Evesham Sewage Treatment Works

phosphorus removal and tertiary treatment plant

by
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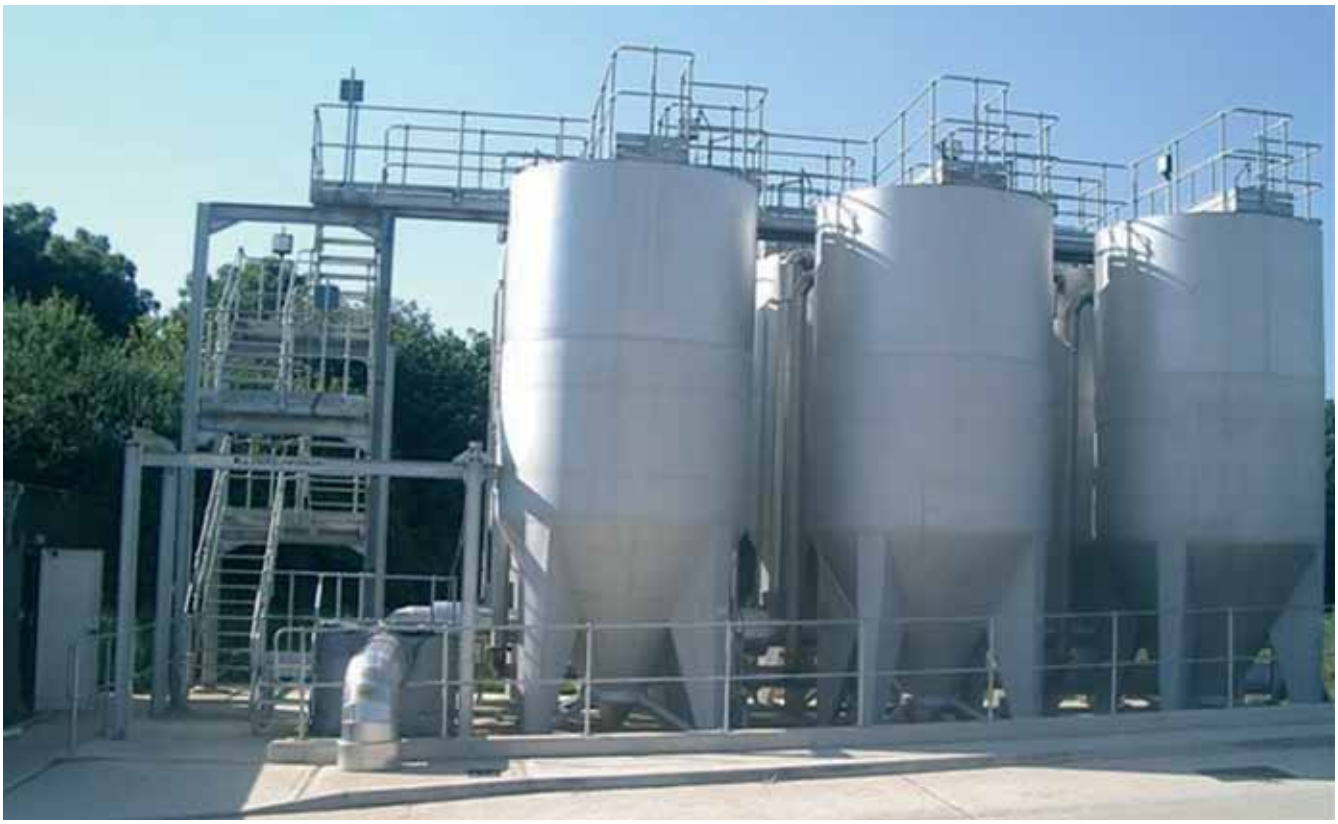
Evesham Sewage Treatment Works treats domestic sewage from a population of 31,600 residents of the market town and surrounding villages. The works also treats effluent from a number of traders. The need for the new development had arisen from implementation of a European Urban Waste Water Treatment Directive to introduce a new phosphorus consent, which is enforced by the Environment Agency. The new consent is to reduce the phosphorus levels to below 2mg/l



Evesham STW: Sand filter installation *courtesy Severn Trent Water*

Brief & design

From the issue of the notional solution from the investment planning team in September 2004, both Severn Trent Engineering Services and Morgan-Est developed the scoping document to ensure that both parties had a common understanding of the proposed solution. Due to the tight procurement period and embracing the new AMP4 contract strategy, it was essential that the design team drew on their experience to minimise the design period by, wherever possible, re-using and improving on designs from previous projects.

