

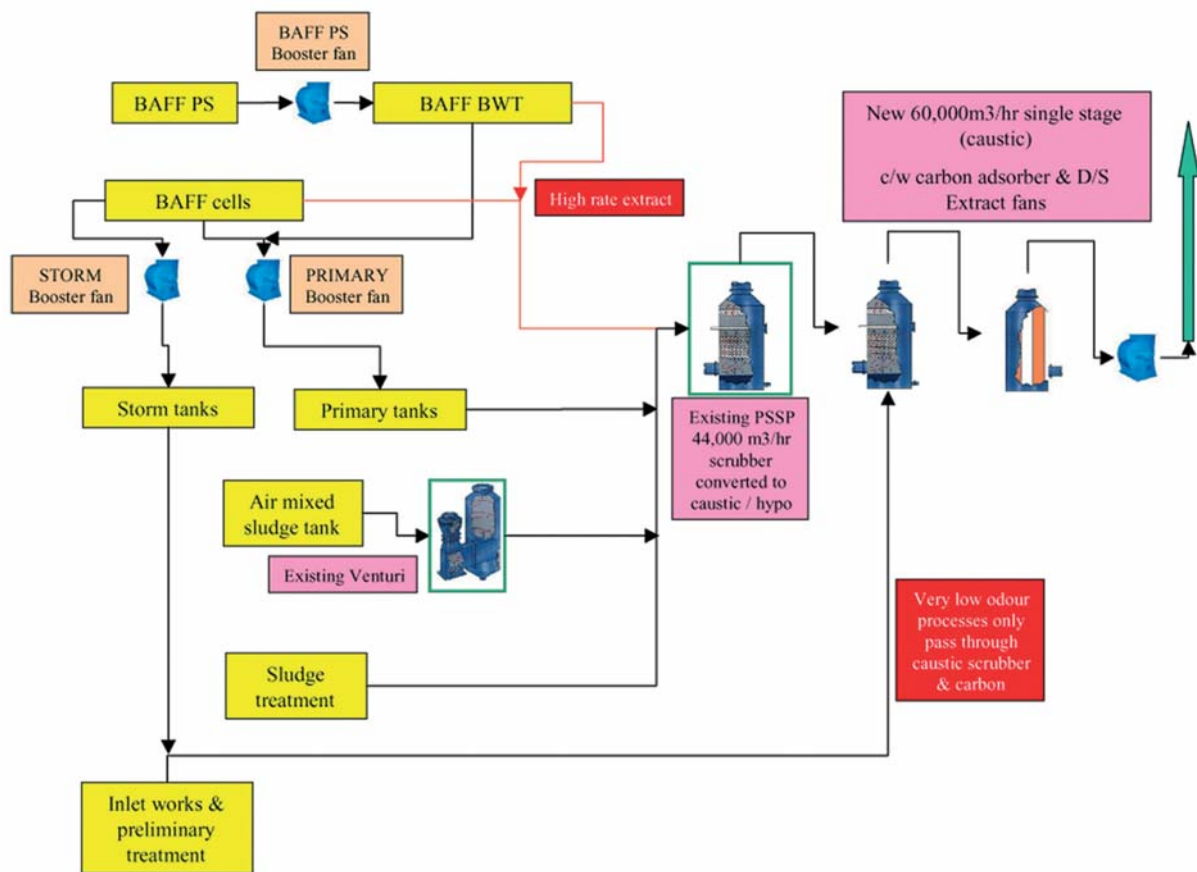
# Bromborough & Birkenhead WwTWs

## odour control

by Jan Michalec

**B**romborough and Birkenhead odour control projects are part of a £15.5m Wirral Odour Control Scheme, which also includes Meols Wastewater Treatment Works (WwTW). Bromborough and Birkenhead WwTWs were constructed during 1995 to 2000, and serve a population equivalent of 130,000 and 220,000 respectively. Birkenhead works is situated close to a town centre, a college of further education, nursery and to other prestigious developments. There is a residential area situated nearby the Bromborough works. At both sites a number of the process units including the inlet works, primary settlement tanks (PSTs) and sludge storage were covered and odour controlled as part of the original project. The Biological Aerated Flooded Filter at Birkenhead was excluded.





Bromborough Process Flow Diagram

courtesy MWH

Both sites already had odour control measures installed, but these were not performing efficiently and over the past 3 to 4 years both sites have received odour complaints.

**Project goals**

The purpose of the project at **Bromborough** is to bring the WwTW into compliance with the Environmental Statement attached to the planning consent i.e. **“The odour at or beyond the works boundary shall not exceed 5 OU/m³ on a 98%ile one hourly average basis.”** For **Birkenhead**, a phased approach to the reduction of emissions from the WwTW was taken. Following completion of the project, odours from the new stack shall disperse to less than **5 OU/m³ (98%ile)** at the boundary as indicated by the dispersion model during normal operations of the plant.

