings
1.2m	3.5 m <sup>3</sup> /s	17 kW	70 MWh (electricity for 22 homes)	35t



Visual 3: Photo of the Venturi pipe's frame, adapted into a jetty.



Visual 4: Visualisation of the old mill and VETT installation.