Deephams STW

tertiary treatment plant utilising Hydrotech® Discfilter technology

by Andrew Bibby

Thames Water's Deephams STW in Edmonton, North London serves an area of North London between Barnet, Haringey and Broxbourne. With a population equivalent (PE) capacity of 870,000, the works is the ninth largest in England. The 30ha site includes inlet works, primary and secondary treatment, stormwater storage and a large sludge treatment centre. Treated effluent is discharged into Salmon Brook, a minor tributary of the environmentally sensitive River Lee, which itself flows into the River Thames in East London. In March 2012 a revised Environment Agency consent came into effect and to meet the new final effluent quality requirements, the works has undergone a major refurbishment. Part of the Deephams STW upgrade is to provide phosphorus removal by chemical dosing and tertiary filtration using VWS Hydrotech® Discfilter technology.

Flow is delivered to a central feed chamber supplying all six Discfilters - Courtesy of Veolia Water Solutions & Technologies

Hydrotech® Discfilter technology

The VWS Hydrotech® Discfilter consists of a series of hollow segmented discs, which support a woven polyester mesh. The discs are mounted on a central shaft. Influent liquor enters along the centre line of the unit and is distributed radially on the inside of the discs. The flow passes through the mesh leaving suspended solids retained on the inner face of the filter elements.

Filtered water is collected in the chamber around the Discfilter and an outlet weir, that is part of the structure, maintains the filtered water level so that the discs are approximately 65% submerged. This retained volume provides backwash water for filter cleaning. Filtered water flows over the weir and away to the outfall.

As the retained solids start to blind the filter mesh, the head loss across the Discfilter increases up to a maximum of about 250mm, and the influent liquor level rises. At a predetermined level a backwash cycle is initiated which rotates the Discfilter and presents clean mesh to the influent liquor. At the same time filtered water from the integral reservoir is pumped at high pressure to jet wash the dirty mesh.

The dirty backwash water is collected in a trough within the centre of the Discfilter and flows away by gravity to a pump sump for return to the head of the works. The backwash water volume is typically between 1% and 3% of the maximum design flow. Filtration is continuous throughout the backwash cycle and, once the cycle is completed, the Discfilter stops rotating and returns to service.

Deephams STW

Thames Water has installed many VWS Hydrotech® Discfilters, and the Deephams plant, rated for the 2016 design horizon flow of 2,700l/s, is much larger than previous installations.

The plant, which is designed to reduce a peak inlet TSS of 25mg/l to 10mg/l on a 95%ile basis, consists of 6 (No.) free standing 304 stainless steel Discfilter units installed on a pre-prepared concrete structure in an area adjacent to what was the sludge cake storage

area. The units were factory assembled and tested prior to delivery which meant that off-loading, positioning and fixing down was completed in only five days.

The 6 (No.) units are fed from a central feed chamber via free discharge flow splitting weirs to ensure equal distribution, and differential level monitoring between the inlet and outlet of each unit ensures that backwashing occurs only when required.

Each filter is fitted with 29 (No.) 2.6m diameter discs covered with 10 micron filter fabric panels retained by a single fastening located at the circumference of the disc segment to allow rapid replacement in the event of damaged fabric. In the event of power failure or if an upstream solids carryover problem occurs, the filter fabric could rapidly become overloaded, resulting in high differential pressure, premature backwashing and possible damage to the fabric and its support frame. To prevent this, each unit has an internal emergency bypass weir arrangement set at 300mm differential level and designed to cater for a flow of up to 600l/s. Each Discfilter has its own dedicated local control panel with an HMI and each is integrated with the main works SCADA and telemetry system.

The new VWS Hydrotech® Discfilters at Deephams were commissioned in early June 2012 and in proving trials, have been run up to the maximum design flow. Performance has been consistent with high level of solids removal.

Modular design

Hydrotech® Discfilter modules, in four ranges up to 1,000l/s, can be supplied on steel frames for building into concrete chambers or as stand-alone stainless steel tank units. The modular design makes filter selection simple and allows for planning for future expansion while still allowing flexibility in choice of materials – ABS plastic or stainless steel for the discs, 304 or 316 stainless steel for frames and tanks, and a choice of 10, 20 or 500 micron mesh depending on the application. Small footprint, low headloss, low backwash water volumes, low power consumption and minimum maintenance by comparison with competitive technologies make the Hydrotech® Discfilter not only cost effective but a more sustainable option.

Other applications

It is not just the municipal wastewater treatment sector that has found applications for the technology. They have also been used for industrial effluent treatment, washwater recovery, algae removal for drinking water treatment, water recovery and re-use and storm water treatment. Units have also been supplied for aquaculture applications in both freshwater and saltwater, and even tropical saltwater in a special alloy version. In fact this robust technology can be used for almost any filtration job where space and cost are key factors.

Conclusion

Hydrotech® Discfilters are developed and patented by Hydrotech, part of Veolia Water Solutions & Technologies, who manufacture the units in Vellinge, Sweden. The first full scale plant was installed in 1995, and there are now over 500 installations in operation globally. In the UK, the first Discfilter pilot tests were carried out early in 2003, followed by the first full scale tertiary treatment installation in the same year.

Previous successful installations include 4 (No.) units in Northern Ireland as part of the Omega scheme, with units also going in at Ringneil and Annahilt STW. These are small works where the Hydrotech® Discfilters modular design and compact layout scored over sand filtration. New contracts continue to be secured on the strength of existing installations, where cost savings over alternative processes are significant.

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The Discfilter spray bar is readily accessible for nozzle testing and cleaning when required - Courtesy of Veolia Water Solutions & Technologies

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