

Charmouth Sewage Treatment Works

£4.5 million upgrade at Wessex Water's south coast plant

by
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Charmouth is a small seaside township in West Dorset, located along a stretch of World Heritage coastline well known for fossils. The area is popular with holidaymakers and the town's normal 2500 residential population swells to over 7000 in summer, with many of the visitors staying in surrounding caravan sites. Sewage treatment was originally provided at a site adjacent to the River Char, just upstream of the town. Discharge of treated sewage into the river was stopped some 15 years ago when Wessex Water constructed a sea outfall extending a mile out into Lyme Bay. At that time the treatment works was converted into a headworks facility comprising 6mm screening and hence pumping to a header tank on the outfall pipeline.



Charmouth STW: Piling for SBR structure - new header tank in background

courtesy: Wessex Water

Project need

The marine discharge has to comply with the Urban Wastewater Treatment Directive, requiring the provision of secondary treatment. Existing storm holding tanks at the site provide adequate storage capacity, however the overflow was identified as an Unsatisfactory Intermittent Discharge and needed the installation of a bi-directional 6mm screen on the outlet.

The consent requirements comprise a full flow to treatment (FFT) of 35l/s, with specified minimum percentage BOD and COD removal across treatment up to a maximum allowable concentration. The improvement works were an agreed AMP3 quality output with compliance to be achieved by 31st March 2005.

Scope of works

Various treatment options were considered to determine how best to re-develop the existing works site. The conventional solution using trickling filters was discarded due to potentially unacceptable odour and fly nuisance, while requiring additional land purchase.

The final proposal was for a sequencing batch reactor (SBR) selected on the basis of lowest cost, space efficiency and successful Wessex Water operational experience. The scope also included for associated sludge handling facilities and odour abatement. By keeping within the existing site, most of the works could be carried out as general permitted development, with only a prefabricated GRP sludge thickening building needing planning approval.

Design philosophy of the new works is governed by the existing outfall. The pass-forward flow is limited to 177 l/s (the outfall capacity), screened and dewatered; FFT is pumped to the SBR and flows above that are pumped directly to the outfall. Inflow exceeding 177 l/s spills through a storm screen into the holding tanks, normally to be pumped back to the inlet works but ultimately overflowing to the river.

New works

The new works comprise:

- * replacement header tank on the outfall;
- * extensions to existing inlet channel to accommodate new screens and grit trap;
- * modifications to an existing pumping well for the FFT and intermediate pumps;
- * RC process structure incorporating a 4-basin SBR, SAS and thickened sludge tanks;
- * duty/standby drum thickeners and polymer plant housed within a GRP kiosk;
- * 2-stage odour control plant comprising a biofilter and activated carbon unit;
- * new MCC installed within an existing pumphouse;
- * upgraded power supply and new standby generator;
- * associated site infrastructure including process pipework, return liquors pumping station, drainage, roads, paving and ductwork.

4 hour cycle

The SBR is a continuous inflow design based on a 4 hour cycle, the cycle timings staggered by an hour so that at any given time two basins are aerating, one is settling and one is decanting. The sizing of the SBR was determined by space limitations and by the process

design requiring full nitrification in order to limit potential odour nuisance. Each basin has internal plan dimension of 14.5m x 4.75m with a 6.5m process depth.

The physical nature of the site is a major constraint. The site is built up on the flood plain at a bend in the river and is protected along the river's edge by sheet piling tied back to anchor blocks. Deep excavation would have been difficult and was neither economic or practically feasible in the available timescale. Both the header tank and SBR are founded at ground level on bored cast insitu piles, and the SBR stands some 7m high. The visual impact is mitigated by the site being set in a natural bowl surrounded by an established tree screen.

Although located several hundred metres from housing, the site has a caravan park adjacent to it. Odour modelling and noise surveys were carried out at the initial design stage and all of the process units are covered to limit potential nuisance.

Implementation

The project was tendered as a design and construct contract under EEC Option C. The contract was awarded in February 2004 to *Costain* who engaged *Carl Bro* as civil designers, *MEICA Process Ltd* to coordinate mechanical and electrical design and installation and *ITT Sanitaire* for the SBR process works.

