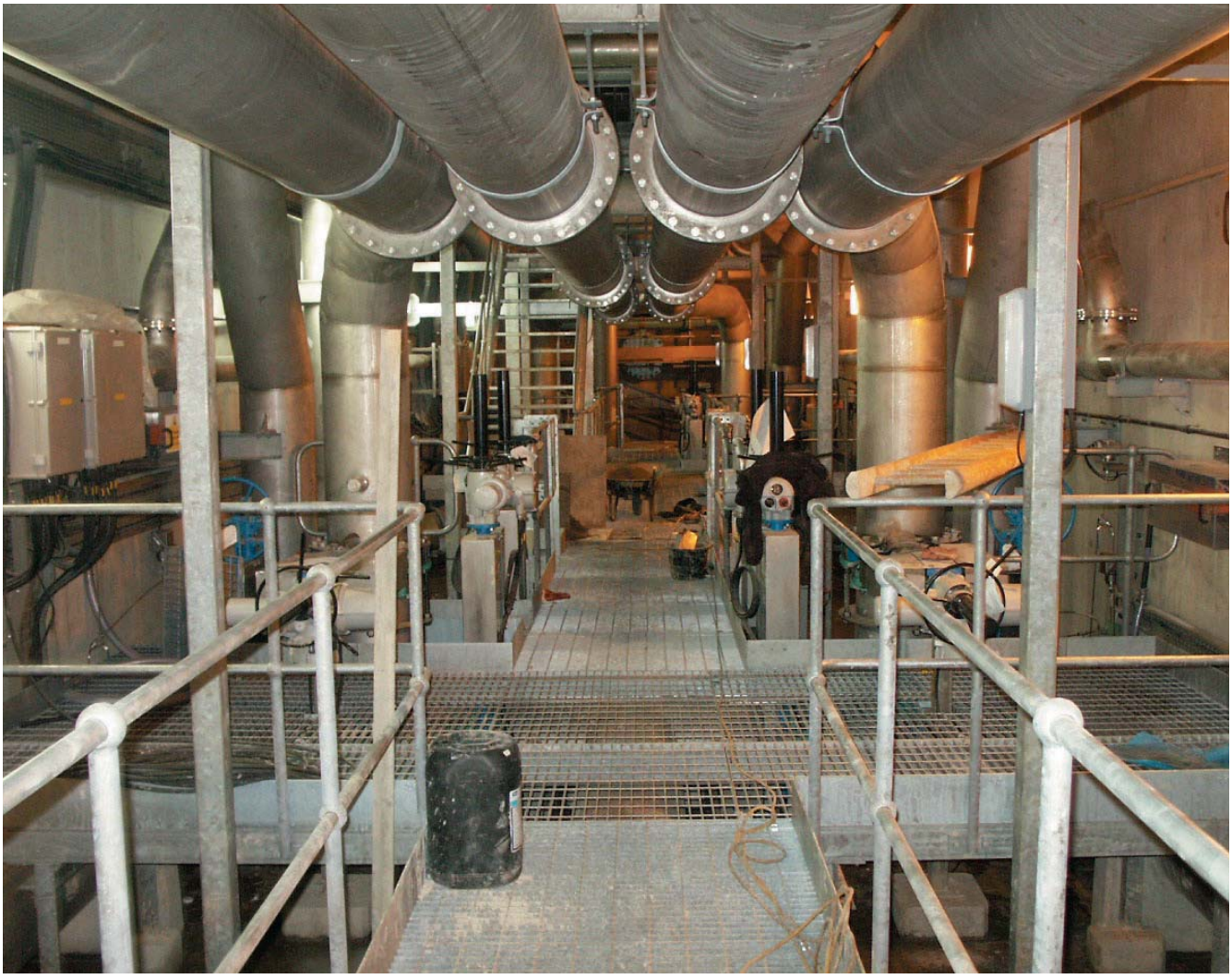
Eastbourne WwTW upgrading

adding secondary treatment – 'like building a ship in a bottle'

Eastbourne Wastewater Treatment Works is located on a prime site on the sea front, immediately adjacent to a residential area. As originally constructed the works comprised primary treatment only but has recently undergone an extensive programme of works, upgrading from primary treatment to full secondary treatment with provision for a UV disinfection system.



Eastbourne pipe gallery *(courtesy Brightwater Engineering Ltd)*

The existing treatment facility at Eastbourne was completed in 1997 by *Biwater Treatment Ltd* who were responsible for the complete project, including design and construction of the underground concrete box and provision of primary lamella plate separators. In order not to detract from the local environment it was a requirement of the primary treatment contract that the works should be constructed largely underground. A turreted superstructure located above the plant was provided to disguise the works and provide access for personnel, and sludge tankers, with the control room also located in this superstructure.

As a result of increasingly demanding legislation and in line with latest treatment directives, Southern Water embarked upon a programme to upgrade many of their primary only treatment schemes to full secondary treatment.

