

# Flag Fen WwTW

## upgrade to meet the future

**A**nglian Water's Asset Management Programme has seen the completion of a further two key projects - both at the water company's Flag Fen WwTW in Peterborough. The Flag Fen Improvements project and the Flag Fen Sludge Treatment centre (STC) Project commenced in 2004 and were completed on schedule and within budget, with handover to operations completed by February 2006.



Flag Fen WwTW

*photo courtesy Skanska-Aker-Kvaerner*

As framework delivery partner, the Skanska-Aker Kvaerner Joint Venture was employed to assist in optioneering and assessing the financial feasibility of various solutions proposed under the two projects. The JV company was formed to combine the civil and structural design skills of Skanska with Aker Kvaerner's engineering expertise for process and MEICA design; skills which complement the requirements of Anglian Water.

### Existing treatment Process

Flag Fen Wastewater Treatment Works was constructed in 1989, and treats flows from the catchment area of Peterborough, which has a current population equivalent of 185,000. Prior to the two improvement schemes, the works comprised the following elements:

- \* inlet screw pumping station;
  - \* elevated inlet works comprising screens/grit removal and flow control;
  - \* secondary activated sludge treatment followed by tertiary BAFF;
  - \* secondary sludge picket fence & gravity belt thickening;
  - \* imported sludge reception and screening;
  - \* sludge dewatering via centrifuges & lime addition to allow disposal to agriculture.
- A site audit carried out by Anglian Water's engineering team investigated the impact of increasing flows to the treatment works and identified the following major issues.
- \* restrictions in the site processes resulted in the inability to treat the consented full flow to treatment. This led to premature discharge to storm..
  - \* much of the existing sludge treatment plant was at the end of its asset life and required extensive operational input to maintain it in working condition;
  - \* inefficient screening of incoming sewage flows and the imported sludge exacerbated the operational problems, as screening carry over caused blockages and plant failures;
  - \* the existing inlet screens required significant volumes of washwater, which starved other site processes;
  - \* changes in the requirements for sludge treatment over

the years resulted in a complex system of pumping mains crossing site. The sludge plant had no centralised control system resulting in high operating costs and poor sludge management;

- \* there was a major bottleneck in the existing SAS surplussing system, which relied on large picket fence thickeners to treat surplus mixed liquors from the aeration lanes, and this prevented flows to full treatment being increased.
- \* the existing belt thickeners were inadequate for future flows;
- \* the existing aeration plant was difficult to operate and had problems maintaining stable MLSS and F:M ratios.

As a framework delivery partner, the Skanska-Aker Kvaerner JV was employed to assist in optioneering and assessing the financial feasibility of various solutions associated with the problems listed above. The final proposed solution was split into two main sections of work.

**Flag Fen Improvements Project**

This project included the replacement of existing screens and compactors with units hydraulically sized for future flows, which are able to use screened sewage as washwater, as well as having improved screenings removal efficiency. The project also looked to optimise the existing activated sludge process and remove SAS via the RAS system as per normal practice. Finally, a temporary thickening route, using redundant PFT's as buffer storage and existing thickeners (with temporary pumps) was created until permanent facilities were constructed.

**Flag Fen Sludge treatment Centre Project**

The scope of this project included a new dedicated imported sludge reception and screening and transfer; new SAS screening; and new SAS Belt thickening facilities to supplement existing units.

Existing redundant Picket Fence Thickener tanks were converted into imported sludge storage (complete with new roof) and SAS Buffer storage. The existing unsafe 3000m<sup>3</sup> thickened SAS storage tank was removed. and the existing storage tanks were converted into thickened SAS storage and blending tanks, which dramatically reduced sludge pumping distances. New odour control facilities were constructed; and the feed pipework to existing dewatering and liming was rationalised.

Involving the Skanska-Aker Kvaerner JV in both projects assured Anglian Water of a managed interface between the two projects, where all team members were able to gain a broad understanding of the site. In addition, there was continuity of key engineering, project and construction staff throughout both projects from both companies, which reduced interfaces and ensured a high degree of team cooperation. These benefits also helped to facilitate improved communications between all parties and thus tighter project control.

**Project delivery - the challenges and benefits realised**

Construction of the Flag Fen Improvements project began in April 2004, whilst the STC project commenced in September of that year. Early in the delivery process the process team realised that operational staff would be key to the successful completion of the project and embarked upon a detailed communication exercise to develop the programme. One of the major challenges facing this project was sequencing the works to ensure the impact upon the site operation was minimised. The intrusive nature of the works posed a number of technical and programming challenges. This required close working to develop a detailed construction philosophy document. Space limitations and maintaining plant operation required the development of a number of Impact Plans to ensure the operational risk was managed.

*working in partnership to support Anglian Water's Asset Management Programme*

design | engineering | construction | project management | upgrades | refurbishment

The Skanska-Aker Kvaerner joint venture is proud to have supported Anglian Water during its AMP3 Programme.