The works needed to be carried out to a very tight timescale. *Costain* had programmed for a 12 month's completion period prior to the 31st March 2005 deadline. A 'fast track' approach was adopted whereby the detail design was carried out to suit the construction sequence. Review meetings were held at various stages during the design to ensure that proposals met Wessex Water



Value added service

Meica Process Limited is a specialist arm of one of the largest engineering service providers in Europe – Imtech, dedicated to providing value added services on a wide range of Water, Wastewater, Sludge and Industrial Effluent treatment projects. The company was formed in 1994 by its current Directors who pride themselves in being actively involved in the day to day running of the business. Our ethos is based on working in a partnering, collaborative and non-adversarial manner and continuing to employ the best people for the job. We provide high quality solutions at minimum total whole life cost which meet and exceed our customers objectives. We achieve this through relentless focus on engineering solutions combined with the development of enthusiastic people who are highly trained and possess the flexibility and commitment required to work collaboratively with our business partners to exceed our continuous goals. Our success to date has been in the following sectors of industry:

Wastewater: Proven capability in designing, refurbishing, optimising, upgrading and maintaining existing works and installing new plant to meet new regulatory and legislative requirements. We have the necessary expertise in-house in a wide range of processes and generally aim to align our solutions with the long-term needs of the operators. Meica Process is also actively involved in providing maintenance support to Water Companies and other clients.





Sludge: The effective, reliable and sustainable treatment and disposal of sludge in accordance with tightening standards is a major challenge. Meica Process has particular experience in the treatment and safe disposal of sewage sludge including the development and implementation of strategy to achieve the latest environmental standards and reporting. Our specialist experience includes sludge handling, thickening, pasteurisation, digestion, dewatering, lime stabilisation and thermal processing.



Water: Meica Process has established expertise in the design, construction and uprating of Water treatment plants to produce high quality drinking water. Our experience includes coagulation, flocculation, clarification, filtration, ozone, carbon absorption, membrane treatment (cryptosporidium reduction) and waterworks sludge treatment (thickening and dewatering).



Industrial Effluent: Meica Process has experience in providing treatment solutions for industry. These include process water re-use, treatment of food, beverage and brewery effluents, the treatment of oil contaminated wastewater and leachate and most recently the abatement of foul odours (VOCs) to meet stringent planning / PPC requirements.



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standards and were suitable for Operations personnel. A major element of the design was the requirement to cover the SBR basins for odour control while still allowing easy visual inspection and access for maintenance. This led to the development of a system comprising plastic rollback covers set in stainless steel frames and manually winched open/closed.

Restricted site

The construction programme was dictated by constraints of a restricted site and the need to work around existing plant. The new header tank was first to be built, utilising pre-cast panels to minimise construction time. The old works could then be demolished, clearing the way for the SBR structure. With this structure occupying a quarter of the site, ancillary works had to wait until the SBR civil works were largely complete. Maintaining access and laydown space was a constant logistical challenge. A remote operated tower crane was set up early on, and although intended primarily for the SBR it proved essential for all of the construction and installation work.

Site working hours were restricted during bank holidays and throughout July and August to try to minimise disturbance to residents and holidaymakers.

Mid-March production

The project involved many interfaces and everyone worked well together to maintain a good liaison at site and accommodate the activities of others. The major civil works were substantially completed by the end of November 2004, and water testing of the tanks was completed over the Christmas period. M & E installation commenced in October with the inlet works. By the end of February 2005 much of the dry and wet testing had been carried out and the inlet works were fully commissioned. The treatment process was 'kick-started' at the beginning of March by seeding the SBR with surplus activated sludge from nearby Bridport STW (also an SBR plant). Testing and commissioning of the sludge thickening and odour control plant commenced in mid-March as sludge started to be produced.

All parties have worked hard to enable the works to be put into operation by the regulatory date despite the many complexities of the scheme. At the time of writing (end March 2005), treatment is fully compliant and formal commissioning tests are well advanced.

Note: *The authors of this article M. Mackintosh & D. Modley are respectively Project Manager & Programme Manager with Wessex Water.*



Charmouth STW: Rollback covers fitted to SBR tanks

courtesy: Wessex Water