

Iver Water Treatment Works

adding a third clarifier stream & 10MI/d reservoir

by Chris Lincoln

Situated immediately adjacent to the junction between the M25 London orbital motorway and the M4 motorway from the west, Iver Water Treatment Works is the largest potable water treatment works owned and operated by Three Valleys Water PLC. The works was originally commissioned in 1974 with a design output of 160MI/d. Over subsequent years various modifications and additions have been made to the plant, resulting in the current arrangement. The present abstraction licence is for 227MI/d, but this treatment capacity is only achievable for short periods when the raw water turbidity is low, typically during the summer months. The current project is to add a third clarifier stream to the site to enable the full licence flow of 227MI/d from the River Thames, plus a 10MI/d reservoir sweetening flow to be treated at all times.



Iver WTW: Preferred location from preozonation building

courtesy: Three Valleys Water

Existing treatment capacity

The process flow currently provides abstraction, screening, pre ozonation, clarification by way of two parallel pulsator clarifiers, inter-ozonation, and granular activated carbon filtration. Associated with this are chemical dosing facilities for coagulation, flocculation, pH correction, disinfection and plumbosolvency control.

A feasibility study was undertaken by *Veolia Water Partnership* early in 2003 to examine the process solutions available to enable the treatment works to abstract, treat and supply water at the licence flow. This study concluded that the optimum solution was to provide a new coagulation and clarification stream in parallel to the existing clarifiers. It became clear that the existing washwater and sludge treatment facilities on site would also need augmenting if they were to cater for the additional load produced by the third clarifier stream operating at full flow.

The feasibility study also identified the need to replace and/or refurbish several motor control centres and upgrade the site-wide SCADA system to incorporate both the new items of plant and the modifications to the existing.

Project scope

The contract awarded to *OTV* included the design, construction and commissioning of a third parallel 87MI/d capacity clarification stream centred upon two *Actiflo*[®] AC10 units. This treatment system was able to satisfy the particularly stringent clarified water specification of less than 1NTU on 95 percentile (spot sample). In addition to the *Actiflo*[®] units themselves, the existing chemical dosing facilities were augmented to encompass increased flow and

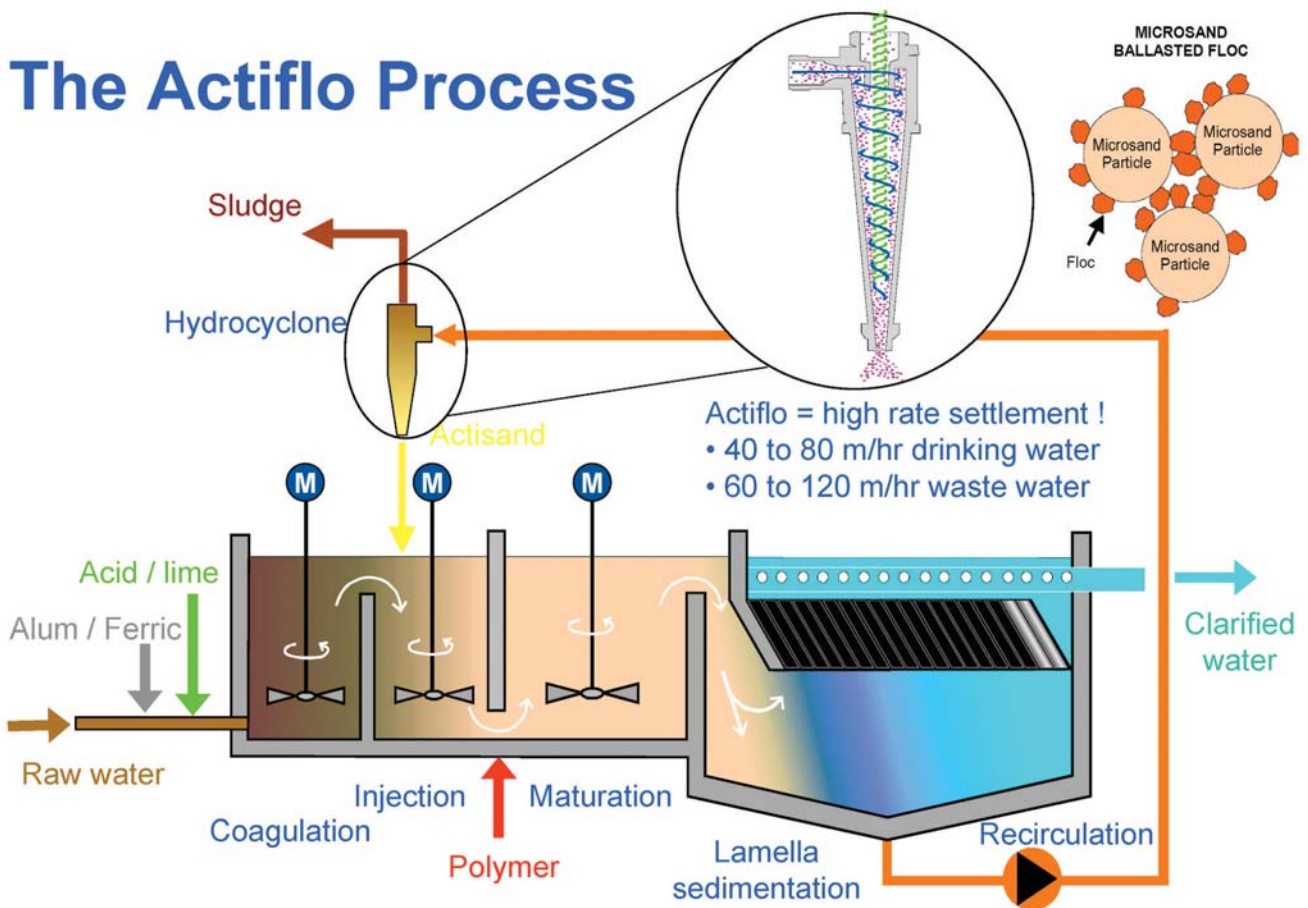
controls for the new clarifier stream. In addition, the existing washwater and sludge handling system has been extensively refurbished, incorporating the construction of a new sludge thickener tank and new polymer batching and dosing plant for all of the thickener streams.

