Tonbridge WTW

works upgrade and cryptosporidium UV treatment

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The Tonbridge Water Treatment Works has been located on the same site since 1871 and during that time it has undergone many reiterations. Its location is perfect for the town it serves, in so far as it is located on an island in the River Medway, close to the High Street. The island has also been put to some very good recreational use. The works are surrounded by football pitches, an activity park and public footpaths running along the river. The only access to this recreational area (and hence the works) is via a bridge with an unknown weight restriction. The result of all this would lead to a highly visible construction site, with access being shared by construction traffic and pedestrians alike.

Approach to the filter and high lift building - Courtesy of South East Water

Investment drivers

With the treatment works being sited on an island and with the old open topped sedimentation tanks being low lying, it is clear that it was susceptible to flooding. Consequently flood resilience was one of the four capital investment drivers in the AMP5 period for Tonbridge WTW.

The second driver was related to cryptosporidium risk at the works and as a result was given a DWI regulatory output date for the installation of a UV inactivation facility of 31st March 2012.

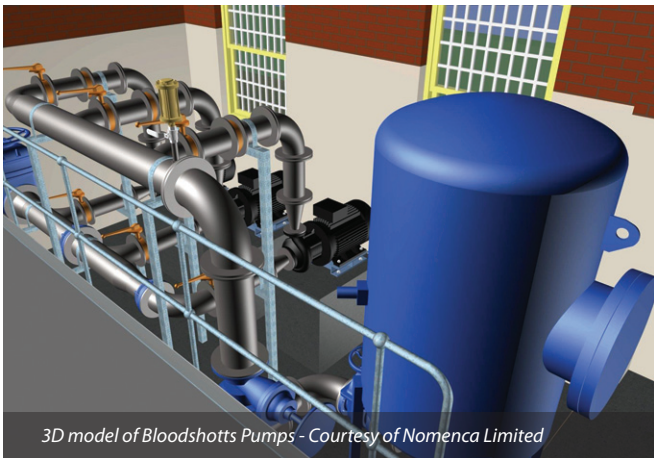
The other drivers were attributed to capital maintenance and an increase in output from the site. The average daily output (ADO) of the works was to be increased from 2.3ML/D, to a future daily output of 4.9ML/D by 2016.

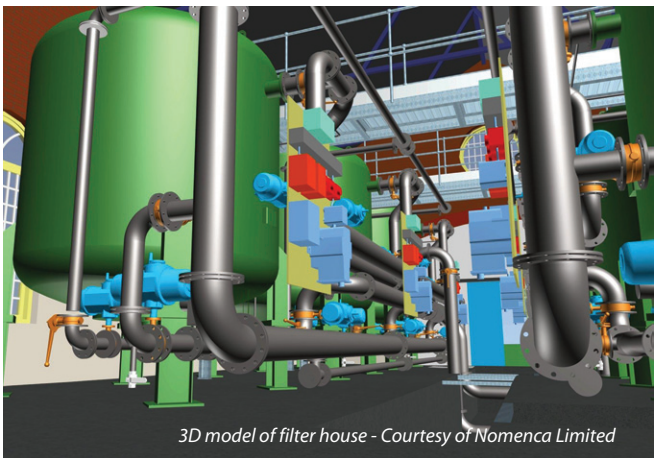
The combination of these capital investment drivers leads to the £3.3m project which commenced in May 2010 and completed in late February 2012.

Preliminary development and procurement

The main building at the water treatment works housing the filters and high lift pumps, was constructed in 1927. The filter room contained 3 (No.) pressure filters designed for the removal of manganese. These filters were badly corroded and it was decided to remove them, and this together with the repositioning of various air blowers and surge vessels, gave a free space sufficient enough to site 6 (No.) new 2.9m diameter pressure filters sized to meet the future output from the works. In addition space would be created to site the low pressure UV sets required for the cryptosporidium regulatory output.