In addition, it was necessary to order the major plant items prior to works order.This was achieved by issuing a letter of intent to Vexamus Limited for modular sand filters and the chemical dosing plant was procured via bulk order arrangement instigated by the Sever Trent Purchasing Department. Other framework suppliers, including ITT Flygt and CEMA, were also consulted during the scoping stage of the project, in order to ensure that the solution was fully developed using the expertise of our pumping and electrical control specialists, respectively. The speed of the design and procurement was possible because team members were fully focused on delivering the project to challenging timescales, and to meet the March 2006 consent date, but with full control of costs.

Scope of works

Provision of a new flocculation/mixing chamber and chemical dosing plant. The dosing plant has the facility for two-point dosing prior to the humus tanks and at the inlet works. Provision of a 3 dry weather flow (DWF) tertiary sand filter (12,945m^3/d) and associated tertiary pumping station and backwash pumping to accommodate the additional flow from the continuous sand filter backwash system.

Contract strategy

The form of contract used by STW on AMP4 Capital Projects is ICE Conditions of Contract, Term Version (1st Edition) modified to suit the AMP4 contract strategy based on a target price with a pain/gain share mechanism.

This is one of the first contracts in AMP4 to be undertaken by Severn Trent Water. The process and engineering design was undertaken by STW along with the detailed design, including hydraulic and structural analysis. Target price was only agreed when the scope was fully defined, roles and responsibilities agreed, and costs were obtained from cost curves developed from an extensive AMP4 contractor selection process.

Contract
The £1.5m contract was awarded to Morgan-Est in June 2005 and construction commenced on site on 18th July 2005.

Planning issues
The work at Evesham STW was granted planning permission by Worcestershire County Council on 30th June 2005. The permission was granted with a number of conditions.

* an appropriate scale plan showing 'Wildlife Protection Zones' where construction activities are restricted and where pro-active measures will be installed or implemented.;
* details of proactive measures (both physical and sensitive working practices) to avoid impacts during construction;
* timetable to show phasing of construction activities to avoid periods of the year when sensitive wildlife could be harmed (such as the nesting bird season;

Persons responsible for:
* compliance with legal consents relating to nature conservation;
* compliance with planning conditions relating to nature conservation;
* installation of physical protection measures during construction;
* implementation of sensitive working practices during construction;
* regular inspection & maintenance of physical protection measures and monitoring of working practices during construction;
* provision of training & information about the importance of 'Wildlife Protection Zones' to all construction personnel on site.

Design development
During the design development stage of the project it was identified that the following had the potential to impact significantly on the development works at Evesham STW,

Bee Orchids;
Badgers;
Breeding Birds.

Badgers
The most significant effect on badgers was the temporary closure of one main sett, one annex sett and one subsidiary sett. These works were completed under licence from English Nature. Consequently, it is anticipated that the works were likely to have a moderate adverse effect on badgers and it should be pointed out that disruption of at least a further seven setts was avoided by careful positioning of the principal and ancillary structures, together with the new pipeline routes.

Ecological surveys highlighted that the site areas lay within a badger species habitat. Badger proof fences were strategically erected within close proximity to the site boundary and an English Nature licence was obtained to carry out construction between 1st June and 30th November 2005.

10 'one way' badger gates were installed within the badger-proof fence. These gates were one way gates specially designed and built to allow the badgers to egress through the gates, but not to re-enter.

