

# Littlehempston WTW, Devon

## £6.4m upgrade for waterworks serving 200,000 population

by  
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**O**PEX savings and greater flexibility in the choice of water source are the main drivers for this £6.4M upgrade of South West Water's (SWW) Littlehempston 76Ml/d WTW which serves Totnes and Torbay, in Devon. The project presented some great challenges and a key to the team's success has been the high degree of trust and teamwork that has operated throughout, providing an excellent example of the benefits of partnering.



Littlehempston: Aerial view of works

*courtesy South West Water Ltd*

### Concerns & problems

Performance concerns at Littlehempston stemmed from the Sirofloc element of the parallel Sirofloc/DAF treatment streams. The Sirofloc's stability varied depending on changes in raw water quality. At Littlehempston this was a significant problem because the works abstracts from five sources, of differing quality. The Sirofloc process was also incurring high operating costs due to the amount of chemicals and maintenance required. Another problem with the old process was the lack of washwater recovery. This meant a loss of potential product and a continuous discharge to the River Hems - resulting in additional OPEX.

To tackle these problems a new process train was proposed:-

- \* two new flash mixers for aluminium sulphate, caustic soda and powdered activated carbon dosing;
- \* two new flocculation tanks for polyelectrolyte dosing;

- \* three new flat-bottomed clarifiers (FBC's);
- \* existing rapid gravity filters.

FBC's were chosen because they offered robustness of treatment, operator familiarity and economic construction. The refurbishment work also included building a covered inspection walkway over the clarifiers, which incorporated wind protection boards, and constructing a building for chemical storage, lab facilities and motor control centre.

As part of the sludge treatment process there will be a sludge balance tank and pumping station to transfer sludge to the refurbished picket fence thickeners. The washwater recovery system will include a supernatant balance tank, pumping station and three settlement tanks, converted from the existing Sirofloc clarifiers. A combined MCC kiosk will house the controls.



Littlehempston

*courtesy South West Water Ltd*

## The team

The works are being undertaken by the K4 One Team alliance: Black & Veatch, principal contractor, SWW and Jacobs. Sub-contractor and partner Enpure is undertaking the process design and MEICA works, with May Gurney as M & E installer.

## The plant

The plant is situated between the picturesque villages of Staverton and Littlehempston and access is severely limited. Prior to starting work, project managers met with representatives from the Parish Councils to discuss residents' concerns and establish measures to limit the impact of the works. As the project progressed, the Black & Veatch project manager has maintained ongoing dialogue with local people, ensuring very good relations with the community. Restricted access routes were agreed and transport is suspended during the morning and afternoon school run. The latter has taken a considerable logistical and managerial effort to maintain. The size of delivery vehicles and cranes has been restricted and ready-mix concrete deliveries for large pours have been carefully controlled.



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There was no space to construct new plant within the existing works, and the ground was congested with existing services. Whilst adjacent land could be used to site the FBC's, the washwater recovery systems, and all connecting pipelines had to be within the plant. Much of the pipelines are being constructed above ground. One 900 dia pipe even passes through part of the existing DAF plant and rises on steel columns to the sand filters.

Value engineering was undertaken to minimise excavation, which in turn reduced construction risk, expense and process risk from diverting existing services. Wherever possible, redundant pipe lines have been intercepted and converted for new or even dual purpose use. Structures have been refurbished rather than replaced.

A consultant undertook computational analysis to design the wind deflectors for the clarifiers. Fully 3D simulations of wind flow were developed for a 3D model of the entire site and surrounding topographic features. 2D simulations of the water-body of the clarifiers was also modelled to confirm the effectiveness of the proposed structural form for the wind deflectors.

The construction programme was challenging, 47 weeks including detailed design - which was carried out in parallel with construction. Failure to meet the deadline would have delayed operational use for 6 months, as the risk of undertaking the commissioning and changeover during the peak summer demand was seen as too great.

To mitigate against this risk the project was split into two phases.

- \* **phase 1 - deliver operational use of the clarifiers;**
- \* **phase 2 - provide washwater recovery and sludge treatment plant.**

The commissioning sequences required the simultaneous

commissioning of the FBC's and decommissioning of the Sirofloc plant, without affecting supply. The plan also had to minimise any process, quality and environmental risks resulting from the introduction of new chemicals.

Whilst extensive analysis proved it unlikely, there remained the risk of blinding the sand filters by the change in clarification process. Initially, the clarifier flows would only be discharged to one of the 10 filters to prove satisfactory performance. Capacity dictated that a proportion of the new discharge would be run to waste, requiring a system of temporary commissioning pipelines. Whilst the quality of the discharge to the filters would be measured by new instrumentation, wastewater quality also had to be measured to control environmental risk. This was assured by tapping into the sample quality instrumentation boards on the existing DAF plant. Once clarifier flows were diverted onto all filters, the existing clarifiers could be isolated for conversion to washwater settlement tanks. For further environmental protection, the filter rinses would be continually over pumped and recycled through the existing sludge handling plant until the washwater recovery system was available.

To date, the new clarifiers are being successfully commissioned ahead of the target operational use date and their performance is so far excellent. The phase 2 tanks are complete and pipework, MEICA, refurbishment and decommissioning are underway. Final out turn costs are under budget and completion should be at least six weeks early. ■

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