**Proposed solution**

Conceptual engineering solutions for both sites were provided by *MWH UK Ltd.*, detailed design and construction contract was awarded to *Byzack*. Main sub-contractors and suppliers were *Earth Tech*, *Hygrade Industrial Plastics*, *Plasticon UK Ltd.*, *PSSP Fabrications* and *MB Plastics*.

**Bromborough**

In order to calculate the required odour control stack emission rate, height and efflux velocity, the emission from odour control plant has been modelled using *BREEZE ISC* dispersion software. The modelling showed that a 28m high stack in the existing position should be utilised, with a **500 Odour Units/m³ discharge**. This would require a two stage chemical scrubbing system based on hypochlorite/caustic with an activated carbon adsorption unit.

**The new system comprises of the following equipment:**

- \* the existing Hygrade Venturi scrubber will be retained and converted to accept blowdown waste chemical from the two stage packed tower chemical scrubbing system;
- \* the existing 44,000 m³/hr caustic scrubber will be retained &

converted to a caustic/hypochlorite scrubbing system;

- \* a new 60,000m³/hr caustic scrubber;
- \* a new 60,000m³/hr active carbon adsorption unit complete with heater;
- \* new caustic/hypochlorite storage tanks and dosing equipment (the existing caustic dosing for the scrubber will be retained and used to dose caustic into the new caustic scrubber);
- \* new duty/standby main extraction fans;
- \* new 28m high stack.

The air from Bromborough WwTW has been split into three categories, by consideration of the odour contaminant loads (hydrogen sulphide, di-methyl sulphide, mercaptan, ammonia and VOCs) from each process unit. Very high odour, high odour and low odour.

*Photo on previous page shows: Bromborough Control Plant under construction (Photo courtesy United Utilities)*

Each category of gas receives different levels of treatment from the odour control system, designed to remove the contaminant gas present in each category.

“Very high odour” air is treated by a venturi pre-scrubber. The treated air from the Venturi scrubber is combined with the high odour air and enters a hypochlorite/caustic wet chemical (packed tower) scrubbing system. The treated air from the hypochlorite/caustic wet chemical scrubber is combined with the low odour air and passed into a caustic wet chemical scrubber. The treated air from the caustic scrubber is passed into an active carbon adsorption unit (via a heater) for final VOC removal, Treated gas from the active carbon unit is discharged to atmosphere via duty/standby fans up a 28m high stack.

**In order for the odour control system to achieve the design reduction in emissions the following areas have been addressed:**



Completed Odour Control Plant at Birkenhead WwTW

*courtesy United Utilities*

- \* reduction of odour generation from areas that are not currently odour controlled, notably from the Great Culvert local to the treatment works;
- \* the provision of suitable covers to prevent fugitive odour release which are operable and maintainable. This will involve improved sealing of the Primary and Storm Tank GRP covers including the scraper drive trains. In addition, the BAFF Feed PS and Dirty Backwash Tank covers are to be updated. Finally new odour control enclosures are to be provided for the screening skips within the inlet and excess storm buildings and a tanker loading bay is to be constructed.
- \* the provision of a suitable extraction system to collect the odorous air from the process units, delivering the design flow rates from all areas, without imposing high negative pressures on the existing GRP covers;
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- \* the provision of an Odour Control Unit (OCU) which treats the collected odorous air, including a discharge stack to provide the necessary dispersion.

**The new system comprises of the following equipment;**

- \* re-use of the existing two stage chemical scrubbing system treating foul air from the majority of the sludge system;
- \* a new 45,000m<sup>3</sup>/hr single stage hypochlorite/caustic wet chemical scrubbing system;

- \* a new 45,000m<sup>3</sup>/hr Active carbon adsorption unit complete with heater;
- \* new caustic/Hypochlorite storage tanks and dosing equipment;
- \* new duty/standby main extraction fans;
- \* new 20m high stack;
- \* existing Biofilter - to be isolated and left on site for possible future use;
- \* sludge screen dry chemical unit - to be removed and utilised by UU on other projects.

**Conclusion**

**Construction of odour control plants at Bromborough and Birkenhead commenced on 5th December 2005 and it is now coming to its end. Birkenhead has achieved project in use status at the end of January 2007 and is now in 12 month maintenance period before it is finally handed over to United Utilities. At the time of writing this article (April 2007) Bromborough was in 14 days trial period which, if successful, will be followed by 12 months maintenance period. It is early days to draw conclusions about the plant performance, but early tests confirm that the project goals have been achieved. ■**

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