Nether Stowey STW, Somerset
improvements & meeting tighter consent

by

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Nether Stowey sewage treatment plant enjoys a rural location on farmland close to the village of Fiddington, on the edge of the Quantock Hills in Somerset. Besides serving the village of Fiddington, from which flows gravitate to the works, flows from Nether Stowey are also pumped to the site – which is some 10 miles west of Bridgewater – for treatment. The population served will rise from 1800 in 2002 to 2000 in 2022 and the population equivalent from a caravan site in Fiddington is 450 in summer. These figures also allow for load from a local trader discharging dairy wastes.

Nether Stowey STW: Improvements & meeting tighter consent courtesy Wessex Water

Existing plant

The site is relatively steeply sloping, occupying two fields at the end of a narrow farm access track. The upper field contains the inlet works with fine screens, primary tanks, percolating filters, humus tanks and sludge management and storage tanks. The lower field is offset laterally from the line of the upper field and the two fields are connected by a narrow access where their two corners join. The lower field contains two grass plots.

Purpose of scheme

The former qualitative consent for the treatment works was 50:80:25 (mg/l BOD:SS:AmmN). The Environment Agency has tightened the consent to 9:18:2 with effect from 1 April 2004. In addition there was an unsatisfactory discharge from the storm tanks that had led to unsightly littering of the river bank and needed to be addressed. Furthermore, the volume of storm storage was slightly lower than required to meet AMP2 guidelines.

New works

From a review of the works performance it was apparent that the new BOD and SS standards were already being met, but the new ammonia standard was considered a particular challenge. During the project option study, tertiary biological aerated flooded filters (BAFFS) were identified as the preferred solution, being a tried and tested means to achieve the tighter ammonia consent. At the same time, the project team became aware of a new process that could achieve the standard using aerated sand filters, but with the advantage of less mechanical plant to control the process and, therefore, with significant cost savings. This new process is the aerated tertiary sand filter (ATSF) plant.

A visit was made to the only full scale plant in operation in the UK, in Harrogate, to provide Wessex Water operations team with the assurance that the plant could perform adequately.

The principal works included in the scheme have been constructed in the upper section of the lower field that was formerly occupied by one of the grass plots. Flow from the humus tanks is passed through a copasac chamber to a pumping station that lifts it through the aerated sand filter (ATSF) plant. From the ATSF plant flow gravitates to a chamber in which a v-notch weir is fixed and where adjacent streams of treated and storm flows can be measured and sampled.

In simple terms, the ATSF plant comprises a bed of sand 2.5m deep in a hopper bottomed steel tank. Air from compressors housed in an adjacent plant room is introduced to the sand bed via diffusers and bubbled up through the sand filter bed. The air supply serves both to circulate the sand around the bed and provide process air for bacteria attached to the sand media to purify the water. A regular flow of sand is continuously raised up the centre of the tank through a plastic tube and washed at the top of the bed, before being dropped onto the surface of the bed to circulate again.

Alongside the ATSF plant is the control panel housed in a GRP kiosk. The plant kiosk, next door, houses the compressors, air receivers and the pneumatic control panel that controls the split of air flow between use for the process and use to circulate the sand bed.

Adjacent to this kiosk, a new standby power generator is provided. The site did not previously have any critical plant, so standby power generation was not deemed necessary. However, with the installation of the ATSF plant this situation has changed and hence standby generation is now required.

Other works have been provided under the project.

Storm flow treatment

* raising of storm tank walls to provide the increase in storage volume required;
* provision of copasacs on the storm tank outlet to protect against discharge of screenings;
* stiffening of external walls of the storm tank to meet structural needs for higher walls;
* provision of mixers in storm tanks to clean tanks before emptying;
* provision of dedicated pump for return of storm flows to the inlet works and re-routing of storm return main downstream of the overflow weir to prevent cycling of returned storm flows back to the storm tanks;

Inlet works

* replacement of inlet works flume to provide better means for initiating discharge of flows to the storm water storage tanks;
* modification of storm weir height to accommodate reduced throat width flume;
* new by-pass weir.

Sludge treatment

* provision of sludge liquor balancing tank;
* provision of diaphragm pump to control discharge of sludge liquor to the works;

Construction/contractors

The works have been undertaken under Wessex Water alliancing arrangements with *Costain Ltd* as main contractor, using *Haswell* as design consultant. *Costain* sub-contracted the procurement and installation of the ATSF treatment process plant to *Paques* of the Netherlands. In addition, *Nomenca* was appointed as a sub contractor to procure and install all other mechanical and electrical equipment.

Progress with implementation

Problems with completing the design of civil works delayed the start of construction in August 2003. The non-critical activities were re-scheduled later in the programme and critical items given priority to complete to the original programme. The full scale plant has been set to work and is performing well to meet the new consent of 9/18/2 (BOD;SS;AmmN) from 1 April 04. *Paques* brought a pilot plant to the site to undertake taking over tests off-line and these were due for completion in June 2004.

Conclusion

The aerated sand filter process appears to offer a cost-effective way of achieving tighter ammonia standards.

Lessons learned

The original intention was that washwater from the ATSF plant would be returned to the humus tanks for settlement. However, it was found that the humus tanks did not provide adequate treatment for washwater and this regime risked compromising the new consent. Instead, washwater flows were returned to the head of the works for primary settlement and filtration: this was found to work well.

During the seeding process a constant flow was maintained to the filters to simplify the dosing of ammonia salts and this meant that re-circulation was necessary. However, the presence of alkalinity is essential for the nitrification process since nitrification uses up alkalinity and depresses the pH. The lack of alkalinity in the re-circulated flow led to the pH becoming depressed and compromising the nitrification process. Successful performance of the nitrification process relies upon a pH of about 6.8 or higher and this meant that the use of re-circulation needed to be restricted. ■

Note on the authors: *S.R. Carver is Project Manager and D. Modley Water Programme Manager, both with Wessex Water.*