Ecological Clerk of Works
The Ecological Clerk of Work's role, provided by MME, was to maintain a watching brief associated with the development works at the site. This involved visiting the site on a regular basis to ensure that the badger-proof fence was maintained, and badgers were not excavating beneath the fence and re-entering the setts. In addition the Ecological Clerk of Works checked that the demarcation fencing around the area of the site where orchids exist was in place and that this area was not being accessed.

Following completion of the works a badger licence report form was submitted to English Nature by MME.

Tertiary treatment
The new tertiary treatment plant consists of six Continuous Upward Flow Sand Filter units. These units operate continuously. Water filtration and sand washing are uninterrupted. Two compressors (duty/standby) supply air to an air lift pump. The function of the air lift pump is to lift the sand, which contains the entrapped solids, from the base to the sand washer at the top of the unit. The sand filter silos are a stainless steel structure.

Chemical dosing plant
The phosphorus removal plant design was developed between Severn Trent Water and Lintott (formerly known as Tyco) This consists of a separate storage tank, tanker filling arrangement and concrete bund, small kiosk which houses the dosing pumps and control equipment and tanker delivery area. The tanker delivery area incorporates a spillage containment area. Design is based on tried and tested designs, therefore, eliminating the need to carry out bespoke designs. To ensure a more effective and efficient use of chemicals, a diurnal profile was developed.

Construction
Due to the demands of a tight procurement programme, early contractor involvement was key to the overall success of the project and required a high level of collaboration among the 'project team' that consisted of engineers from STW and Morgan-Est. An example of this was to build the new flocculation.mixing chamber off-line to reduce the operational disruption to the works and to ensure that the duration of the phased temporary overpumping operation was kept to a minimum. Considering the complexity of the pipework immediately upstream of the mixing/flocculation chamber, it was essential that the flow being discharged into the new chamber from the 12 filter beds was adequately controlled by the construction team on site. This work was undertaken following close consultation and liaison with the operational site staff representing the Sewage Treatment Group (STG)

Commissioning
During commissioning of the sand filters STG Operations insisted that the effluent from the sand filters was returned to the head of the works until all the fines had been removed and the results obtained met the requisite consent standard. As each sand filter unit had to be tested at maximum flow (30 l/s), a decision was made by the project team to undertake 'cyclic' tests where control valves were used to control the flow through each unit.

This allowed a reduced flow of 30 l/s to be discharged into the backwash pumping station and returned to the head of the works via the 150mm dia. rising main. This alleviated the need for a temporary overpumping operation that would have required in excess of 180 metres of temporary above ground pipework across the site, for at least a seven day period.

The first series of tests involved 3 sand filter units which received a flow of 10 l/s for 8 an hour period, followed by a maximum flow of 30 l/s for a 2 hour period, through each individual unit. This testing regime was then repeated for the remaining 3 units.

Once samples were taken, analysed and confirmed as compliant, the final effluent was then discharged into the River Avon, via the designated route.

Following discussions with the Environment Agency and Worcester County Council Planning & Environment Department, a collaborative Spoil Management Plan was developed to provide a sustainable solution whereby all arisings from the construction work (approximately 1,700m^3) would subsequently be used as fill material and temporarily stored within an area deemed to be outside the extent of the flood plain. Waste management practices employed were that all excavated material was stored on site to reduce lorry movements through the town of Evesham. Construction activities were restricted to certain hours of the day.

Sustainability award

The project achieved the Severn Trent Sustainability Capital Investment Platinum Award in 2005.

Scheme benefits

In summary the development works at Evesham STW achieved the following:

* the scheme is fulfilling all its objectives;
* the local community benefit from improved water quality;
* the completed scheme is reliably achieving required consent;
* the contract was delivered on time and within budget;
* was well received by Severn Trent Sewage Treatment Group.

The mitigation and protection measures outlined in the habitat survey conducted around the entire site and the Construction Ecological Management Plan, including the floodplain area, ensured that the effects on the bee orchids, badgers and breeding birds, were minimised. ■

Evesham PDosing Plant Installation *courtesy Severn Trent Water*

Note: *The author of this article, Ian Johnson, is a Project Engineer with Severn Trent Water.*