

Chertsey Microfiltration Plant

two water sources brought together for final treatment

Filtration systems for public water supply applications have to be increasingly efficient to fulfil national and international quality standards. Three Valleys Water, the UK's largest 'water only' supplier has a robust investment policy and a significant proportion of the company's annual capital investment of more than £60m is spent on new filtration equipment to ensure consistent high quality water is provided to its customers. Three Valleys operates the world's largest ultra-filtration plant at Clay Lane, Bushey in Hertfordshire and more than 30 per cent of the company's output is now filtered using membrane technology.



(courtesy Three Valleys Water).

Three Valleys Water, a part of *Vivendi Water*, has been supplying water to the local community for more than 130 years and now provides 800 million litres of water each day to three million customers in parts of Bedfordshire, Berkshire, Buckinghamshire, Essex, Hertfordshire, Surrey and the London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Enfield. The supply area covers a total of 3,700 square kilometres, stretching from Luton and Royston in the north to Guildford in the south, and from Berkhamsted in the west to Dunmow in the east.

£4 million project

One of Three Valley's Water's latest filtration programmes is at **Chertsey Water Treatment Works in Surrey**, a site treating two water sources via two separate systems which are brought together for final treatment. Here a *Memcor Continuous Microfiltration*

Submerged (CMF-S) system has been chosen for its flexibility to treat both Abbeymeads gravel well water and River Thames water, fed from the Northern Burway reservoir.

The two sources have very different water quality characteristics, The new Chertsey installation is currently the largest CMF-S plant in the UK, designed to treat up to 41 Mld of water. CMF-S water has been in supply since December 2002.

Design intention

The primary design intention of the *Memcor* system is to replace and uprate the treatment provided by the old Abbeymeads Rapid Gravity Filters (RGFs). The system is particularly suited to fit in with the site's existing hydraulic infrastructure. Additionally, the new plant has been built on the base of a disused settling tank.



(courtesy Three Valleys Water).

The CMF-S installation comprises of six cells (tanks), each containing 192 submerged membrane modules with each module made up of 14,000 hollow membrane fibres. The fibres have a nominal core size of $0.2\mu\text{m}$ which allows the removal of a range of contaminants such as suspended solids, colloids, algae, bacteria, protozoa and cysts. The Chertsey membranes are made of oxidant tolerant PVdF. The overall system comprises of additional ancillary equipment including filtrate/backwash pumps, blowers, compressed air supply system, CIP system and control system.

There are more than 700 Memcor CMF systems in use around the world performing owners' requirements for high quality water along with their need to control capital and operating costs. The particular benefit of the submerged technology is that it is based on a vacuum design leading to a simplified overall design with lower system footprint and lower capital and operating costs

When the membranes are filtering, feed water flows into the cell housing the membrane modules. The modules are completely submerged below water level and are attached to the filtrate (filtered clean water) manifold. Water is drawn through the membrane fibre walls by vacuum (generated by the filtrate pump) to the inside of the hollow fibre. The filtered water flows out of the membrane module through the filtrate manifold. Contaminants which cannot pass through the membrane wall are retained on the feed side of the system.

During filtration, retained particles will form a filter cake which will build up on the outside of the fibres causing an increased pressure drop across the membrane (or Trans-Membrane Pressure – TMP). This filter cake is removed from the membrane surface by backwashing followed by cell drain down.

The CMF-S system utilises an efficient, combined air scour and liquid backwash to maintain good filtration performance. This backwashing regime, which typically takes around three minutes at a 60 minute frequency, maximises the time between chemical cleans (CIPS) which are undertaken periodically. Membrane integrity is checked daily by means of a Pressure Decay Test (PDT) on each cell. Should a cell fail the PDT test, the defective module can be easily identified for on-site operator repair (pinning).

Unobtrusive

As Chertsey WTW is on a green belt site, with the River Thames on one side and the M3 motorway on the other, the plant needed to be as unobtrusive as possible. The system is installed in a new building constructed on the base of a disused septic tank which satisfies Three Valleys Water's aesthetic needs and requirements. The installation, which is also protected by a grass embankment is invisible from the M3. Though it is close to the river its location is above the 100 year flood level.

Plant controls are fully computerised and will be fully integrated in the site control room and the company's overall control system. It has been designed to be automatic and the only personnel required on site will be for maintenance and inspection purposes.

Three Valleys Water's partners in the project are: *Vivendi Water Partnership, Paterson Candy (now Black & Veatch Contracting), Memcor and JBS Construction.*

Projected outturn cost is put at £4 million. ■