To provide the required flood resilience to the new sedimentation tanks it was decided to place them on raised ground within the existing site. This area was sufficient in size to site 3 (No.) replacement sedimentation tanks, together with the required inlet chamber, incorporating cascade aeration, and the low lift pump chamber. The final top water level of these tanks was chosen to minimise the possible flood risk.


3D model of Bloodshotts Pumps - Courtesy of Nomenca Limited


3D model of filter house - Courtesy of Nomenca Limited

In addition, the chlorination and dechlorination equipment and the orthophosphate dosing unit were to be replaced along with the construction of a new backwash tank with replacement backwash facilities.

During this stage, a number of risks to project delivery were identified. Amongst the top five risks was the potential for flooding, which was mitigated by programming the construction through the spring and summer months of 2011.

These elements formed the majority of the scope of works, which was competitively tendered using a Design and Build NEC target cost contract. The chosen contractor, Nomenca, was appointed in December 2010, with a start on site date of mid January 2011.

Design and construction

With the requirement for the old works to be kept operational throughout the construction period it was considered crucial that all potential blockages to the sequencing of the works were identified in relation to the mechanical installation within the main building. One of the key features in achieving this early insight was Nomenca's extensive and thorough use of 3D modelling, which was one of the factors in selecting them as the main contractor.

During the setting up of the site compound, a high priority activity was to send in laser scanning equipment to carry out a detailed scan of all the equipment located in the building. This information provided accurate dimensional placement of the equipment as well as providing accurate dimensions of the 'freed space'.

Using this scanned information Nomenca was able to construct a series of 3D models showing images of a number of key stages through the construction period. With these in place it was possible to ascertain and identify pinch points that would lead to significant areas of conflict that could cause delays to the project. One of the recognised areas of risk was whether or not the replacement filters


Inside the filter house - Courtesy of South East Water


The sedimentation tanks - Courtesy of South East Water


Motor Control Centre at Tonbridge WTW - Courtesy of South East Water

could pass through the front door without the need for major dismantlement of the existing equipment (which would thereby exceed the allowable eight hour works shutdown period). The 3D model indicated that this operation would be possible, however mitigation plans were formulated.

On the appointed day, with all the plans laid the first filter was lifted upright and offered to the gap between the wall and the old filters and the filter moved through with just 50mm to spare. All three of the first set of filters were off-loaded and moved into their final resting place in a single day.

Another risk that had to be addressed early in this phase was the foundations of the floor within the filter floor. In order to progress this, a series of core samples were taken at various locations around the floor which showed various voids, indicating that the replacement filters could not be supported adequately.

Whilst there were a number of options, the chosen one was to employ a ground chemical injection process, which would keep costs to an acceptable minimum and would have no negative impact on the delivery of the project.

Testing and commissioning

With the filters now in place and with the sedimentation tanks completely water tested, the mechanical and electrical installation could now be progressed. The replacement high lift pumps were completed, tested and made operational.

Following the completion of the mechanical and electrical installation for the initial set of three filters, and with the replacement motor control centre being tested and commissioned and with all the other ancillary systems (e.g. the backwashing system, chlorination and sulphonation units) also being available, it was possible to carry out the full commissioning of the process.

This involved initially passing the raw water from the sedimentation tanks onto the new filters treating this water to potable water standards, and as a safeguard, passing this treated water back through the original set of filters before passing onto the contact tank and distribution.

Despite some initial turbidity issues with the first three filters, this operation went smoothly and the 14 day performance and reliability trials were progressed without a water quality issue arising.

At this juncture, and with the UV plant now operational, it was declared that the regulatory output was achieved on the 23rd September 2011, some six months ahead of the scheduled date.

This therefore enabled the original filters to be removed and the final set of three filters to be positioned and installed. With the mechanical and electrical installation now complete, final tests were made on the final set of filters and a final performance trial was successfully carried out.

The removal of the original set of filters and the successful commissioning of the new motor control centre allowed for removal of the original MCC and repositioning of smaller items, which had been temporarily located, into their final position.

Training took place, asset tagging occurred, Operation and Maintenance Manuals were produced and the contract was successfully completed by the end of February 2012.

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