# Eastwood Wastewater Treatment Works

## uprating 50% of older secondary treatment to meet new consent

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**Yorkshire Water's Eastwood Wastewater Treatment Works, serving Todmorden on the Lancashire/ Yorkshire border, was built in 1926. In common with many Pennine treatment works, the site is long and narrow, sandwiched between the River Calder and the Rochdale Canal. Secondary treatment used to consist of the original percolating filters, supplemented by a 1960s plastic media, high rate filter and 1990s plastic media filters. Uprating of the works was required to comply with a new consent, which was particularly demanding on ammonia requirements.**

Filter under construction *(courtesy Yorkshire Water's CaSP).*

**Existing works**

The original secondary treatment consisted of mineral media percolating filters of various diameters. The main filters ranged from 20 up to 50 metres diameter, with smaller filters using up space in between. The depth of the brick and ash media was only 1.2 metres, set on a large common base slab.

In the late 1960s, a high rate filter, some 8 metres high, had been added upstream. The plastic media it contained helped to reduce the biological load but required an operationally expensive pumped feed. In 1990, the plant was also augmented with a pair of circular plastic media tanks for 50% of the flow, together with new humus tanks.

**Brief**

A brief was issued to Yorkshire Water's western area capital solutions partner (CaSP), Gleeson MWH, to bring the older 50% of secondary treatment up to current consent standards, particularly on ammonia. With 95 l/s requiring treatment to a BOD consent of 25mg/l, an SS consent of 50 mg/l and ammonia consent of 7 mg/l, an innovative approach was required on such a tight site.

**Process options**

The option of replacing the high rate filter tower, with a combination of two plastic media filters and using the same 1.2 metre filters with new slag media was discounted on cost grounds. Similarly, the use of a new SAF filter was discarded on the basis of higher costs.

A single rectangular filter was ruled out as a result of the large distributor plant capital cost and past experience of Yorkshire Water in respect of maintenance costs. This left the preferred solution of new circular filters, located in the same space as the existing ones.

**Process limitations**

Authorisation was given in November 2001 for the construction of five 30 metre diameter, 3.0 metre deep filters, with a completion date of March 2003.

In order to maintain process, four of the filters had to be complete and operating before the high rate tower could be made redundant. In addition, an existing 50 metre diameter filter had to be maintained until sufficient new filters out-performed it. This presented the project team with layout and logistical problems. It was also necessary to cover the summer season of long dry periods with resulting low flows. A temporary ferric sulphate dosing kit was installed to facilitate BOD load dropping as primary sludge, if required, during the construction period.

**Construction options**

The land available was over 250 metres long, but the width varied from 50 to 20 metres, with a gentle curve following the route of the canal. Access to the site for heavy vehicles was available from one end only.

The old media overlaid a 250mm thick concrete slab. This had been cast in 1926, with screeds forming falls and channels draining to the single outlet channel running along one longitudinal edge. This slab was cored and tested. It was found to have acceptable strength, but was on top of weak ground. It was essential not to puncture the slab and also minimise the concrete overlay, both for cost and hydraulic reasons.

Rectangular precast concrete wall units had been used on other sites for water retaining structures. The ease of construction and the 1.2 metre length of each unit made it a flexible option for this project. The decision was taken to develop a single, rectangular, precast concrete tank into a working solution, incorporating five circular filters.

The big advantage of "circles in a rectangle" type of construction was:

* **programme** - there was continuity for all operations. Overall construction duration could be drastically cut;
* **maximum site area for work** - with an existing concrete floor slab to work off construction activities could be planned on a larger scale;
* **access for plant & materials** - with access from one end, materials could be delivered and stored. Laydown and storage areas could move as construction proceeded;
* **tile & media placing** - this could be planned on a larger scale with less use of conveyors;
* **existing base slab** - with the filters being interconnected, the existing slab with its old pattern of drainage channels and falls could still be used, irrespective of where one filter stopped and the next one started;
* **cost** - with the advantages listed, the end result was a more cost-effective construction.

**Detailed design**

The design incorporated ribbed highly reinforced freestanding units, manufactured by *Whites Concrete.* The ribs at either end of the 1.2m wide units were bolted together, trapping a *hydrotite* sealant strip. They were also aligned at the installation stage and did not require any propping. They were made to a fixed 3.0m height with holes in the central section to accommodate pipework.

The precast wall units were placed on a concrete levelling beam tied into the existing slab. An inner and outer ring beam was cast, giving the pre cast units the required anchorage to prevent horizontal movement once loaded.

The layout was finalised after removal of the old filters and bulk excavation. Setting out on site confirmed the fine detail required to fit the final filter layout and in situ concrete required, adjacent to a canal retaining wall.

View from distribution chamber *(courtesy Yorkshire Water's CaSP).*

Construction started in April 2002, with over 1500 dowels being fixed into the existing slab. Whilst the levelling slab was formed, the central chamber for the distributor and associated pipework was started. The precast walls were erected at a rate of up to 20 units per day, enabling inner and outer ring beam to be quickly shuttered and poured.

By the beginning of June, preparations were made to enable the blockwork, internal walls, process pipework and internal cable ducts to be constructed. A distribution chamber was constructed and the tiles and media placing began at the end of June.

By the end of July, the filter arm distributors to the first filter were operational and full commissioning of this filter was completed by the end of August. As a result of the construction method, the remaining filters came on line at three week intervals. This enabled earlier decommissioning of the remaining filter and tower, facilitating earlier than planned completion of the last filter before Christmas.

**Programme**

Apart from final landscsaping and road repairs, the contract was substantially complete by Christmas, some three months ahead of programme and to budget. Initial indications are that the plant performance is exceeding process expectations at a vastly reduced operational cost.■

**Note on the authors:** *Adrian Parker & Brian Close are Project Manager and Senior Construction Manager, seconded to Gleeson MWH CaSP from MWH and MJ Gleeson Group plc respectively.*

*Note on CaSP: Yorkshire Water's western area Capital Solutions Partner (CaSP), is a contractor consultant joint venture, consisting of MJ Gleeson, MWH, Peter Duffy and Mowlem Johnston.*