Calder Vale STW River Quality Objectives

£8m upgrade improves effluent quality to River Calder

by

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Calder Vale STW is located approximately one mile to the east of the centre of Wakefield. The works receives combined domestic and relatively high trade load from the catchment that comprises a population equivalent of 155,000. The treated effluent is discharged into the River Calder. This purpose of this £8m upgrade is to ensure that continuous treated effluent from the STW complies with the River Water Quality Objective standards set by the Environment Agency (EA).

Calder Vale STW - aerial view of upgrades under construction *(courtesy John Grunson BEng, BSc).*

Existing operation

The main treatment processes at the works are Primary settlement, Mammoth and Sheffield bio-aeration units, traditional stone media percolating filters and final settlement tanks. Current consent standards are 30mg/l SS: 25mg/l BOD: 11mg/l NH_3: 125mgl COD. Pending completion of upgrades, modifications had been made to the works to ensure they met new ammonia consent standards. This had been achieved by an increase in mixed liquor solids and dissolved oxygen (DO) by supplementary aeration measures.

Project objectives

A feasibility study identified primary project objectives as:

* compliance with the River Quality Objectives;
* compliance with the existing consent under the Water Resources Act and Urban Waste Water Treatment Directive;
* reduction of maintenance problems associated with screenings passing to plant downstream of the preliminary treatment.

Scope of works

New works were established as :

Inlet works screens & screenings treatment

* replace coarse bar existing screens with fine screens in area with limited space;
* emergency bypass around screens and grit removal;
* screenings handling plant.

Biological Secondary treatment

* activated sludge treatment process;
* washwater system upgrade.

Decommissioning, demolition and other site works

* decommissioning and demolition of existing Mammoth & Sheffield bio-aeration units and stone media percolating filters.

Calder Vale STW - Redundant Sheffield Units await demolition (April 2003) *(courtesy: MWH & Yorkshire Water Services Ltd).*

Programme
The Feasibility study and award of the design and construct contract were carried out to a very tight schedule. The design & build contract for these works was awarded to *Harbour and General Works Ltd* under NEC Engineering and Construction contract with site works commencing March 2002.

Re-using the existing settlement and humus tanks required commissioning of the new ASP to be programmed in phases to allow parts of the existing process to be decommissioned in stages and the re-used tanks to be refurbished and recommissioned to operate as part of the new process.

Design decisions
A single nitrifying Activated Sludge Plant (ASP) was selected as the preferred biological process to replace the existing secondary processes. The new 4 lane nitrifying activated sludge plant includes a selector with anoxic zone for denitrification and a tapered aerated zone. The single plant is easier to operate and with a sufficient number of lanes is still flexible enough to undertake maintenance activities and deal with lower loads. ASP is a robust and well proven nitrifying process.

The three existing final settlement tanks used for the Mammoth process and the two existing humus tanks used for percolating filters, are all just over twenty years old. These tanks are predominantly of reinforced concrete construction and potentially have a residual asset life of a further 40 years. Therefore, it was cost effective to re-use these tanks where possible as part of the new biological process.

End of an era
The 'Sheffield' Activated Sludge plant at Calder Vale treatment works, so named after its design location, has provided a reliable service for the people of Wakefield since 1925. It is a testament to the design that, so many years later, it stills helps to treat the city's waste water, meeting all previous discharge standards. Once a common feature in many treatment works it is believed these Sheffield Units are the last of their kind in the country.

Lessons learned
A time of writing (April), the project is expected to be completed by the end of June 2003, remaining within cost targets. The project has been implemented retaining full treatment capacity and meeting the existing consent on site during the construction and commissioning phases of the new works.

Physical constraints and maintaining operation of the existing works required flexibility and substantial forward planning. The presence of a variety of other contractors and personnel outwith the Contract at Calder Vale STW also necessitated close liaison between all parties. Regular meetings and discussions, as required, to discuss all aspects of the project were instituted at an early stage. The spirit and ethos of mutual trust and co-operation as fostered by the NEC Conditions of Contract, were found to be invaluable in overcoming the inevitable challenges that are encountered in a project of this nature.

Project Team
The team formed to implement this project was a mixture of staff from *Yorkshire Water, TEAM and Harbour & General Works Ltd. TEAM* consists of a joint working agreement between *MWH, EC Harris and Arup Water.* ■

Note:*The author of this article, John Gruson, is Project Supervisor & Senior Engineer with MWH.*