Highly saline influent

During 1998, a desk top study of available options to upgrade Eastbourne was undertaken by Southern Water Services and a number of contractors to determine the best available solutions for what it was realised was going to be an extremely difficult project. Main considerations were to find a process that could provide the required treatment levels on a difficult, highly saline influent and to fit all the necessary equipment within the confines of the existing underground structure. Building a new underground structure was ruled out, other than a last resort on the grounds of disruption to the local environment and the high additional expense of such an operation.

Having evaluated all possible options for the new secondary plant, Southern Water's team of specialists determined that to comply

with all of the conflicting constraints on this difficult scheme, Biological Aerated Flooded Filter (BAFF) technology would be the most appropriate form of treatment. Following a thorough evaluation of the various BAFF technologies available, Southern Water drew up a short list of suitable suppliers of this technology and commenced the selection process for suitable contracting teams to bid for the work.

Team

It was at this stage that *Biwater*, the construction contractor for the previous primary treatment contract and *Brightwater,* one of Southern Water's approved process contractors for BAFF technology, teamed up to tender for the work. This team provided a strong alliance due to *Biwater's* intimate knowledge of the existing works, *Brightwater's* extensive experience of treating sewage with a high degree of saline infiltration and the excellent working relationship between the two companies developed during bidding and construction of previous schemes.

Tender documents were issued in November 1999 with an extended bid period due to the complexity of the scheme. Prior to the issue of tender documents it was recognised that a significant part of the evaluation process would involve convincing Southern Water's technical staff of the confidence levels in treating highly saline influent with wide variations of saline from day to day and hour to hour. In order to demonstrate full confidence in the process design proposals, *Brightwater* set up and operated a pilot plant on a representative saline influent to endorse the suitability of its *Biobead* treatment process.

Pilot plant

In view of the wealth of information on influent quality, including salinity, available for the site, Brightwater elected to set up a pilot plant local to their offices. This was arranged to mimic all possible flow, load and saline combinations in order to give full confidence in the process under all expected site conditions which would not have been possible on site due to time constraints.

Process design for the overall works involved a balance between the number of existing lamellla plate settlers that could be retained and maximisation of the capacity of the BAFF to supply a sufficiently de-rated unit to handle problems inherent in treating saline sewage. Further constraints were placed on the overall design by the construction methods employed for the existing box structure and its complicated roof support, including columns built into the area required for the new BAFF plant.

Ultimate design for the new plant, arrived at after careful consideration of numerous options, involved removal of three of the existing lamella units and provision of a six reactor *Biobead* BAFF plant.

Results of the pilot work, undertaken concurrently with preparation of the tender, demonstrated that, at the loading rates proposed for the new secondary plant, the *Biobead* plant proposed would perform well. Pilot results indicated that it could handle considerably higher salinity than expected at the Eastbourne site (up to 14500mg/l compared with 11000mg/l expected) and also tolerate much higher rates of exchange at up to 5 g/lh.

Contract award

After careful consideration of all aspects of the received tenders, the contract to update and extend the works at Eastbourne was awarded to the *Biwater/Brightwater* team and work commenced on design mid 2000.

Just as the tendering exercise required a fully integrated team approach to ensure success, this proved to be equally essential during the detailed design and construction phase, due particularly to the constraints imposed by the concrete box into which the new plant was to be built.

It was fully recognised at the tender stage that access into the structure for all new components would have to be through a 3.1m x 3m opening in the roof of the existing lamella hall. This, together with the high specification materials required due to the high salinity levels, meant that virtually all of the mechanical components for the BAFF had to be designed from scratch. A further complication was that the reactors and internal components had to be constructed around existing roof support columns, resulting in components for most of the reactors being different from one reactor to the next.

Concurrent with the detailed design stage, Biwater commenced work in the lamella hall during summer 2000, first removing the three redundant lamella units including the concrete tank structures and, following completion of the design, building the new BAFF structures.

Work in the existing structure has often been difficult, arduous and cramped, with shift working required in order to make full use of access into the building and cranage facilities so as not to delay the project. Special consideration has, of course, been given to health and safety measures due to the confined and difficult working conditions.

'ship in a bottle'

Construction of the extension works at Eastbourne has been an immense challenge for all concerned – it has been likened to 'building a ship in a bottle' – and has been a success due to the close cooperation of all parties.

There are many examples of the level of cooperation required in order to design and build the scheme and these include:

* sections of tanks not fully constructed until after partial completion of mechanical installation to allow improved access;

* walk through openings allowed in tank walls to improve access, with the openings closed after mechanical installation;

* adoption of tighter than normal working tolerances – the BAFF gallery pipework design allowed for as little as 10mm between feed pipes and adjacent pipe flanges, which is impressive considering the size of the feed pipe work at 450mm.

The plant is now virtually complete from a construction point of view and is undergoing mechanical, electrical and process commissioning and is expected to be fully on line by the summer of 2002. ■

Note: *The Editor & Publishers wish to thank Brightwater Engineering Ltd for producing the above article for publication.*