

# Slough STW Improvements

## discfilter tertiary treatment to meet tighter consent

by  
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**S**lough Sewage Treatment Works, located on the edge of the M4 between Slough and Windsor, serves an average population equivalent of 257,000 with FFT of 118.4 MLD. The works has benefited from a two-phase multi-million pounds upgrade to meet a tighter effluent consent. Phase One provided a new inlet works, additional BNR aeration lanes, additional final settlement tanks and upgraded sludge handling, which was commissioned in 2004. Phase Two, added a new Discfilter Tertiary Treatment Plant, which was commissioned in 2005.



Slough STW: Discfilters being installed

*photo courtesy Veolia Water Solutions & Technology*

### Scheme background

Laing O'Rourke carried out the improvements at Slough STW in two phases. Phase One added a new inlet works, two 29mm diameter primary clarifiers (existing, two 29m dia) Two BNR aeration lanes (4existing), two 35m diameter final settlement tanks (existing, four 29m dia.) and upgraded sludge handling; this phase was commissioned in 2004. Phase Two added a new Discfilter Tertiary Treatment Plant, which was commissioned in 2005. Whilst the overall design improvements allowed for the Tertiary Treatment Plant, the actual requirement for it could only be confirmed after completion of the first phase improvements.

After the first phase was commissioned, final effluent from the two existing 29m dia. shallow wall and the two new 35m dia deep wall final clarifiers was monitored over an extended period to determine what tertiary treatment capacity, if any, was required to meet the new discharge consent.

### Phase Two design

The existing discharge consent of 30/20/9 (SS/BOD/Ammonia)

was replaced with a tighter consent of 15/10/3 together with a phosphorus limit of 1mg/l from December 2005.

Analysis of the effluent data indicated that the combined effluent from the final clarifiers had a suspended solids level of 20mg/l 95% ile. From this, the design team determined that 40% (47.4MLD) of the final effluent flow required tertiary treatment prior to blending with the remaining 60% (71MLD), to meet the new consent. On this basis a design was finalised with the disc filter solution.

Thames Water selected the Discfilter solution over alternative Tertiary Treatment solutions because they had already installed several Hydrotech Discfilters at other treatment works in the previous three years and were confident in the performance and reliability of the units.

The Hydrotech Discfilter provides a large filter area for a small footprint; minimal headless across the filter; continuous treatment during backwash cycles; accessible filter media and a modular design suitable for a variety of applications.

During the design stage, consideration was given to install the Discfilters in concrete channels, or to install a package in steel tanks on concrete plinths. The final solution incorporated the Discfilters in concrete channels with a flow splitting and by pass protection structure.

**Tertiary Treatment Plant Specification.**

The design team specified the required performance of the Discfilter for flows up to 47.4 MLD (550 l/sec); a summary can be found in the table below. The average inlet to the Discfilters was expected to be 20mg/l with spikes of 30 mg/l.

|    | Inlet condition |      | Effluent requirement |             |
|----|-----------------|------|----------------------|-------------|
| SS | mg/l            | mg/l |                      |             |
|    | 10 - 15         | 5    | 15 - 30              | 67% removal |

To meet the specified outlet parameters the Discfilters were fitted with 10 micron filter elements.

The specification required that each Hydrotech Discfilter accept 300 l/sec, which allows one unit to be taken out of service, whilst maintaining treatment capacity, or allow 900 l/sec to be treated with the three units if required. This is to accommodate possible changes in the quality of the blended effluent from the four final clarifiers, which would in turn require more flow to be treated by the Tertiary Treatment Plant. In addition, space was allowed within the civil structure to accept a fourth Discfilter, should extra capacity be required. This additional capacity has been achieved at minimal cost due to the modular design of the Discfilters.

**Construction**

Laing O'Rourke carried out the phase one improvement at Slough, STW then undertook the phase two works following the assessment for the requirements for the tertiary treatment plant.

Veolia Water Solutions and Technologies were selected to provide their Hydrotech Discfilters for the new Tertiary Treatment Plant, Their contract included the design, manufacture, supply, delivery, installation, testing and commissioning of three Hydrotech HSF2220-2F Discfilters, complete with local control panels, access platforms and lifting equipment.

A consequence of the wait time between the phase one improvements and the assessment of the final effluent was to limit the time available to complete phase two.

Following confirmation of the outline design requirements, the Tertiary Treatment Plant was tendered in March 2005 and awarded to Veolia Water Solutions & Technologies at the end of April 2005.

Delivery of the Hydrotech Discfilters took place in September 2005 and the plant accepted flows on 9th November 2005. This was followed by a period of performance tests, which demonstrated that the Hydrotech Discfilter Tertiary Treatment Plant met the treatment requirements and hence, the new consent before December 2005.

A good, proactive relationship between Thames Water, Laing O'Rourke, and Veolia Water Solutions & Technologies ensured a smooth integration between the existing works and the new installation and allowed the project to be delivered ahead of schedule and within budget.

**Tertiary Treatment Plant Performance**

Performance of the Hydrotech Discfilters was tested as part of the take-over procedure during November 2005. The inlet suspended solids ranged up to a maximum of 29 mg/l and at all times the outlet was less than 10mg/l and met the specified design at all inlet loads. As a result, the new Tertiary Treatment Plant has allowed Slough to discharge below the levels of the new effluent consent.

**Hydrotech Discfilter operation**

The Discfilter receives flows in to the centre of the unit, which runs at approximately 65% submergence. The influent flows from the inside to the outside of the discs, by passing through the 10-micron filter elements attached to the discs, The suspended solids contained within the influent are captured on the inner face of the filter elements; the build-up of captured solids increases the head loss across the Discfilter and as a result the inlet water level rises. At a predetermined level a backwash cycle is initiated which rotates the Discfilter and presents clean mesh into the flow path; at the same time high pressure water jets 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. This flow is between 1% and 3% of the maximum treated design flow. After the backwash cycle is completed, the Discfilter stops rotation and continues to filter (filtration is continuous throughout the backwash cycle).

Filtered water is collected in the chamber around the Discfilter and an outlet weir that is part of the structure, retains the filtered water level. This retained water is used as a reservoir for the integral backwash water pump. Filtered water flows over the weir and away to outfall. The operational head loss across the unit varies from zero to approx 250.mm.■

*Note: Kevin Legg was the Project Manager for principal contractor Laing O'Rourke; Michael Heelas was the Project Manager for Veolia Water Solutions & Technologies and Emily Gilbert was the Application Engineer for Veolia Water Solutions & Technologies.*



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