We look forward to continuing our relationship as a member of the AMP4 @one alliance delivering cost effective engineering and construction solutions.

Under this programme, the fully integrated JV provides project management for the design and construction phases, with Skanska providing civil and structural design for water, wastewater and sludge treatment projects, and Aker Kvaerner providing engineering expertise for process and MEICA design.

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During the project commissioning, issues associated with the new imported sludge transfer pumps were highlighted. This was due to the high volume of imported raw sludge and the variable nature of the incoming sludge quality. The imported sludge generally had a high dry solids content (4-8%) and contained large quantities of grit and rag. Following a review of available technologies and trialling of a number of chopper type and sludge handling centrifugal pumps, the team opted for rotary lobe positive displacement pumps by Vogelsang. These have proven to perform well.

The primary business benefits of completing the two projects included:

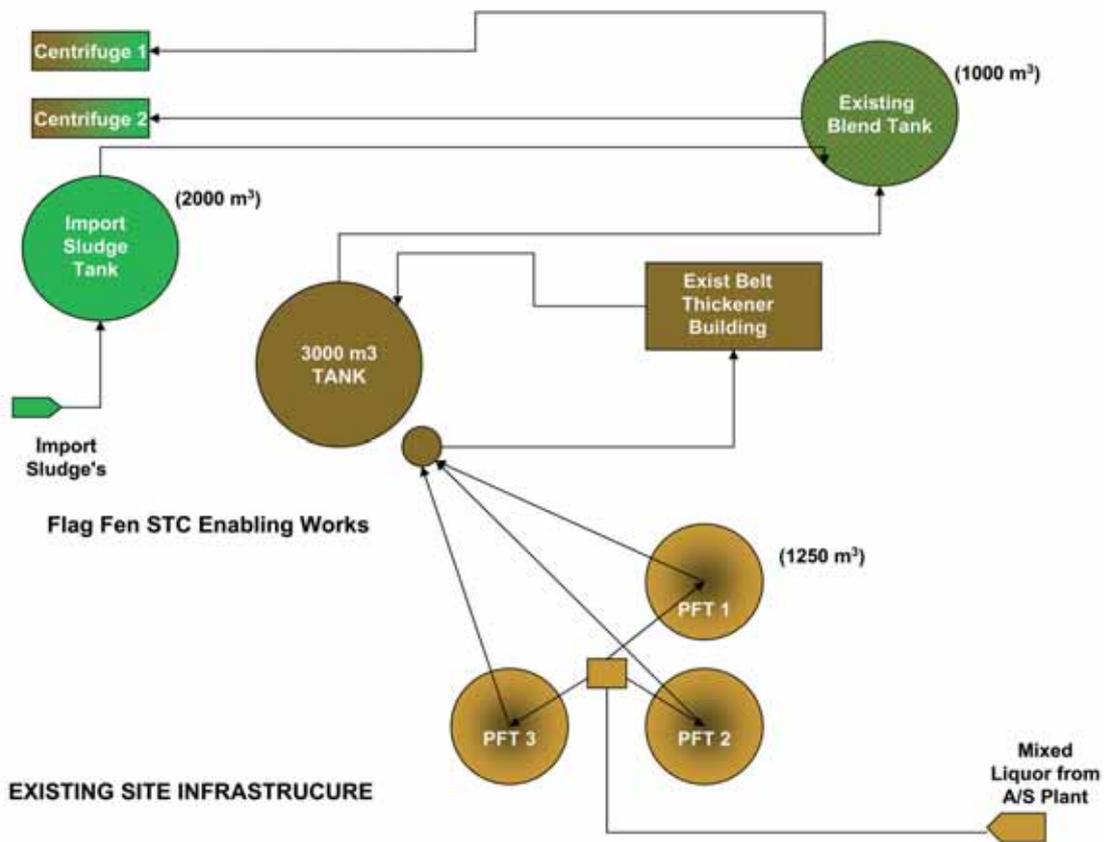
- \* ability to treat the consented flows to full treatment;
- \* reduced risk of screening passing into the AS plant, storm tanks, tertiary BAFF and the site sludge system;
- \* provision of an efficient, safe and reliable sludge handling plant to cater for growth requirements;
- \* provision of sufficient capacity to handle increasing

- quantities of SAS due to growth within the catchment area;
- \* ability to produce a consistent quality and quantity of sludge to the Sludge Treatment Centre;

A proactive approach from both companies as ensured that existing methods of working were evolved to match Anglian Water's requirements. The Skanska-Aker Kvaerner Joint Venture was one of only two AMP3 framework partners to move into the AMP4 Capital Alliance.

Both projects were successfully completed on programme and within budget, and were handed over to operations by February 2006. These projects, combined with the many others in the capital programme, support Anglian Water's efforts in improving drinking water, bathing water and river water quality. The Skanska-Aker Kvaerner JV is proud to contribute to the delivery of this commitment. ■

**Note:** The Editor & publishers thank Skanska-Kvaerner joint venture for providing the above article.



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