

Thames Water - Riverside STW

Phase 2 improvements – aeration

by David Watts BSc, CEng

Riverside Sewage Treatment Works is one of the larger works managed by Thames Water Utilities in East London. Situated near the A13, just inside the M25, Riverside serves population equivalent of 405,000 (including trade flows) and discharges the treated effluent into the Thames via Rainham Creek. As a result of a new Environmental Agency discharge consent standard and the apparent decrease in trade effluent, there was a requirement to remodel the existing process plant whilst maintaining the existing treatment process. This presented the opportunity to introduce a nitrifying treatment plant thus ensuring future compliance to the year 2015.



New vertical shaft aerator gear box (courtesy Thames Water Utilities Ltd)

The project is being implemented as a combined alliance between *Thames Water and Interserve Ltd* under a target cost IChemE cost reimbursement contract. The main contract has an agreed target cost of £12.4m, with a total project outturn cost of £14.7m and a programmed completion date of March 2003.

Existing plant

The existing works consisted of three primary streams of treatment, A, B and C with an average flow of 112 tcmd. Domestic effluent being treated via stream A and B, C stream being used to treat trade effluent. Majority of the A and C stream plant was constructed in the 1960s, the existing mechanical plant having surpassed its asset life. The treatment process provided primary and secondary treatment using surface aeration to support a conventional activated sludge process. Sludge treatment is provided off-site by sending sludge to Beckton STW for incineration.

While both the primary and final settlement tanks had an aggregate capacity to meet future needs, it was identified that the existing aeration tank capacity at Riverside was insufficient to provide the retention period required to achieve the future consent standards. The existing surface aeration equipment on B stream had reached the end of its useful life dating from the 1930s and was in poor physical condition. Replacement of B stream was required and upgrading of the mechanical plant to both A and C streams.

In conjunction with this work it was apparent that current incoming flows were only subject to coarse screening, this is now to be upgraded to fine (6mm) screens.

Design & scope

The project has to be implemented whilst retaining full treatment capacity on site during construction and commissioning of the new

works. Also, any solution has to take into account the limited available space for extensions to the existing works.

The project identified a number of key enhancements to the existing works to meet the new consent standard:

- * trade sewage flows and domestic crude sewage are to be combined for later distribution to the new aeration plant. A combined aeration/ FST stream was required utilising the existing 'A' stream, a new 'B' stream and the existing 'C' stream. The existing A and C lanes are to be upgraded using new surface aerators allowing anoxic zones to be introduced and thus a nitrifying aeration plant. The upgraded 'A' and 'C' streams are to treat 24% and 36% of the flow respectively.

- * the existing 'B' aeration plant is being demolished and replaced with six new aeration lanes with a total volume of some 14,600m³. The new aeration lanes will be supplied with air via new diffused domes, thus requiring a new blower house. Again, anoxic zones are to be introduced to produce a nitrifying plant with a dissolved oxygen control system;

- * the existing A/B RAS (return activated sludge) pumping stations are to be upgraded to provide three new 300 l/s pumps and new integrated mixed liquor and RAS chambers are to be constructed;

- * in order to allow the existing 'B' aeration plant to be demolished an interim chemical dosing plant is required to support the process and allow the existing treatment capacity to be maintained;

- * risk evaluation and control measures are required as part of this project.

The process design incorporated nitrification as part of the new process to meet any foreseeable enhanced consent standards. As part of the urban wastewater directive, a further tightening of the consent has been notified and the provision of a nitrification process will enable Riverside to meet this new consent without further modification.

Construction & commissioning

The installation primarily consists of the construction of six new 5m deep aeration lanes replacing the existing 'B' stream. The six new diffused aeration lanes will be equipped with a total of 1596 new diffuser domes and provide a settled sewage retention period of 7.6 hours at average flow, treating a maximum flow of 99.4tcmd. To supply the new process a new blower house is required to provide a maximum air flow of 21,000m³/hr for the

new aeration lanes. Some 12% of each aeration lane is to be converted into an anoxic zone to augment the process.

Phase 11 modifications provide for integration of the existing ten final sedimentation tanks with the new and upgraded aeration plant. Integrated mixed liquor and RAS chambers are required to equally distribute flows between the existing ten final sedimentation tanks. Blanket control of the final tanks is being provided via conventional actuated flow control bell-mouths.

Conventional reinforced concrete construction is being utilised on site with all structures piled to cope with the low-load-bearing ground conditions. Requirement to maintain the existing treatment process whilst work continues on site has been most challenging, with chemical dosing plant being utilised to support the process and to ensure continued compliance with the works consent standards. Full process control is being provided via a new SCADA control system located within the main control room, with a new dissolved oxygen control monitoring system to maximise efficiency of the plant.

The refurbished 'C' stream has just (March 2002) been commissioned equipped with new surface aerators and 'B' stream taken out of service for demolition.

Key flow data

Average daily flow	115 tcmd*
Maximum flow to treatment	216 tcmd*
Average settled sewage BOD load	16200 kg/d
Average settled sewage NH ₃ -N load	3450 kg/d
Average sludge production	33.0 T DS/d

*tcmd = thousand cubic metres per day.

Extensive development work by the project team has been undertaken to meet a tight programme and manage the ongoing risks associated with the project. This was made possible by procurement via a single tender alliance with *Interserve Ltd* that allows a partnering approach to be adopted for project delivery. All work is to be completed by March 2003 to meet the implementation date of the new consent standard.

A team working approach has proved successful in meeting the challenges posed by complex remodelling of the existing works and the project is currently (March 2002) on programme to deliver one month ahead of schedule. ■

Note: *The author of this article, David Watts, is Project Manager with Thames Water.*
