

# Sandown Water Supply Works

## increasing overall capacity of works and improving process

by  
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**T**he Isle of Wight has a residential population of 134,400. During the summer months this is boosted by thousands of tourists. The main source of potable water on the island is from boreholes and adds into the chalk aquifer, this is a finite resource that can only come under severe pressure during a dry summer following a dry winter. The only other water sources on the island are the Sandown Water Supply Works (WSW) and a pipeline across the Solent from Testwood WTW near Southampton.



Sandown CEP lagoon under construction

courtesy 4Delivery Ltd

Sandown WSW treats water abstracted from the River Yard, which not only provides a base supply, but allows the rate of extraction from the boreholes to be reduced in winter to allow the ground water levels to recover.

The current treatment process uses a *Johnson Neptune Microfloc* plant - comprising four horizontal tube settlers with integral rapid gravity filters; arranged in parallel to treat the flow before transfer to GAC adsorption units provided to remove pesticide residue. The *Microfloc* plant performs well under steady state conditions, but the River Yard is susceptible to rapidly changing river flows which cause the raw water to have high turbidity which can significantly affect the output of the plant.

**There is no recovery of process water and accordingly some 0.8MI/d to 1.3 MI/d of abstracted water flow is discharged to sewer.**

**Southern Water's brief to their contractor, 4Delivery, is to increase the overall capacity of the works and improve efficiency of the process.**

### **Increase in works capacity - New 5Mld Treatment Plant**

4Delivery's contract for Sandown WTW requires the installation of a new treatment plant of 5Mld output to augment the capacity of the Microfloc plant.

Preliminary treatability investigations were carried out to assess the performance of a range of process options. The results indicated that the application of conventional sedimentation/clarification process would offer the best balance of performance reliability and whole life cost. To deliver this it was proposed to install a Raw Water Lamella plant for clarification, followed by a Rapid Gravity Filter unit complete with the attendant inter-stage mixing, dosing, clean backwash water tank and disinfection processes.

### **Implementation - Feed & Flash Mixing Tank**

A 350mm dedicated main feeds the 5Mld stream. PACI coagulant and NaOCl are injected along the main upstream of a new static mixer leading into the Flash Mixing Tank (retention time two minutes). The PACI dose will be flow proportional; with the PACI concentration being set from an Aztec coagulation control monitor. The flash mixing tank will be equipped with a variable speed flocculator.



concrete being poured into the base of the new wash water tank

courtesy 4Delivery Ltd

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#### Flocculation/Clarification

This will comprise a three compartment flocculation tank sized for thirty minutes and a single raw water lamella clarifier. The sludge is collected from underneath the lamella plate pack by a scraper which directs the sludge into the sump. The sludge from the sump is delivered under gravity to the sludge holding tank prior to being pumped to sewer.

#### Filtration

Filtration is achieved by utilising a Rapid Gravity Filter operating at a nominal velocity of 6.3 m/h and equipped with single media. The stream will effectively shut down during RGF filter backwash with the plant demand being fulfilled by the existing Microfloc plant. During backwashing of the RGF, the clarified water that has passed through the Lamella will run continuously back to the raw water lagoon.

#### Clean backwash water tank

The clean backwash tank is designed to hold two complete washes. The filtered water will flow through the tank and overflow into a compartment which will be connected to the new GAC sump for transfer through the existing GAC plant and into supply.

#### Improve the overall process efficiency; Washwater Recovery Process design rationale

The design has to balance the high intermittent flows of dirty washwater from the filtration processes and minimise fluctuations in quality to the washwater clarification process.

The washwater recovery and sludge disposal system consist of a fully integrated sequence of processes that provides the following functions in series:-

- \* the design has to balance the high intermittent flows of dirty washwater from the filtration processes and minimise



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courtesy 4Delivery Lsd

fluctuations in quality to the washwater clarification process; the washwater recovery and sludge disposal system consist of a fully integrated sequence of processes **that provides the following functions in series;**

- \* reception & balancing of the existing microfloc, sludge/back wash water, the existing GAC adsorber backwash and the new RGF dirty washwater flow;
- \* pumped transfer of balanced dirty washwater to the wash water recovery plant;
- \* polymer conditioning and flocculation of dirty washwater;
- \* lamella clarification of dirty washwater;
- \* return of recovered supernatant to raw water lagoon with supernatant turbidity <10NTU;
- \* reception & balancing of clarifier sludge and washwater lamella settled sludge;
- \* transfer of pumped sludge from sludge holding tank to Sandown WTW via 150mm sewer pipe.

#### Implementation

The washwater recovery system is configured to provide two separate streams after chemical conditioning of the water. Under average operation and loads, the system has sufficient spare capacity to enable one stream to be removed from service for cleaning and/or maintenance.

In a filter recovery situation or where two Microfloc units are required to wash or a double wash of the new RGF, both lamella clarifiers are brought into service.

#### Dirty washwater lamella clarifiers

The dirty washwater lamella clarifiers will be optimised to reduce minimal solid carry-over in the supernatant. They will be operated in a manner that avoids the accumulation of sludge within the dirty

washwater lamella clarifier and the corresponding risk of cryptosporidium oocysts carry-over to the inlet of the main treatment process. The operator is able to set intervals and durations for desludging, based on plant performance and operation. The plant operator is also able to over-ride timer-based desludging with a manually initiated desludge sequence.

The polymer dose rate is set manually with the works automatic control ensuring the required chemical flow rate is adjusted to meet variations in plant throughput.

#### Sludge treatment

Sludge from the raw water lamella clarifier and dirty lamella clarifier separators will flow under gravity to the new sludge holding tank from where it will be pumped to the existing sewer.

#### Current progress

A contract has been let with MWH Constructors to deliver the scheme. Work has commenced on site and is progressing towards water into supply date of 31st March '08.

4Delivery Lsd is a consortium comprising industry leaders United Utilities, Costain and MWH, which is carrying out £750 million worth of environmental improvement schemes on behalf of Southern Water across Kent, Sussex, Hampshire and the Isle of Wight from 2005 and 2010. ■

#### Subcontractor:

**MWHC as a Tier One (Main contractor)**

**Capital value - £7 million.**

**Note:** The Editor & Publishers wish to thank David Ecob, Solutions Manager with 4D Delivery Lsd & Tony Beer, Lead Technical Expert Water Process, Southern Water for producing the above article for publication.