Rendlesham WwTW. Suffolk

Bio bubble - Secondary Treatment Works Improvements

by **Mark Francis**

Rendlesham STW is a rural Sewage Treatment Works located approximately 14 miles north of Felixstowe. It serves a population equivalent of 4,233 and as part of the Asset Management Plan (AMP3) River Quality Objectives Directive, the approved discharge consent had to be revised by the obligation date of 31 March 2005. Within the area of Rendlesham there are two operational treatment works (STW) located a few hundred metres apart and also an abandoned STW. They are: Bentwaters STW, which is an ex MOD works and is currently privately operated; Wackerfield STW which is owned and operated by Anglian Water and Towerfield STW, owned by Anglian Water but not operated since 1993. Flow that previously arrived at Towerfield is now passed to Wackerfieldd STW

Rendlesham Park WwTW new construction *Photo courtesy Bio-Bubble Ltd*

Anglian Water scheme drivers
Wackerfield and Towerfield are located adjacent to each other, and are collectively referred to as Rendlesham Park STW.

Within the Rendlesham catchment there are 520 houses currently under construction by private developers. Construction began in May 2003 and is programmed to take three years. In addition, initial enquiries have been made to Suffolk County Council about the construction of a further 75 houses.

It is proposed that Anglian Water will eventually adopt through a section 104 agreement, the sewer network infrastructure associated with the Rendlesham Development, and provide treatment for all sewage flows.

Total DWF for the catchment requiring treatment has been calculated at 680m^3/day.

The existing Rendlesham Park STW did not have sufficient treatment capacity to treat the additional flows from the new housing development, and Bentwaters STW is a percolating filter works which will not have been designed for the required level of ammonia removal. It is also now partially demolished.

The sewage treatment provision for Rendlesham is, therefore, to be rationalised with the construction of a new STW on the existing Rendlesham Park STW site.

Basis of design
Population: 4233 PE
DWF 680 m^3/d;
Flow to full treatment 1766 m^3/d
SS 25mg/l; BOD 10mg/l; Amn.N 8mg/l.
Consent compliance:95%ile.

Primary benefits the project set out to achieve were:

* compliance with the primary requirements of the AMP3 River Needs Consent (RNC);
* reduced risk of prosecution by the EA for solids, BOD and ammonia non-compliance.

Value management considerations
At a value management meeting the project team reviewed costs and implications of capital options below:

- **Nitrifying Trickling Filter + Dynasand Sand Filtration;**
- **BAFF Plant - using the existing Final Settlement Tanks;**
- **BAFF Plant - without existing Final Settlement Tanks;**
- **Bio-Bubble.**

Recommendations
The final recommendations held preference for the Bio-Bubble, which was considered to be the best possible option capable of meeting specific site requirements and, of surpassing the revised RNC consent of BOD: 10 mg/l; SS:20 mg/l and NH3-N 2 mg/l with compliance percentile of 95%.

The Bio-Bubble solution also offered the advantages of:

- lower capital, operating and maintenance costs;
- low & stabilised sludge production;
- process capability to achieve the required consent standards;
- reliability achieved using two batch reactors;
- automated process with low manpower operational requirements;
- a new treatment facility built off-line, completely replacing an existing works;
- low odour to satisfy the developer needs;
- operations were strongly supportive of the proposed solution.

Process
The Bio-Bubble is British designed and holds several international patents. It follows the principle of Arden and Lockett and integrates significant improvements to the activated sludge model that forms the basis of the Bio-Bubble Advanced Aeration process:

Advanced Aeration of the Bio-Bubble has a demonstrated reliability that is capable of serving anticipated growth and will absorb unforeseen or shock organic and hydraulic loads without compromise to the final effluent consent.

It is noted for an exceptionally low and stable sludge production that is much lower than any other waste water treatment process and odourless operation even during hot summer seasons. The design and quality of the system also assures a robust long life capability that will serve potential generations well into the distant future.

The process includes a Balance Tank to receive screened sewage from the inlet works and which will be retained ready for transfer into one of the two Reactors on demand. Each reactor operates over four phases inclusive of Fill, React, Settle and Draw. The React phase can be adjusted for aeration and anoxic periods to suit the process requirements for today and of future consent demands, and can be selected to take advantage of the Biological Nutrient Removal (BNR) capabilities of the process.

As per the other Bio-Bubble installations within the Anglian Water region, sludge waste production from the reactors is proving to be exceptionally low, averaging at approximately 14m^3 per month.When this is compared to other processes the significance of reduction becomes noticeable with projected sludge waste production rates of over 100 m^3 per month. ■

Note: *The author of this article, Mark Francis, is with Anglian Water Service*