

Delivery of Anglian Water's Sludge Strategy upgrading to meet BioSolids regulations

by
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BioSolids Regulations requiring a log kill of pathogens came into force in 2001 and throughout AMP3 and into the fifth year of Anglian Water's Asset Management Programme, sludge dewatering schemes have been delivered at the company's plants. This article describes the systems and required flexibility in working that have been used successfully on sludge dewatering schemes to enhance efficiency and project delivery based on projects ranging from £0.1 to £5.0 million.



Tilbury:

courtesy: AK Engineering Services

April 2004 marked the start of the fifth year of Anglian Water's current Asset Management Programme (AMP3), through which the Skanska-Aker Kvaerner Joint Venture, as one of six appointed partner contractors, has consistently been a leading performer.

Kvaerner Group, formed a joint venture company to combine the civil and structural design skills of Skanska with AK Engineering Services engineering expertise for process and MEICA design – skills which complement the requirements of Anglian Water.

Skanska with Aker Engineering Services, part of the Aker

Both companies were previously part of the Trafalgar House and

subsequently Kvaerner Group, thereby utilising existing and successful long term working relationships. A pro-active approach from both companies ensured that existing methods of working were evolved to match Anglian Water's requirements.

Throughout the AMP3 period, schemes to deliver sludge treatment facilities for Anglian Water have been frequent requests to Skanska-Aker Kvaerner. The Bio-Solids Regulations schemes requiring a log kill of pathogens within the sludge were commenced in 2001 and the various projects have continued.

Schemes of varying size and complexity were included in this package. From the outset of AMP3, the Joint Venture team was pro-actively involved with Anglian Water in the conception stage of projects prior to costing. The JV team developed the following Design Development programme with Anglian Water:

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

An illustration of the schemes developed and built follows.

Name	Area	Equipment provided	Capacity
Charlton		Twin Duty/Assist Centrifuge Plant inc. centrate return and Screw Discharge system	Centrifuges each rated at 16m ³ /hr, 4.5%w/w feed.
		Lime Plant	4.35 m ³ /hr 22%w/w Cake.
Letchworth		2 No. Duty/Assist Centrifuges, inc Centrate return & Washwater Disinfection	Centrifuges each rated at 25m ³ /hr, 3%w/w feed
Tilbury	Part A	Import Sludge Reception Facilities (Tank & Screening)	Import 60m ³ -operating at 60m ³ /hr, throughput
	Part B	Centrifuge in parallel with Temporary centrifuge discharging to Lime Plant	Centrifuge rated at 41m ³ /hr, 5.0%w/w feed 8-16m ³ /hr

Following the success of the BioSolids schemes a series of packages were subsequently awarded. Four typical plants are described here, illustrating the Joint Venture's experience of dewatering equipment and the varying design requirements.

Cambridge STW

Originally two existing centrifuges with associated feed tanks fed a traversing skip conveyor via a screw transfer conveyor. The traversing conveyor automatically fed five skips and/or a discharge bay.

Skanska-Aker Kvaerner installed a new *Alfa Laval* Centrifuge to replace the existing units. The feed was to be directly from secondary digesters via duty/standby macerators and feed pumps. It was necessary to build the new centrifuge in parallel with the existing units, thus maintaining dewatering capacity throughout the construction period.

Skanska-Aker Kvaerner developed a new PLC/HMI Control system with *Alfa Laval* for control of auxiliary items around the centrifuge package. The scope of work included basic concept through to FDS development, factory testing and commissioning, controlling sludge flow from start up to routine operation.

As part of the work scope, the existing traversing conveyor required the replacement of its obsolete control PLC and integration into the overall control system. Careful preparation and upfront testing of the new centrifuge package enabled final changeover to the new centrifuge to occur in a single day (including all necessary alterations to the existing traversing conveyor).

Colchester STW

Originally, two centrifuges with associated existing feed tank fed a fixed position skip-loading conveyor which delivered to either of four skips or the existing drier plant.

In order to provide a standby to the existing two units, Skanska-Aker Kvaerner provided a new centrifuge feed pump, fed from the existing feed sump, utilising the existing polymer system. For the new plant the now proven PLC/HMI control system was installed and customised to the new requirements: no macerator and a single duty feed pump.

Furthermore, additional hardwired interlocking was essential to prevent new and existing systems operating together. Enhancements were also added to correctly interface with the drier plant, to allow, for example, the centrifuge to start up to skip with wet cake and transfer to dryer once cake quality had been established.

Harwich & Dovercourt STW

The existing centrifuge with associated feed tank fed a lime plant, a manually moved screw skip conveyor delivered to either of two skips.

A new replacement centrifuge was provided along with a new centrifuge feed pump feeding from the existing feed tank, complete with polymer system. For the new plant, the PLC/HMI Control System was installed, customised and expanded to include control of the existing lime plant and skip discharge conveyor.

Although this site could be shut down for a period of weeks to enable the new plant, built in parallel to be commissioned it provided practical challenges in other respects. Firstly, the existing power supply to the centrifuge was insufficient. After early recognition an alternative supply was found and routed to the required location. Secondly, the layout for the existing centrifuge was cramped in terms of proximity to other facilities on site. Building a second in parallel was, therefore, extremely tight. Detailed site measurements, lateral thinking and detailed construction planning, prior to arrival at site, overcame the issue.

Whittingham STW

Whittingham already had three belt dewatering units processing both raw and digested sludge at approximately 25m³/hr each, A fourth *Simon Hartley Klampress* with associated feed pump was installed to provide standby capacity. Discharge of the unit was to be to existing conveyor systems. An existing polymer dosing system was used and integrated into the new plant press control. There were now two discharge conveyor systems from the *Klampress* area, one for raw sludge to be limed and the other for digested sludge to be loaded into skips. Since different *Klampresses* could be fed from different feed types, intricate control was required on all new and existing units to ensure that, depending on the type of feed, interlocks from the correct discharge system existed to stop the respective *Klampress* in event of failure in the system.

Refurbishment work, integration with existing assets and re-utilisation of existing assets in new configurations are key areas where the Joint Venture has made significant developments in its working practices. Expertise in these areas helps Anglian Water and the *Skanska-Aker Kvaerner* Joint Venture team make informed decisions with respect to the practicalities of re-using existing equipment.

The AMP3 execution has been successful for both Anglian Water and the Joint Venture for several important reasons:



Harwich:

courtesy: AK Engineering Services

- * Anglian Water's decision to partner with contractors during
- * correct selection of personnel resource by Project Management and the appropriate allocation to similar types of jobs, ensuring learning curves are short and lessons learned are rapidly integrated;
- * economy via "Standardised Designs". Although each job is different with respect to terminal points and interfaces, designs have been standardised around core items of

- equipment, therefore minimising costs and programme;
- * discipline engineers who were open-minded and adapted their methods of working to become multi-disciplined and better equipped at working on multiple projects at any one time. ■

Note: The author of this article, Gavin Hawkrigg, is a Senior Process Engineer at AK Engineering Services.