

Bellozanne STW

new sludge thickening and dewatering facilities

by Wayne Broadbent

Bellozanne Sewage Treatment Works (STW) in St Helier serves the Island of Jersey and is operated by The States of Jersey's Transport and Technical Services (TTS) Department. As part of an ongoing capital maintenance programme, the existing sludge treatment facilities are being replaced in phases. The new facilities will comprise sludge thickening, storage, digestion, stabilisation and dewatering plant. Phase 1 comprised the design and construction of sludge thickening facilities for the surplus activated sludge (SAS) from the activated sludge plant (ASP) and dewatering facilities for the digested sludge and associated works.



Polymer plant - Courtesy of Trant Construction Ltd

Bellozanne STW

The existing facilities comprised:

- Preliminary treatment.
- Primary settlement.
- Secondary biological treatment by the activated sludge process.
- Ultraviolet disinfection.
- Sludge thickening by drum thickeners.
- Anaerobic digestion.
- Dewatering by centrifuges.
- Sludge stabilisation using lime.

Undertakings

During construction, the works had to remain fully operational at all times because it was not practical to process the sludge elsewhere on the island.

Trant Construction were responsible for the detailed design of the process and MEICA aspects as well as undertaking the civil

engineering, mechanical engineering, electrical installation and commissioning. Trant Systems Electrical (TSE) designed, manufactured, installed and commissioned the new sludge motor control centre (MCC). TSE also developed the MCC software, integrating it with existing system architecture.

New works

The new sludge thickening and dewatering facilities were located within a disused existing building (the new ST&D building) with the provision for odour control facilities. The new facilities comprised:

Sludge thickening & dewatering (ST&D) building: The existing building had been out of use for a period of time and was in need of major modification works to make it serviceable for the dewatering and thickening plant. An MCC room was constructed at the first floor level below the new SCADA Room along with a workshop room and storage room on the ground floor.

The existing concrete raised floors were strengthened to accommodate the new plant. To provide access to the new rooms



Sludge Treatment Building - Courtesy of Trant Construction Ltd

and equipment, stairs, walkways, landings, lifting equipment were installed. Building services such as lighting, ventilation, air conditioning, fire and gas detection systems were provided.

3D modelling: The generation of a 3D model of the ST&D building, using Trant's in-house capability, presented a realistic representation of the complex pipe routing required, enabling swift partner buy-in to the layouts prior to any fabrication or installation taking place. This helped to accelerate the procurement and installation works, eliminating potential service clashes.

Outside the building a number of long pipework runs were threaded through the existing above ground services.

New sludge stream operation: The primary sludge and surplus activated sludge (SAS) streams were separated as part of the works to improve the overall sludge thickening and, critically, the performance of the primary settlement tanks. The SAS stream has been designed to process 4,400kg of dry solids/day.

The sludge streams were separated by providing new pipework and associated control systems. A number of cross connections and control functionality were put in place to facilitate six modes of operation to various storage tanks on site and bypasses provided for thickening and digestion systems.

New sludge thickening system: 2 (No.) variable speed drum thickener feed pumps were provided to pump SAS across site via a new 100m long stainless steel pipeline to 2 (No.) new drum thickeners. The new thickeners were located within the existing ST&D building on a strengthened raised concrete floor. Dedicated thickened sludge pumps transfer the thickened sludge via a new 100m long pipeline across the site to an existing sludge storage tank.

The filtrate from the drum thickeners discharges to a new filtrate tank located on the ground floor of the ST&D building before being transferred over 150m long pipeline, via 2 (No.) new filtrate return pumps, to the head of the ASP.

New sludge dewatering system: A new centrifuge was installed within the ST&D located on the same elevated floor as the drum thickeners. Provision on the floor was also made for the installation of a second centrifuge (currently in operation elsewhere at the works) at a later date.

Full mechanical and electrical installations for both centrifuges were provided to allow for the dewatering system to be commissioned under the contract when the existing centrifuge will also be relocated. The dewatering system is designed to process 10,575kg dry solids/day. Fully automatic liquid polymer make-up and dosing systems were installed on the ground floor of the building in a new containment bund for the centrifuges (and drum thickeners).

A 150m-long stainless steel centrate pipeline was installed across site to the existing biomaster tank and onto the head of the ASP.

Motor Control Centre (MCC): A 15m-long, U-shaped 600amp MCC with dual supplies was installed. The MCC was fed from 2 (No.) separate transformers, incorporating a change over compartment, providing security of supply to the works. The MCC (form 4 type 2) was located in a purpose-built MCC room within the ST&D building.

The MCC was provided with the latest generation of Mitsubishi touchscreen HMI, the top of the range E1151Pro+. The HMI was selected for its ability to store and display schematic diagrams, manufacturer's data sheets and other aids to the operation and maintenance of the site, as well as for its superb graphical displays of site status. The PLC was networked via a fibre optic cable to 2 (No.) existing PLCs, and D registers were prepared for the connection of site telemetry over RS232.



MCC - Courtesy of Trant Construction Ltd

Project delivery

Key factors in project delivery were providing the States of Jersey with:

- Operational flexibility: If things did go wrong at the works it was not practical to process the sludge elsewhere on the island.
- Continued equipment supplier support post contract completion: The States of Jersey expected and required the same level of response from suppliers as in the UK mainland.

Specific points related to the contract

Trant's design team worked closely with TTS to ensure that the optimum equipment layout was realised to fit within the restrictive building constraints, whilst providing sufficient access, lifting and maintenance room to work with the plant. TSE designed an innovative U-Shaped panel design for efficient utilisation of space and to meet all the client's requirements. With the majority of the M&E work taking place in the building the construction phase had to be carefully planned and phased to ensure that installation works were carried out safely and efficiently. The logistics of shipping the majority of the M&E plant across to Jersey were also key to developing the programme and procurement strategy.

Conclusion

The success of the project, completed in October 2012, was achieved through in-house multi-disciplinary teamwork and utilisation of real and virtual technology, with Trant's specialist water engineering biosolids team leading the way.

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Process pipework - Courtesy of Trant Construction Ltd

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