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Self Cleaning Waste Water Storage Tank Vacuum Flushing System with HOBAS® Fitting in Fife, UK

For coastal communities the historic solution to sewage disposal has long been straight forward; simply to put it into the sea. 20th century improvements introduced some treatment before sending to a sea outfall but still had the inherited problem that the sewer system was designed as a combined sewer and storm water line (meaning that rainfall is also sent in to the sewer): At times of high rainfall the incoming flows exceed the capacity of the plant and have to be discharged directly to sea without treatment. These obviously environmentally unfriendly practices are now no longer accepted and work continues across Scotland and the UK to modify the drainage and sewage systems to prevent these unacceptable intermittent discharges (UIDs).

The answer to this is the use of online and offline storage tanks to hold exceeding flows back until they can be correctly processed. Such a project required the construction of the Dysart Pump Station in Fife, Scotland, with a 12.5 m ID (inside diameter) concrete tank that stores up to 800 m³. It is however the nature of offline storage tanks that considerable deposits are left after each use so they require some cleaning process afterwards. To avoid this Dysart Pump Station uses a vacuum system to hold back a column of the stored water in the center of the tank until the tank is nearly empty again and then quickly releases it to flush debris from the tank floor in to a gutter and then to the pump for discharge.

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Constructing the central column in cast or pre-cast concrete is common but can be slow and does not guarantee the leak



tightness required to maintain the vacuum over several days. Due to the tight construction program the contractor and design engineers considered the use of a one piece CC-GRP Unit from HOBAS. This option has many advantages: The pipe is naturally airtight and as a one piece unit it has no joints to leak. It can be quickly crane lifted onto the prepared support and, if required, have the vacuum control system fitted before being placed in the tank avoiding operatives working at height later to fit it. An access chamber with a ladder above the vacuum control diaphragm was required which was also provided within this one piece solution.

The 10.5 m high GRP column was designed to resist buckling due to vacuum loads, and positive internal pressures, both of which create axial compression or tension respectively in the GRP column. In operation, approximately 6 m head of water would be held back within the GRP column but also in some instances there could be higher water levels outside the structure generating a 0.36 bar positive pressure. Such pressures (both circumferentially and axially) are minor for the pipe but create considerable loads on the integral GRP floor at the top of the column on which the vacuum flush diaphragm is fitted. The support in the tank base needs to take the weight of the pipe and contents but also has to keep the pipe from lifting when there are higher water levels outside than inside. For this the bottom 300 mm of the GRP column was externally coated with coarse sand and high strength non-shrink mortar is used to key the pipe onto the concrete supporting ring.

HOBAS supplied the unit to a short delivery time to suit the contractor's installation program and the whole pump station now operates successfully and for the benefit of the Scottish coast.

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Year of construction
2010
 Product type
10.5 m-long Fitting
 Diameter
DN 1800
 Pressure class
PN 1
 Stiffness class
SN 10000
 Application
SewerLine®
 Contractor
Barhale Construction

Consultant
Atkins
 Vac Flush System
CSO Technik
 Client
Scottish Water
 Advantages
Quick and simple one lift installation, Leaktight with no joints to keep vacuum longer, corrosion resistant, strong to resist internal & external pressures

