Shellbrook WTW

improvements to provide availability throughout the year

by David Trethewey MIET

South East Water (SEW) has invested in the region of £2m at Shellbrook Water Treatment Works, which takes water from the Ardingly Reservoir, treating 52l/s for the Cuckfield Service Reservoir. Historically, earthy, musty taste and odour complaints were received whenever Shellbrook WTW was used during the summer months, coinciding with the algal blooms in the reservoir. This led to the operational practice of taking Shellbrook out of supply during the summer, or whenever the complaints were reported, and supplying the area with water from Barcombe WTW, which has ozone and GAC for both pesticide and Taste and Odour control. During that time, Shellbrook acted as a chlorination booster station of the water from Barcombe and pumping it on to the Cuckfield Reservoir.

Clean backwash tanks with the GAC tanks behind *Courtesy of Enpure Ltd*

The SEW Water Resources Management Plan required Shellbrook Water Treatment Works to be available for supply continuously during the next investment period at the design output, to ensure that the demand forecast could be met. There was a DWI regulatory requirement by 31 March 2011 to ensure that Taste and Odour parameters were under the allowable prescribed concentrations.

Existing process

The raw water passes through an inline mixer before being dosed with ferric chloride as a coagulant. Caustic soda is then dosed to obtain the correct coagulation pH. The water flows to a flash mixer, where it is dosed with Polyelectrolyte. The water continues to the inlets of four up-flow floc blanket clarifiers for the removal of suspended matter and oxidised iron and manganese. Clarified turbidity is monitored on the outlet.

The settled water is dosed with chlorine before flowing to four rapid gravity sand filters (RGF's) which remove the remainder of the suspended matter and reduce the iron and manganese concentrations to below the permitted maxima. Turbidity is measured on each filter outlet to monitor performance.

The filtered water gravitates into a 2 (No.) cell chlorine contact tank, which allows the conditions for disinfection to occur. On exiting the tank, the chlorine concentration is reduced by the addition of sulphur dioxide gas to achieve the set-point chlorine residual required for pumping into the distribution network. The final water is monitored continuously for chlorine, turbidity and pH levels, with automatic plant shut-down should any of these parameters fall outside required limits. The water is pumped to the Cuckfield service reservoir.

The solution

- The option considered to be both appropriate and feasible was the installation of GAC contactors to remove the organic components that cause taste and odour issues.
- A design was developed by Enpure Ltd working closely with SEW, leading to an NEC 3 Option C design and construct project. This utilised Enpure's standard design for gravity steel tanks, utilising their previous experience of installing the ITT Leopold filter floor arrangement into the GAC contactors.
- Backwash water would be supplied by new backwash

pumps fed from a new clean backwash water tank. Dirty backwash water from the GAC contactors would be routed to the existing lagoons, along with the existing RGF backwash water and clarifier sludge.

- A break-in to the pipe from the RGFs to the contact tanks would be made and the flow diverted to a new relift sump to pump flows through the GAC filters before flowing on to the existing contact tank. The relift sump was designed to remove an existing hydraulic restriction between the RGF outlet and the contact tank inlet.
- New backwash pumps and air scour blowers would be provided, to replace the existing RGF backwash pumps and blowers, designed to facilitate both the RGFs and the GAC. This would need careful coordination to ensure that the plant was always available for supply. Modifications to the chlorination system would be required to accommodate the new configuration.
- A new MCC, complete with PLC and SCADA system, was required along with the associated cabling, pipework and civil works.
- SEW took the opportunity to undertake refurbishment of the RGFs whilst there were construction activities ongoing, and a site set up in place; thus improving the quality of water going forward to the new GAC plant and their performance.

Site constraints

Due to the access road crossing the Shell Brook with a bridge of unknown weight limit, the design required utilising vehicles of axle loading no greater than the current usage. The solution was to manufacture the clean backwash water tank in two pieces and couple them together at site. Off-loading and positioning was achieved using a tracked crane to spread the load.

There was a dirty water pipeline running through the construction site which was re-routed and resulted in resolving another hydraulic issue for the site. Some cabling also had to be re-routed in some instances and worked around in others.

GAC outlet channel in construction
Courtesy of Enpure Ltd

Summary and benefits

The programme offered a number of benefits including:

- The modular design minimised the civil construction period on site, since the tanks simply required flat slabs.
- By adapting the existing mezannine floor within the existing main building to accommodate the new MCC, no time was required to obtain planning consent for a new building on an already congested site.
- Pre-washed GAC media was used to minimise the commissioning period.

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GAC outlet channel completed *Courtesy of Enpure Ltd*