Actiflo[®] process

The *Actiflo*[®] process is a patented compact water clarification system that utilises microsand as a seed for floc formation. The microsand, known as *Actisand*, provides surface area that enhances flocculation and acts as a ballast or weight. The resulting sand ballasted floc displays unique settling characteristics that enable clarifier designs with high rise rates and short retention times. These designs result in system footprints that are between 5 and 20 times smaller than conventional clarification systems of a similar capacity.

Actiflo[®] can be applied to both ground water and surface water where either better performance and/or cost reduction is desired. It is ideally suited for difficult-to-treat waters such as rapidly fluctuating sources or extreme conditions. The process consistently displays very efficient removals from raw water with high or low turbidity, colour, TOC, algae, particle counts, *Cryptosporidium*, iron manganese, arsenic and other typical undesirable water contaminants.

With over three hundred references in some 25 countries around the world, *Actiflo*[®] has proven to be a very versatile and adaptable process. In the UK alone, 10 potable water *Actiflo*[®] units are currently in operation providing in excess of 750MI/d of excellent clarified water.



Actiflo® process

In the *Actiflo*® process, a coagulant is first added to the raw water. The coagulant may be a metal salt, e.g. ferric chloride, aluminium sulphate or poly-aluminium chloride with which the dissolved substances are converted into a non-soluble solid substance in the form of colloids. To enhance the coagulation at Iver, sulphuric acid is added to correct the pH. The content of colloids in the water, partly deriving from the chemical precipitation and partly from the admitted polluted water, can now coagulate to larger primary particles. The precipitation and coagulation processes are performed simultaneously as they are both very rapid processes.

In the injection tank *Actisand* is added and mixed into the raw water. The primary source of sand is separated from the recirculating sludge but a storage silo and conveying system is also installed to top up the sand levels in the system.

As the water flows from the injection tank to the maturation tank a flocculant in the form of a polymer solution is added. Through different mechanisms, these polymers bind the *Actisand* and the primary particles together in large settleable flocs.

After flocculation, the water is admitted to the lamella separator. The flocs settle quickly as the *Actisand* increases the floc density considerably compared to the flocs in other precipitation processes. This enables the rise rate in the lamella separator to be 30-80 times higher than in conventional chemical precipitation plants. The treated water passes through the lamellas and leaves the plant through the collection launders.

The precipitated sludge and the *Actisand* are extracted from the bottom of the lamella separator and pumped back to the hydrocyclone. The recirculated flow typically makes up 3-6% of the influent, depending on the concentration of suspended solids in the influent. The sand and sludge are mechanically separated in the

hydrocyclone. The sand is returned to the injection tank and the sludge flow is routed away for further treatment. The sludge flow makes up approximately 2-4% of the total water flow treated.

Project execution

A key requirement of the project was that all the above activities had to be carried out whilst maintaining the treatment works into supply. This has been achieved with only limited short-term shutdowns, typically less than one working day of Iver Treatment Works. Careful and detailed planning of these shutdowns enabled OTV, Veolia Water Partnership and Three Valleys Water to changeover a combination of new and existing plant from now redundant MCCs to new control panels, incorporating revised control software.

Civil works were substantially complete by December 2004, allowing mechanical and electrical installation to commence across a variety of work faces. Commissioning of the new plant began in January 2005, with the first MCC panel delivery.

Replacement pumps and polymer dosing equipment were brought on-line in the sludge treatment facility in a phased manner to maintain operation of the treatment works. *Actiflo*® commissioning is now in progress, with client takeover on schedule for June 2005. ■

Key participants

Veolia Water Partnership – Planning & Project Management;
OTV - Process Contractor & Joint Principal Contractor;
Trant Construction Ltd - Civil Engineering & Joint Principal Contractor;
Riverside Automation Ltd - plc & SCADA system
HLF and Nomenca - Mechanical Installation.
EPS Ltd - EICA installation.

Note: The author of this article, Chris Lincoln, is Project Manager with OTV.



Iver WTW: Existing pulsator clarifiers and location of third stream

courtesy: Three Valleys Water