

# Anglian Water AMP3 Improvement Projects

## Quality programme and Capital Maintenance Schemes

by  
Faye Turner BSc., & Subasish Dutt CEng., CEnv., FCIWEM

**T**he new £7m sewage treatment works at Whittlesey, situated 10 miles from Peterborough, comprises three main systems: inlet works, activated sludge plant and sludge thickening process. It was designed to serve a population equivalent of 18,591 (2011) with a full flow to treatment 9811m<sup>3</sup>/day, to meet a UWWTD Consent Standard of BOD:TSS:NH<sub>4</sub>-N:P15:30:5:2mg/l. The plant was successfully delivered on programme and within target price in just 18 months in order to meet consents which came into force at the end of 2004.



Whittlesey STW

*courtesy: Anglian Water & Aker Kvaerner*

Whittlesey STW was the largest scheme the *Skanska-Aker Kvaerner* Joint Venture undertook within the Anglian Water AMP3 Framework Agreement.

The JV, one of six appointed partner contractors under the AMP3 Partnering Framework for Anglian Water, combines Aker Kvaerner's expertise for process and MEICA design, with the civil and structural design skills of Skanska, which complement the requirements of Anglian Water.

The JV worked along with Anglian to design, construct and commission over 90 schemes ranging from £200k to £7m that covered both the AMP3 quality programme and capital maintenance schemes. It had, therefore, to respond to a wide range of projects.

### Modelling in design

During the design of Whittlesey, state-of-the art modelling was carried out by Anglian Water to confirm aspects of the design, testing and optimising flow splitting and mixing under various operational conditions.

Computational Fluid Dynamics (CFD) was carried out on the inlet works to ensure even flow distribution to the screens. BLOWIN was used to model process performance of the entire treatment works to ensure that the required effluent quality was achievable under different scenarios of operation.

### Construction

*Skanska-ker Kvaerner* started civil activities on site in September 2003 and from the onset there were several difficulties to work around with regard to site access and the existing trickling filter works. The site itself was situated just outside of Whittlesey town centre and was surrounded by farmland to the south and west and Whittlesey Dyke to the east. The only access to the site was across an unmanned level crossing; with up to 50 deliveries a day during the peak of construction, this required careful planning and agreement with the Rail Authorities,

The new plant was built next to the existing trickling filter works and it was essential that this works was kept on-line until the new plant was able to produce compliant effluent. From the outset, good relationships were established with the on-site operators. Good communication was established so that any arising problem was quickly resolved right



Chatteris STW: showing modification to existing deaeration tank

*courtesy: Anglian Water & Aker Kvaerner*

through to the commissioning stages when the operators' experience of the existing works proved invaluable when it came to diverting flows.

Seeding of the aeration lanes, which coincided with turn of flow, was staggered over a 10-day period and 20 tankers of iron-rich sludge were used to seed each lane to encourage easy sludge settlement.

The process took around three weeks to acclimatise, after which the Mixed Liquor Suspended Solids (MLSS) levels steadily rose from seeding values of around 1000mg/l to design values of 2500mg/l and during the same period Dissolved Oxygen levels dropped steadily from 10mg/l.

Analysis of the final effluent from the new works showed that the effluent was in consent from the first day of treatment. As the existing percolating filters were deteriorating rapidly, this was welcome news and the decision was made to discharge directly to outfall **ahead of the scheduled date.**

**On 29th December, Whittlesey achieved Stage 1 handover & operation of the plant was passed over to Anglian Water Operations. This milestone marked a huge achievement for the Whittlesey Team, down to which the success of the project truly lies.**

#### Capital Maintenance Schemes

**Skanska-Aker Kvaerner Joint Venture's MEICA capability has been effectively utilised to deliver performance improvements on various capital maintenance projects for Anglian Water during AMP3. The approach to these schemes is totally different to the quality programme schemes. The key issues associated with the capital maintenance projects are:**

- \* work was completed on live, operational sites with multiple interfaces;
- \* refurbishment work had to be done such that it did not impact on the operation or safety of the existing plant and this followed a full operational review of existing plant;
- \* novel & innovative design and construction methods were explored due to the limited shut down time available for installation and commissioning;
- \* close working relationships were established with vendors and sub-contractors, allowing information to be received in a timely manner, preventing unwanted delays. This allows plant to be returned to service with minimal disruption;
- \* procurement of materials and sub-contracts had to be completed timely to achieve programme milestones;
- \* installation and commissioning plans and risk assessments produced early in the design phase to ensure safety and plant operation are not affected at any stage of the works;
- \* training of site personnel to familiarise them with the new equipment installed and specifically the interaction with existing plant.

**The Joint Venture developed the following design development programme with Anglian Water for the capital maintenance projects:**

- \* definition of problem and scope';
- \* scheme selection (target cost stage for the chosen option(s);
- \* detailed design & construction.

An example of how these capabilities have been used on **capital maintenance projects** is shown below.....

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## Chatteris STW

### one of nine Anglian Water Capital Maintenance Schemes

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**C**hatteris Sewage Treatment Works was one of nine capital maintenance schemes executed as a bundle of work under one Target Cost contract to a value of £2.5 million. This work involved removal of the existing surface aerators, replacing them with mixers and submersible aerators. To ensure the operation of the site and safety of site staff were not compromised, a detailed Impact Plan was completed. This highlighted the sequence of work to be completed and the associated responsibilities, whilst also stating all contingency measures which would be put in place should installation not be completed as planned.

The close working relationships created within the supply chain allowed optimum operating locations for the mixers and aerators to be established using a CFD modelling package. It was found that although the mixers could be installed from existing walkways, the submersible aerators had to be installed at a distance from the existing walkways which would result in access problems. In order to operate correctly and to prevent the aerators rotating during operation and start up, the aerators had to be fixed in some way. However, fixing the aerators to the tank floor would result in the tanks having to be drained in order to remove the aerators in the future.

An in-house design was developed which would result in modifications to the aerator base plate and the introduction of vertical locating posts which finished above top water level. The locating posts and base plate modifications allowed the on-site crane to remove and re-install the aerators without draining the tanks and without expensive additional walkways, whilst also ensuring the aerators did not move during operation. The development of the costs established that the proposed modifications were very cost effective and Anglian Water approved these for implementation.

Information on various assets to be refurbished is often limited, however, the close working relationship with the vendors and sub-contractors allowed *Skanska-Aker-Kvaerner* to obtain information on various products which helped to prevent delays or unexpected problems at an advanced stage of refurbishment and hence allowed the asset to be returned to service with minimal disruption. This also allowed effective Target Costs to be developed and ensured a high standard of Operating & Maintenance Manual produced.

#### Partnership approach

The partnership approach with Anglian Water under AMP3 is considered a significant factor in the success of schemes undertaken by the *Skanska-Aker Kvaerner JV*. The capital maintenance and quality programme schemes required different approaches and the JV was able to achieve success for both types of scheme with focused team effort and innovation. ■

#### Note on the authors:

*Faye Turner is Senior Process Engineer and Subasish Dutt, Technical Manager, both with Aker Kvaerner.*