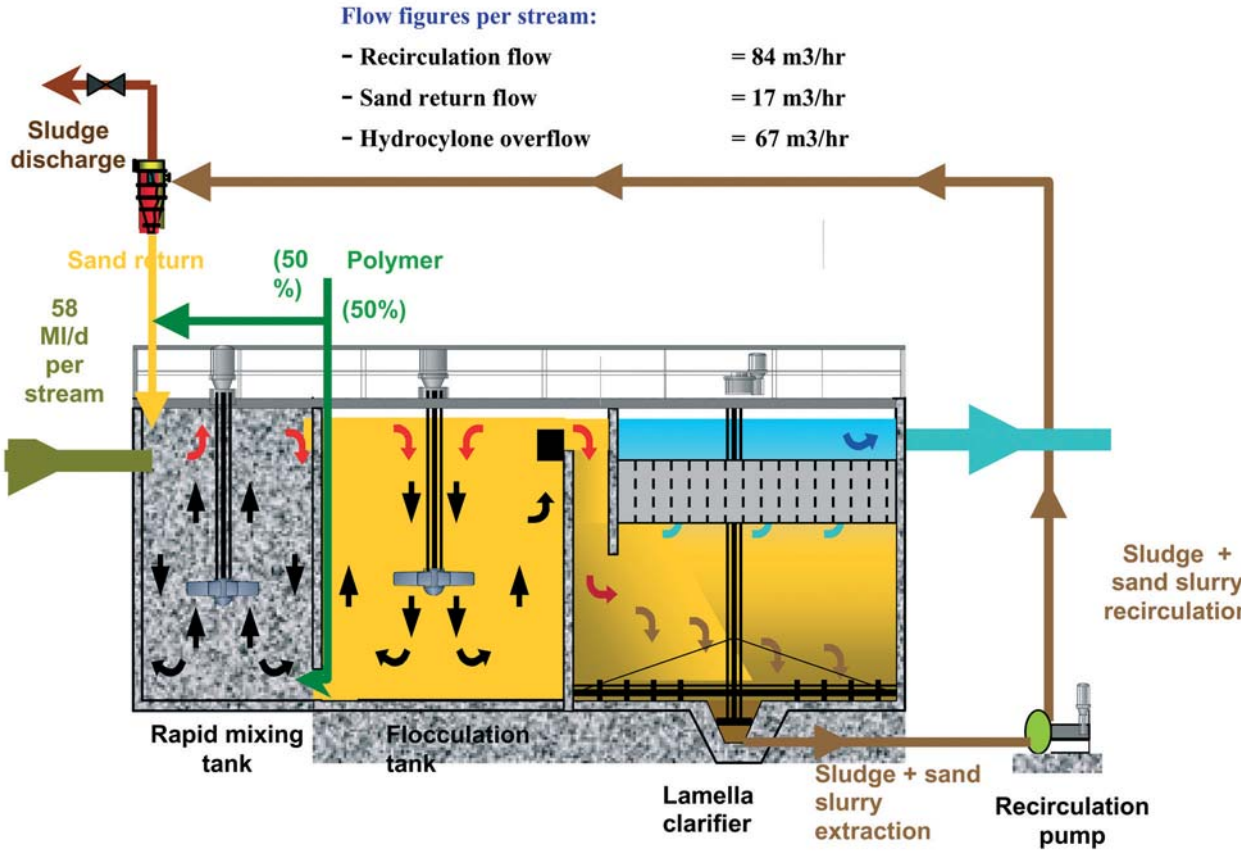
Fobney Advanced WTW

process upgrade to increase output

by David Osborne MBA, BEng, CEng, MIMechE

Fobney AWTW is the main supply of water for Reading. It is fed directly from the River Kennet and is therefore susceptible to fluctuations in turbidity that are found in the river. When high turbidity is seen in the river it had a large effect on the throughput of the water treatment works. When demand was lower this did not cause problems as variations in flow output from the works were balanced with storage in the network. However, as the demand in the area for water has increased, the dips in output from the works compromise the ability to meet the demand. An upgrade to the water treatment works was therefore required..



