

# Cromer WwTC

## meeting requirements for secondary treatment

**C**romer WwTC is located to the south of the town of Cromer on the Norfolk Coast and serves a population equivalent of 35,000 for three months of the year (summer) and 24,000 for nine months of the year (winter). The existing primary treatment, which consisted of lamella settlers was to be decommissioned, as it failed to operate effectively and the handling of primary sludges on site gave rise to numerous complaints from nearby residents. The purpose of this project was to meet the requirements of the Urban Waste Water Treatment Regulations 1994 (UWWTR) for secondary treatment by the end of December 2001, and to improve the sludge thickening and storage facilities.



Cromer WwTC Aeration tanks/walkway/pipe gallery (courtesy Anglian Water Services Ltd)

### Process

The activated sludge process was selected to treat summer flows of 206 l/s and winter flows of 176 l/s, operating in re-aeration mode in summer, reverting to conventional aeration in winter. The benefit of this combination is that the re-aeration system can treat greater loads than a conventional system with no plant redundancy.

**In summer**, crude wastewater receives preliminary treatment and is then applied to the aeration lanes operating in re-aeration mode. Re-aeration involves an extra step to traditional activated sludge. This is the aeration of return activated sludge (RAS) before passing into the main aeration tanks. The advantage of this treatment process is that the overall footprint area can be reduced by 20% when compared to conventional activated sludge. During the treatment process, 50% of sludge in the system is in the re-aeration tanks and 50% is in the main aeration tanks.

Consequently, the use of the re-aeration tanks allows the main aeration tanks to be reduced in volume. Following the activated sludge process, re-aeration followed by aeration, flows pass to final settlement tanks (FSTs). Sludge withdrawn from the FSTs is recycled to the re-aeration lanes.

**In winter** when flows are lower, the direction of flow through the re-aeration tanks is reversed so that they become conventional aeration tanks.

The existing picket fence thickeners were removed and replaced with gravity belt thickeners. Sludge can either be drawn off at 0.2% dry solids (ds) from the aeration lanes or RAS at 0.8% ds. The belts were sized to thicken either sludge to 6% ds.

### Construction elements

Flows from the existing preliminary treatment plant are pumped to



Cromer WwTC Secondary treatment building (courtesy Anglian Water Services Ltd)

the front of the new works, which then pass into the flow mixing chamber. The screened sewage influent is thoroughly mixed with RAS, screenings return liquors and filtrate from the sludge thickening plant

The flows are then conveyed through to the rectangular re-aeration and aeration lanes. Each tank contains a network of diffuser aeration grids. The diffusers are fed air from positive displacement, rotary lobe type blowers.

Flow gravitates from the aeration lanes to the rectangular FSTs, entering the tanks at low level. A chain and flight type scraper system is installed in each tank to enable efficient sludge and scum removal. A scum tube rotates at set periods throughout each day to remove scum from the surface of each tank. Scum can be returned to either the RAS tank or surplus activated sludge (SAS) tank.

Longitudinal launder channels with V notch weirs, projecting into the FSTs, transfer flows to a common final effluent (FE) channel from where it gravitates to the original FE pumping station. Longitudinal weirs were installed as Anglian Water has experienced problems on other sites where rectangular tanks were provided with end weirs. They have the advantage of reducing end wall turbulence, which can cause disturbance of the sludge blanket leading to the possibility of carry-over the outlet weir. The longitudinal weirs have a dead band adjacent to the end wall to prevent sludge blanket carryover.

#### Design aspects

The works is built on land originally used for a gas works. This has caused a significant contaminated land problem. A site investigation contractor was involved early on in the design to establish the implications on the design and make recommendations for the disposal of contaminated material.

The local council imposed strict planning requirements on design of the works which related to aesthetics, odour and noise. Planning requirements had stipulated that the original works had to be enclosed within brick and tile buildings and this also applied to the new works. The brick building, in appearance, mimics a traditional Norfolk farm. The building not only hides the works from the view of the general public but also attenuates noise and provides containment of process odours.

All plant within the aeration and re-aeration lanes and FSTs was designed for removal in small sections to reduce the need for

heavy lifting equipment. Lifting facilities were installed over pumping stations for the safe removal of plant.

#### Odour control

To contain strong odours and minimise the build up of gases emitted from the effluent, covers were installed over the aeration lanes and pumping stations. Foul, low volume, air drawn off from under the covers was returned to the existing wet scrubber odour control system. These odours were combined with air drawn from the existing preliminary treatment building and from beneath the hoods over the new sludge thickening plant. A new odour control system was installed to treat the high volume building ventilation from the new secondary treatment and existing sludge treatment buildings.

The two process streams run adjacent to each other and, in order to accommodate the RAS and process air pipework which feeds into the tanks, a pipework channel 4m wide, 1.5m deep, is provided centrally, cantilevering over the top of both tanks. A walkway is provided over the top of the channel for man access throughout the length of the building.

Anglian Water required that a permanent tank draindown facility be incorporated into the design of the aeration, re-aeration lanes and FSTs. This was accomplished by installing a dry well submersible mounted pump in the low level gallery that ran between the aeration lanes and FSTs. Suction pipework draws from the lowest point of the aeration lanes and from the sludge hoppers of the FSTs with flows returned to the head of the works for re-treatment.

The low level gallery was also used as the location for the SAS transfer pumps. By utilising this low level area, the pumps were able to draw directly from the base of the SAS tank without a suction lift. A permanent gas monitoring system was installed within this low level area because of the risk of H<sub>2</sub>S build up.

#### Partnership arrangement.

The project was run under a partnership arrangement with Anglian Water Services responsible for process and architectural design; *Halcrow Group Ltd* was responsible for producing civil and M & E detailed designs; *Morgan Water* for civil construction and *Purac* for M & E procurement and installation. ■

**Note:** *The Editor & Publishers wish to thank the Project team for their cooperation in producing this article.*