

# Ormesby WTW - Trihalomethane Project

## upgrading plant to meet new compliance values

by  
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**O**rmesby Water Treatment Works supplies potable water into the northern supply zone of Great Yarmouth, a predominantly tourist area with a population that can double during the summer months. Ormesby WTW is also used as a supplementary supply to Lound WTW during peak demands. The works has a design capacity of 45MI/d but operational constraints limit practical output to a maximum 35MI/d. The Water Supply (Water Quality) Regulations 2000 Trihalomethane (THM) compliance values changed from December 31st 2003 to 100µg/l maximum. This left Essex and Suffolk Water exposed to a greater risk of failure and had to satisfy a DWI Section 19 undertaking.



Ormesby WTW: First half of roof under construction

courtesy Essex & Suffolk Water

Ormesby WTW extracts water from two sources. The works is immediately adjacent to Ormesby Broad (36.3MI/d max.) providing one source and pumps from the River Bure (27.2MI/d max) some 18 miles (30km) away providing the other.

The works is divided into two operational streams. The two-stage Paterson stream dates from the 1930s and employs even earlier Slow Sand Filters. This stream is purely physico-biological comprising summary settlement, RGF and SSF.

The second, more recent stream is the 1950s *Candy Plant* which employs pyramidal hopper sludge blanket clarifiers followed by RGFs. This process now uses an iron based coagulant and is fully utilised all-year round to maximise the nett quality of water and thus reduce the THM risk.

These two streams merge ahead of GAC contactors, for pesticide removal, before final disinfection in three tanks of a considerable age. These tanks were SSFs in their original guise but have subsequently been converted to one Chlorine Contact Tank (CCT) and two storage reservoirs with an Ammoniation process being adopted between tank 1 and 2 to prevent THM formations.

### Desktop study & lab tests

In April 2002 *Montgomery Watson Harza* (MWH) was appointed to undertake a desktop study and carry out extensive laboratory testing of the raw water characteristics to establish whether the organic content could be sufficiently reduced by improved coagulation.

The raw water analysis showed that both sources have high alkalinity with a high organic content. The Ormesby Broad presented higher average TOC and UV levels at 9.5mg/l and 21.4 Abs/m against 5.4mg/l and 14.2 Abs/m from the River Bure. Turbidity levels in the two streams are comparable, as are the pH levels.

Algae levels vary seasonally but seldom cause any treatment problems from the River Bure source. However, there are problematic blooms in the Broad for approximately three months each year giving counts as high as 35,000/ml. Colour and optical density values (OD) revealed an increase from historical data as did the DOC levels but to a lesser degree. This is cross-referenced by a general deterioration in raw water quality recorded by many water companies across Europe.



Ormesby Water Treatment Works Sinusoidal Flow Lanes under construction

courtesy Essex & Suffolk Water



Ormesby: The 12T pre-disinfection tie-in pipework

courtesy Essex & Suffolk Water

Testing of water quality through the process stages led to the conclusions that the physico-chemical *Candy* plant is able to treat both sources but only to an effective output of 11Ml/d while the physico-biological *Paterson* plant is restricted to the smaller capacity River Bure source.

Analysis of the physical conditions also demonstrated that the Primary streams were not meeting their design filtration rates which would allow works output to have blending flexibility. In addition, the disinfection phase was allowing very little Ct control as the tank has a single baffle arrangement. This allows 'short circuiting' and gives an indeterminate detention time.

The work package agreed constituted a new, conventional CCT with a programme to:

- \* refurbish the *Candy* clarifiers;
- \* refurbish the *Candy* filtration stage.

The CCT was released as a Design & Build contract under ECC Option C to *Mowlem plc*, an NWL/ESW Framework contractor, with a Target Cost of £2,390,000. This project being derived from an undertaking did not form part of E & SW AMP3 submission.

Ormesby WTW is a very compact site with little space for new build assets. Options were considered for location of the tank with the eventual decision being taken to construct in an E&SW owned field adjacent to the works. This eliminated the risk of constructing next to brick built long-standing storage tanks, and would not affect the site storage capacity.

As stated earlier, Ormesby WTW is a stand-alone site and disruption can have serious implications to continuous supply. Project team consultation with the Environmental Health Dept. of the local district council led to a section 61 application for extended working hours being granted to give greater working time scope to a very tight programme.

This flexibility also allowed tie-ins to the existing pre-disinfection main to be carried out overnight when demand is lower.

**This major part of the scheme was delivered three weeks ahead of the DWI deadline and within Target Cost.**

The *Candy* clarifiers work was carried out by *Aquazone Ltd* and formed part of an Extension of Works Information under the ESW Minor Works Process Framework, which also constitutes an ECC Contract Option C.

The work package incorporated an acid protection re-lining of the tanks and a refurbishment of launders and sludge cones and other steel structural elements. As with the Contact Tank, this DWI deadline was also achieved.

Work that does not form part of the undertaking is currently taking place on site to address the *Candy* filter performance.

As has been stated earlier, the *Candy* filters are not treating their design capacity. The active management of THM compliance during poor raw water quality times is greatly assisted by directing as much water through the *Candy* stream as possible.

The process is currently being converted to a *Leopold Flooring System*. The system will produce a more regular, efficient backwash and stop the formation of Polyzoa and calcification resulting from dead zones at the bottom of the filter.

This work is currently on programme and due to finish in February 2005. ■

**Note:** The author of this article, Guy Waker is Project Manager, Essex & Suffolk Water.