

Packington Sewage Treatment Works

new oxidation ditches and inlet works

by
Sadhu S Buray BEng (Hons), CEng, MICE

Packington Sewage Treatment Works treats domestic sewage from a population of 15,000 residents in Ashby-de-la-Zouch and Packington village in Leicestershire. The works also treats effluent from a number of traders. The need for new development had arisen from implementation of the Environment Agency's River Quality Objectives. The new tighter discharge consent for treated effluent is 15mg/l BOD, 30 mg/l suspended solids and 5 mg/l ammonia. Additional scheme benefits include reduction in odour and fly nuisance and abandonment of existing assets nearing the end of their life. The new works replace the existing inlet works, primary and secondary treatment processes.



Packington STW: New oxidation ditches, MCC & blowers.

Photo: Courtesy Severn Trent

Process description

The variation in load with fluctuating trade waste and size of population served suited an oxidation ditch process which was considered the most robust and economically viable. Severn Trent Water uses oxidation ditches for medium sized populations (2,000-10,000) but their use may be extended for unusually variable loads. The standard design is based upon the general principle of separating the two fundamental requirements of circulation and aeration with each of these contributing to the third factor – mixing.

The ditches at Packington are designed on a population equivalent of 33,000 and design flows of 84 l/s Min flow, 352 l/s 3DWF and 105 l/s Average flow.

Preliminary treatment in the form of screening and grit removal is provided upstream of the ditch in the new inlet works. Sewage from the inlet works is passed forward to an anoxic tank. Primary settlement is not necessary with this type of process.

There are three ditches, each measuring 14m wide by 82m long by 5m deep. Prior to entering the ditches sewage from the anoxic tank and return activated sludge is mixed. The mixed liquors are then distributed by gravity to the three ditches.

Mixed liquors are aerated in the ditch by a grid of fine bubble air diffusers fed from 3 duty and 2 standby blowers. Dissolved oxygen (DO) levels are measured by DO probes and the analogue output from the probes is fed to the blower controller for correct blower operation.

Mixed liquor from the ditch is passed forward to two final tanks where the treated effluent discharges to a watercourse. The 19.2m diameter tanks have a side wall depth of 2 metres and a 20 degree sloping floor. A returned activated sludge pumping station with weir penstocks is used to control the removal and return of activated sludge to the mixing chamber.

Contract strategy

The form of contract used to procure the works is ICE Conditions of Contract (7th Edition) modified to suit, on a Target Price design and build basis. This contract was one of the first large scale contracts in AMP3 to be undertaken by *Severn Trent Water (STW)* under a Design and Build approach. The process design was retained by *STW Biwater Treatment Ltd (BTL)* carried out detailed design, including full hydraulic analysis and construction. Tender documents included sufficient scope of works to enable *BTL* to offer a design which achieved project objectives but also scope to generate a cost effective detail design. Target price was only agreed when the scope was defined, a risk register agreed and the scheme compared to benchmark costs.

The client, STW appointed their in-house Construction Management Group (CMG) as their Project Manager and Planning Supervisor. Regular design review meetings were undertaken by *CMG, BTL and Capital Liaison* who represented the Client's interest. Meetings included the review of designers risk assessments and value engineering exercises to achieve cost savings.

Scope of works consisted of:

- * 3 No. crude sewage oxidation ditches;
- * diffused air system & associated blowers & control for ditches.
- * inlet works, including odour control;
- * 2 No. 19.2m dia final settlement tanks including desludging;
- * scum removal system;
- * RAS, SAS, Scum & washwater pumping stations;
- * motor control centre, HV switchgear & transformers;
- * SAS thickening plant;
- * flow distribution;
- * anoxic tank & mixing chamber;
- * liquor return pumping station;
- * demolition of redundant assets.

The new construction is on a greenfield area within the existing site boundary. Interface with existing works is limited to pipe connections and diversions.

Odour control

The existing works have a significant odour impact on the surrounding area and has caused complaints from local residents and the nearby Packington village. To overcome these problems, the new inlet works are covered and fitted with an odour control unit comprising wood chip and calcified seaweed media to achieve a H₂S removal efficiency of 95% rising to 99% with the addition of a carbon filter. Covers are to be supplied and fitted by OCS and the odour control by ERG. This arrangement has required meetings with both suppliers to overcome interface issues.

Construction

The ditch and final tanks were piled to resist flotation due to high ground water levels at the site. *Simplex Foundations* designed and constructed a total of 548 and 116 continuous flight auger piles on the ditch and final tanks respectively.

A large temporary lagoon was constructed to take groundwater from the dewatering operation. The lagoon discharged onto a disused grass plot area before entering the watercourse. This ensured the maintenance of a high quality discharge which was essential for compliance with the Environment Agency's requirements due to the SSSI designation of the receiving watercourse.

On-site disposal of surplus excavated material promoted significant environmental benefits and cost savings. A total of 26,500m³ of surplus excavated material will be used to create a landscaped screening bund that will screen the works from the A42 and local B roads. Value engineering is also being explored with respect to demolition of the existing assets, with consideration for potential recycling of the bacteria bed media.

Progress

The £5.2m contract was awarded in November 2002 and construction commenced in February 2003. Oxidation ditch construction followed the completion of piling works in July 2003. Savings on construction time were made by adopting prefabricated mesh reinforcement on the oxidation ditch walls and bases. The estimated time saving on traditional reinforcement fixing was three weeks.

At time of writing (Feb 2004) the civils works are approximately 80% complete, with minor structures and pipelines currently under construction. M & E installation has commenced and process commissioning is programmed to start May 2004 in order to achieve the programmed completion date of 23rd July 2004. ■

Note: *The author of this article, Sadhu Buray, is a Resident Engineer*

702

Odour Control by ERG

25 years of experience supplying odour control systems to the waste water industry



← **High efficiency chemical scrubbing systems** catalytically enhanced with Odorgard™ or upgradeable



Operational savings → with state of the art catalytic iron filters for H₂S removal



← **Reliable biofilters** fully enclosed, 95-98% H₂S removal using specially conditioned biomedica



Low cost dry media filters → for any gas flow - annular, double bed, deep bed, containerised - single or dual media - Activated and impregnated carbon, and oxidising dry media



ERG (Air Pollution Control) Ltd
 T: 01403 221000 F: 01403 221001
 E: info@ergapc.co.uk www.ergapc.co.uk

CONTROL GEAR INSTALLATION – GENERATOR HIRE AND SERVICE – MOTOR REPAIRS – SPARES SERVICE



ADDICOTT ELECTRICS LTD



Addicott Electrics Limited is proud to be 'Framework Supplier' of Generator Sets for Wessex Water.

Nether Stowey WWTW, Radipole Pumping Station, Wimbourne & Kinson UV Plants



Generator Construction – Sales – Service – Hire – Repair – Generator Control and Synchronising Panel Manufacture
Complete M + E Installations

01626 774087

Quay Road, Teignmouth

668