Actiflo® design parameters *courtesy of Thames Water*

The brief for this project was:

1. **To increase the works output making full use of the current 72 Ml/d peak river abstraction licence and providing peak week works capability from current levels to approximately 65Ml/d or over, anticipated raw water conditions until 2020.**
2. **Deliver beneficial use by June 30, 2007 within budget.**

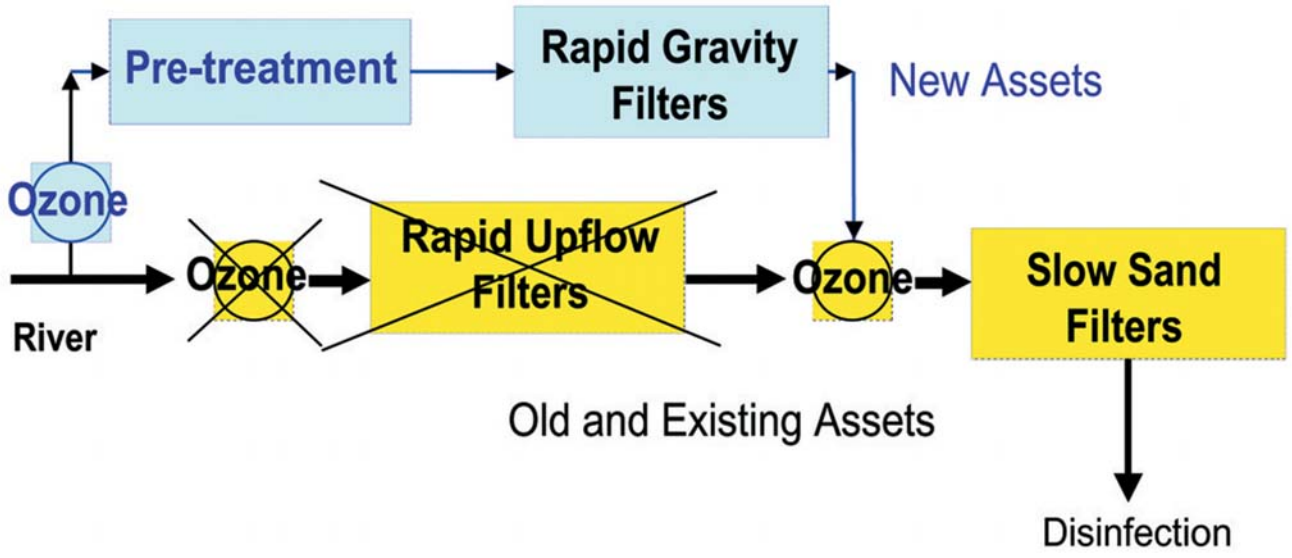
Technical background

The majority of Thames Water's surface water treatment works utilise bank-side storage reservoirs, such as those seen near Heathrow prior to treatment at the main plants. These reservoirs remove the fluctuations in turbidity from the river but result in algal bloom. Therefore, most of these works have Dissolved Air Floatation process which adds fine bubbles to the water to float the particles and algae from it.

Fobney draws its water from a canalised section of the river Kennet and does not benefit from bank-side storage. A different process was required to sink the river silt rather than try to float it. Land space was also a major problem, with little space left on site and being located in the flood plain. Traditional processes to settle solids take up a lot of land space. A new process for Thames Water was, therefore, proposed, called the Actiflo® process. This works by the addition of sand particles, to which the finer silt particles can attach and therefore sink faster in the clarifiers. This process has a fraction of the footprint of more conventional processes. The sand is recovered and cleaned to re-use in the process.

The challenges

* Timescales - The £30m programme had to be delivered between June 2006 and June 2007.
* The new process stream was to be built on an area of land that had particularly high ground water levels.
* Provide sufficient parking during construction and minimise vehicles where possible for the 150 strong workforce at peak.
* Deal with environmental issues - Badgers, Tree preservation orders, discharge consents for site dewatering during construction.



