

# Pocklington WwTW

a compact solution to provide treatment to meet FFD consent

by  
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**P**ocklington WwTW is located in a semi-rural setting in East Yorkshire and receives pumped and gravity flows from the catchment area. The site required upgrading to meet a revised final effluent ammonia discharge consent of <3 mg/l under the EU Freshwater Fisheries Directive (FFD) that would become effective on 31 March 2010. CostainMouchel was tasked by Yorkshire Water Services (YWS) with the design and construction of the upgrade to the existing works. The £2.8M scheme was implemented under the AMP4 agreement with Yorkshire Water, which is structured to drive innovation in design and construction. The scheme highlights the approach taken to supply an innovative, cost effective design to tight timescales.



Activated sludge plant nearing completion

Courtesy of CostainMouchel

The existing works consisted of:

- Inlet pumping station with integral combined sewer overflow (CSO) type screen for storm flows;
- Inlet screens and pre-treatment;
- Storm storage and return facilities;
- Primary settlement;
- Primary and secondary ferric dosing for phosphorus removal;
- Secondary treatment provided by biological filters and humus tanks;
- Tertiary treatment provided by nitrifying sand filters;
- Interstage pumping.

The works were required to treat the following future flows, loads and consents for a design horizon of 2020:

Population equivalent	11,450
Daily average BOD loads	687 kg/day
Daily average suspended solids	750 kg/day
Daily average ammonia loads	88 kg/day
DWF	2,797 m <sup>3</sup> /day (32.4 l/s)
Formula A	13,526 m <sup>3</sup> /day (156.56 l/s)
FFT	6,402 m <sup>3</sup> /day (74.1 l/s)
BOD	14 mg/l
SS	30 mg/l
Ammonia	3 mg/l
Phosphorus	1 mg/l

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### The approach

The first step was to fully understand the flows and loads to be treated by the treatment works. This highlighted problems such as the works passing flows significantly higher than the required flow to full treatment (FFT) during storm conditions.

The second step was the evaluation of treatment options, which were agreed with Yorkshire Water Services and then evaluated based on CAPEX and whole-life cost. A number of process options were considered, including:

- 100% activated sludge plant (ASP);
- Additional and improved treatment from the existing works;
- Blended flows from the existing biological works and reduced capacity ASP.

On selection of the process treatment, the design and constructability of the various structures and process units were examined in detail, in order to ensure the most economic method of construction. This included the combining of structures, required depths of large structures in the ground, materials of construction and waste minimisation.

A Construction Lean Improvements Programme (CLIP) was implemented during the design and construction phases to facilitate the production of a compact construction programme and minimisation of construction waste.

### Description of the completed treatment works

The solution maximises the existing assets by using the existing biological filter works and tertiary treatment system to treat 67%, with an ASP to treat the remaining 33% of the flow and loads.

Modifications were made to the existing works to make the process more robust, as follows:

- FFT control – variable speed drives were added on the existing inlet pumps to limit the FFT to the consented flow;
- Biological filters – the existing filter distributors were fitted with electrical drives.

The new activated sludge plant comprises the following:

- Combined selector chamber and Anoxic zone;
- Two compact, circular ASP units, each sized to treat 16.7% of the flow and load. Each aeration lane, operating on a plug flow principle, surrounds the final separation tanks (FST). The diffusers can be lifted out of the aeration tank for inspection and maintenance;
- The FSTs are each equipped with a half-bridge scraper and desludged by actuated bellmouth valves, with the RAS flowing by gravity to the selector chamber and Anoxic zone.

Sand Filters - strainer to prevent gross solids being passed to the sand filter system.

Sludge Thickening - gravity thickening is provided for the SAS.

ASP Feed Pumping Station - the variable-speed pumps operate within a section of the selector and Anoxic tank.

### Features incorporating innovative design approaches

- The compact, circular ASP combines aeration and final settlement in a combined structure with the aeration lane construction utilising the outer wall of the FST;
- Air from the aeration blowers also provides mixing in the selector tank;
- The interstage ASP pumps are controlled by summation of the sewage inlet and RAS flows;
- Wide use of steel structures instead of concrete.

### The team

The project was delivered for YWS by the AMP4 Waste Water (East) Joint Delivery Team (JDT), which comprises YWS, Costain and Mouchel. All staff involved, working together as CostainMouchel, are co-located at offices in Castleford, West Yorkshire.

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