Poole Sewage Treatment Works

£11m upgrade of major sewage treatment plant at coastal town

by

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Poole, a large coastal town in the county of Dorset has a population of around 140,000 and is famed for its large natural harbour, being one of the principal centres of sailing and yachting in the UK. Sewage treatment is provided at a site located about one kilometre to the north of Holes Bay in Poole Harbour, with the site discharging via a culvert directly into Holes Bay. The £11 million upgrade of the sewage treatment plant by Wessex Water has to meet the AMP4 compliance date of 31st December 2008.

Poole: SBR Structure under construction October 2007 *photo courtesy Wessex Water*

Project need

Poole Harbour has been designated as a Sensitive Area under the EU Urban Waste Water Treatment Directive. Tertiary treatment is required to reduce the risk of excessive nutrient enrichment and eutrophication in Poole Harbour. The consent requirements comprise a flow to full treatment (FFT) of 1220 l/s, with specified minimum percentage removal across treatment of Nitrogen, BOD and COD up to a maximum allowable concentration. The improvement works are an agreed AMP4 quality output with compliance to be achieved by 31st December 2008.

Scope of works

The selected option entails the provision of a de-nitrifying sand filter utilising methanol dosing and a sequencing batch reactor to treat sludge liquors. By keeping within the existing site most of the works are being carried out as a general permitted development with only a standby generator and four prefabricated GRP kiosks needing planning approval.

The new works comprise:

* denitrifying Tertiary Sand Filter (TSF) plant;
* TSF feed pumping station with upstream flow split and screening chamber;
* Methanol storage & dosing facility for the TSF;
* liquors treatment plant incorporating a Sequencing Batch Reactor (SBR)
* associated site infrastructure including process pipelines, pumping plant, motor control centres, instrumentation and telemetry facilities, relocated electricity sub-station, new standby generator and cabling to facilitate the new works.

The TSF is a continuous backwash design based on treating 70% FFT. It comprises an above ground concrete structure split into six banks which each contain six cells of sand media to treat the influent. Diluted methanol is injected into the TSF via a static mixer on the feed pipework.The feed pumping station has a working volume of 950m^3 and provides flow attenuation to prevent the sandfilter beds

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Poole STW upgrade - TSF structure under construction October 2007 *photo courtesy Wessex Water*

from becoming fluidised. Incoming flows first enter a flow split-chamber incorporating a bypass; flows to the TSF pass through an automatic 6mm-2D screen. The TSF site has been designed with future expansion in mind to treat 80% FFT.

The methanol storage and dosing facilities are located within a high-security compound in the middle of the STW site. There are two 70m^3 tanks fabricated as a carbon steel double-skin construction separated by 150mm of foamed concrete, tested for fire and impact resistance.

The SBR provides treatment to liquors from the digested sludge presses. It operates on a 12 hour fill/mix/aerate/settle/decant cycle and has internal plan dimensions of 22.4m x 15m with a 7.8m process depth. The above ground concrete structure includes inlet and discharge balancing tanks, fitted with GRP roof covers and odour control facilities to keep potential nuisance to a minimum. The treated effluent is pumped to the inlet of the site BAF plant and the sludge is returned to the RAS system.

The physical nature of the site is a major constraint. Space for new structures is restricted and the SBR is sited over a partially demolished storm tank approximately 3.5m below ground. The site is built on an artesian aquifer in a sand layer some 18m down. The TSF and SBR structures are founded on settlement reduction piles which stop short of the artesian aquifer preventing leakage and contamination.

Implementation

Separate packages were tendered for the design, supply and installation of the respective process plant, with the TSF works being awarded to Paques (from Holland) and the SBR works to Enpure (formerly Purac). At the same time, March 2006, MWH was engaged as lead designer, enabling them to co-ordinate the process design with the overall civil, structural and ME&I design. MWH had previous experience of methanol dosing, gained through their 4D joint venture working on similar schemes for Southern Water.

Construction contracts were let in March 2007. The civil works were awarded to local contractor *Dean & Dyball* (now part of Balfour Beatty). who were also to act as Principal Contractor for the project. *Nomenca* were contracted for the mechanical installation of the pumps, screening and odour control plant, along with the complete electrical installation for the works.

The construction programme was dictated by the constraints of a restricted site and the need to maintain existing plant operation. Pool STW comprises three separate process streams and each of these had to be diverted into the new flow split chamber. This chamber needed to be constructed and put into operation as a priority to allow flows to bypass the area of the TSF before work could start there.

Another critical element of the construction was the TSF feed pumping station, entailing a 12.5m internal diameter caisson sunk to a depth of 15m. Borehole dewatering was installed around the shaft in order to reduce the groundwater pressure. The caisson was constructed in a conventional 'top down' manner mostly within a firm clay which enabled a ring to be jacked down each day as excavation proceeded.

The main TSF and SBR structures were substantially completed by the end of 2007, and the process plant and M & E installation commenced in December 2007. Work is currently on target for the SBR commissioning to start in May 2008, with the TSF following on two months later.

The project has involved many interfaces and all parties have worked well together to maintain a good relationship at site and accommodate the activities of others. Construction has been carried out on programme to a tight timescale, and completion this summer should enable Wessex Water to optimise the new processes well in line for the Regulatory Date of 31st December 2008.

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