Schematic showing Fobney WTW Process Upgrade *courtesy of Thames Water*

* Ensure that the speed of the design keeps ahead of the construction programme (due to a very demanding project programme).
* Accommodate planning issues within the programme.
* Maintain existing works output requirements throughout.

The Solution

The solution was a new ozone unit, a pre-treatment (Actiflo®) process and Rapid Gravity Filters (RGF's) that replaced an exiting Ozone unit and Rapid Upflow Filters (RUF's).
In order to meet the challenging timescales, existing designs were selected for the main process units.

* The pre-ozone unit was copied from one recently built at one of our London WTW. Two units were required at Fobney to double the capacity;
* The Actiflo was largely a proprietary unit with standard design for the main parts.
* The Rapid Gravity Filters were substantially copied from the design used at one of our provinces WTW but with eight filter beds rather than four. The main mechanical and electrical elements were able to stay largely unchanged from the previous design.
* The intermediate pumping station and chemical building footprint was copied from one used at our London works.

The amount of design re-use enabled us to very rapidly get a footprint in a tight space with which we were confident to move forward in construction, whilst the details of the site specifics were finalised.

The plant was set out into defined areas which linked with the sub-contracts that would be required such that the Actiflo plant had the majority of its equipment in one area and the RGF plant had most of its plant in one area and likewise the ozone plant. This enabled the main contractor to have its sub-contractors working on site at the same time without them affecting one another. Avoiding sequentially work which would have lengthened the programme.

At the front end of construction the site was laid out so that there was sufficient car parking, offices and welfare facilities etc to accommodate the high numbers of people that would be working on the project.

Due to the layout of the construction areas three tower cranes were erected to lift the 500 tonnes of steel and 7000m^3 of concrete that were needed during construction of the plant.

The team

The commissioning team. led by Thames Water, were brought into the project early on, some of them having been involved in a previous filters project and hence bringing much to the team. Several of Black & Veatch's (previously MJ Gleeson) key staff had been involved in the previous London project under similar time-scales.

Regular liaison was maintained throughout the project to deal with the fast pace of the programme. The team worked well with a focus on what had to be delivered at each of the key milestones for water into supply date and for the full completion date so that effort was not diverted onto areas that were not required until after June 2007.

The completion

The selection of the Actiflo® process, although new to Thames proved to be the right one. The speed with which it could be commissioned was surprising and without it, it is unlikely that the key dates could have been met.

Martin Salter MP officially opened the plant on 3 December 2007.

After completion, British Waterways had planned to dredge the river immediately outside of the treatment works intake. If the new works had not been in place this would have had a significant impact on the plant. Water turbidity was 50 times higher than it is on a typical day and about 3 times higher than the new plant was designed to treat at full flow. The new plant was able to continue treating water at the normal daily output throughout the dredging without 'hiccup'.

Key Programme dates:

Start construction phase: 1 June 2006.
Deliver beneficial use by (65 Ml/d into supply); June 30, 2007.
Take over: 24 October 2007

Note: ***The Editor & Publishers wish to thank David Osborne, Project Manager with Thames Water for producing the above article for publication.***■

Gee pre-treatment dosing technology at the heart of **Fobney upgrade**

Under a contract awarded by Veolia Water Solutions and Technology (VWS), Gee & Company has installed the bulk of the dosing equipment for the Actiflo TM clarification process to treat abstracted water as part of Thames Water's upgrade of Fobney Advanced WTW in Reading.

By virtue of Gee' single-source capability, the scope of Gee's contract was to fabricate all thermoplastic chemical storage tanks, and – after factory testing – to supply, install and commission three separate dosing systems, including skid-mounted Signal metering pumps, and all suction and discharge pipe-work to the points of application.

Located in a new and dedicated chemical dosing house, the system stores and doses sodium hydroxide, ferric chloride and dosing only for a polyelectrolyte.

Gee and VWS in partnership – setting the industry benchmark in chemical dosing.

GEE

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