£23m Crossness STW Upgrade

fine screening & power supply integrity improvements

by

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Crossness STW, on the southern bank of the River Thames in the London Borough of Bexley, serves a population equivalent of 2,000,000 and has a catchment of 240 sq km, receiving combined foul and surface water from much of South London. Dry weather flow is in the order of 600,000 cu.m/day and a flow to full treatment capacity of 980,000 cu.m/day. The works provides 12% of Thames Water Utilitiesô total sewage treatment capacity. 19th century covered tanks, built by Sir Joseph Bazalgette, provide storage and settlement of first flush stormwater, before excess stormwater spills to the River Thames. The works currently has 25mm bar screens at the inlet, upstream of the 12 inlet pumps. There is now, however, an AMP3 obligation to provide fine screening for all flows.

Configuration of the existing inlet works and significant operational constraints made it extremely difficult and costly to upgrade the existing installation with new fine screens. Study work investigated several alternative locations for new screens.

The most cost effective solution involved screening the flow to full treatment (FTFT) and the storm flow separately down stream of the inlet pumps. In addition to the screening obligation, Crossness STW has a complex existing power supply configuration that was becoming increasingly unreliable against a background of increasing demand on site. The project also. therefore, targeted improvements to power supply arrangements in order to both maintain site integrity and lower operating costs.

Issues

The decision to relocate the screening process has further consequences:

* refurbishment of inlet pumps to provide additional head to pump flows to the new elevated FTFT screens;
* provision of revised protection to the inlet pumps, due to removal of existing screens (to preclude double handling of the screenings that would otherwise be caught).

The current average site electrical load is approximately 8.3MW rising to 10.5MW under storm conditions, with an expectation of increasing to 10.2MW and 12.8MW respectively at the end of AMP3. This is due to a combination of revised treatment requirements as well as the obligation for fine screens.

Power sources

The site sources power from a combination of the National Grid, an onsite powerhouse with a total of 12 dual fuel or diesel engines and the on site sludge powered generator, which utilises site produced sludge as fuel for its steam driven turbine. Supply from the National grid is currently restricted in capacity, the sludge powered generator is not always available due to statutory inspections and maintenance and the powerhouse engines are some 40 years old, with most reaching the end of their useful life. Spares are also becoming less readily available. In addition, the cost of electricity from the powerhouse is significantly more than that from the grid.

Solutions

* **Inlet pump protection.** 12 rotating bar interceptor units (RBIs) have been chosen to replace coarse screens in the existing channels which are up to 11.6m deep. The RBIs protect the pumps from large debris but allow screenings to pass forward. Other options were considered. These suffered from the problems of batch clearing of captured screenings, with manual intervention, or required the installation of an automated screenings removal system. (if the life expired screens were refurbished and retained), with subsequent double handling of screenings. The RBIs have been designed to be lifted out as complete units for maintenance and repair, precluding working in 11.6m deep channels.
* **Inlet pump refurbishment.** Sequential refurbishment of 8 pumps at an offsite location.
* **FTFT screens.** Installation of four band screens in an elevated structure upstream of the grit channels. Screenings maceration and conditioning for disposal to landfill.
* **Storm screens.** Installation of eight 10m long semi-circular trough screens, with screw conveyor screenings clearance, fixed to the outlet weirs of storm tanks. Screenings washing and de-watering for disposal to landfill.
* **Additional power.** New 22.5 MVA electricity supply from National Grid providing a firm 15MVA supply.
* **Standby power**. Replacement of ten generator sets in power house with four new fully automatic 2MW units together with new power management system.
* **Electrical distribution.** Reconfiguration of site HV distribution system, with new and modified HV switchgear, power transformers and cabling.

In total this work has been budgeted at approximately £11m for the screenings work and £12m for the power upgrade.

Delivery process

This projected is being implemented within Thames Water's AMP3 Trident Alliance arrangements, using an integrated team from Thames Water Engineering and Operations along with the Alliance Designers *(Hyder Consulting*) and Construction Contractors *(Laing O'Rourke).*

There has been input from key works staff at all levels to draw on the full depth of experience and knowledge existing on the site. The arrangement utilises a 'Green Book' target cost contract.

Work commenced on site early in 2003 and is programmed for completion late 2004. Maintaining integrity of power supply during the power upgrade, in order to maintain the treatment process, has presented significant challenges. Careful planning, risk assessments and close working relationships between designers and construction and operations staff have played a key part in the success of the project.

Very close cooperation with operations personnel was essential, so as not to jeopardise the treatment process and effluent consent. To date the co-operation has worked well, with no compliance issues for operations or major problems in the progress of the project work which is forecast to deliver within budget and schedule. ■

Note: *The author of this article, Keith Mansell, is a Senior Project Manager with Thames Water.*