Urchfont, Wilts. STW
tertiary BAFF plant for small Wilts village

by
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The small village of Urchfont, population 1,176, situated approximately 5 miles south of Devizes on the northern edge of Salisbury Plain, has a traditional gravity flow sewage treatment works handling a 100 per cent domestic inflow. The population is expected to rise to 1,299 by 2020 and the Environment Agency had indicated that it intended to tighten the works' discharge consent with a regulatory deadline of 28 February 2003.

Urchfont STW – BAFF Sludge Tank *(Courtesy Wessex Water).*

The existing works facilities consist of:

* two Macerators (inlet works);
* two 5.0m square upward flow primary settlement tanks;
* two biological filters (13.6m dia and 16.4m dia with stone media;
* two 5.0m square upward flow humus tanks;
* one storm tank (capacity 155m^3);
* one old concrete sludge holding tank (volume 34m^3);
* final effluent recirculation pumping station;
* sludge liquor/works drainage pumping station.

This is a traditional gravity flow sewage works with a high inlet works which feeds two raised primary settlement tanks, flows then pass through the high level dosing siphons before entering the biological filters. From the filters flows move forward to humus tanks which are set into the ground. Final effluent passes through a sampling chamber to the adjacent watercourse.

Existing consent

Consented Dry Weather Flow (DWF)	295 m^3/d	3.4 l/s
Consented Flow to Full Treatment (FFT)	864 m^3/d	10 l/s

Urchfont STW BAFF Plant *(Courtesy Wessex Water).*

Effluent Quality 25 : 40 : 10 (BOD:SS: AmmN)
:200 : 200 Upper Tier (BOD : SS).

Future Consent

The EA indicated that it intended to tighten the discharge consent in the AMP3 programme to:

10 : 20 : 2 (BOD : SS : AmmN)

Regulatory deadline 28 February 2003.

Selected Option - Tertiary BAFF plant

Following a review of process options and an initial appraisal conducted by Wessex Engineering Services based in Bath, it was agreed in early 2002 that a tertiary biological aerated flooded filter (BAFF) plant would be constructed on the site of the former sludge drying beds. The scheme was designed and constructed by Wessex Water's Alliance contractor, *Costain/Carlbro*.The chosen BAFF plant was the "Biobead" system as supplied by *Brightwater Engineering.*

Process

Effluent leaving the humus tanks discharges into the new BAFF feed pumping station (with duty/standby variable speed pumps) which lift the flows up to a high level flow distribution chamber where it feeds three BAFF cells.

The BAFF three cell design consists of three reactor tanks, each 3.5m long x 1.8m wide x 5.1m high. This arrangement allows for one cell to be taken out of service with the remaining two cells being able to provide effective treatment for the maximum effluent flow of 11 l/s (FFT of 10 l/s plus the dirty water return at 1 l/s).

The effluent passes upwards through the biobead media which is held in place by a steel mesh grid. air is introduced co-currently to the effluent at the base of the media which helps the development of biomass on the buoyant plastic biobeads.

Removal of excess biomass is achieved by fluidising (back washing) the media by increasing the air flow rate. During this period the outflow is diverted to the dirty water tank (volume 50m^3) where it is returned to the primary settlement tanks distribution chamber. Only one cell at a time is backwashed.

The BAFF reactor cells are constructed in reinforced concrete which have piled foundations due to poor ground conditions. Access to the reactor tanks is by means of galvanised mild steel stairs and landings. Each cell has removable GRP access covers to prevent the ingress of leaf debris and there is a standpipe on the top level of the plant to aid washing down of the biobead mesh.

Three air blowers have been installed at ground level to provide process and scour air (for back washing) for the cells. One blower provides sufficient process air for all three cells. During a back wash, two blowers run together to provide scour air to fluidise the bed of one cell. The third blower acts as a standby unit. Each air blower is housed in its own acoustic enclosure which gives a noise attenuation of 65dBA at 1m from each blower.

In addition to the tertiary BAFF plant, the following items were installed to improve operation of the works.

* inlet screen, 6mm apertures, and screenings handling equipment;
* two auto desludging pumps for primary settlement tanks;
* 70kVA standby generator;
* glass coated steel sludge storage tank (Volume 100m^3).

Construction started on site in June 2002 and was completed in January 2003 with EA consent being achieved 28 February 2003. Process commissioning of the BAFF plant was accelerated by seeding its media with nitrifying indigenous humus sludge. However, due to the colder seasonal temperatures in December/ January it took 5 weeks for the plant to become fully nitrifying.

As part of the performance trials for the BAFF plant, it was decided to test one of the BAFF cells against the performance criteria required for its 20 year design horizon. This was successfully achieved by artificially loading the designated cell with a combination of settled sewage direct from the primary tanks and a manufactured solution of ammonium sulphate.

To date the BAFF plant is performing exceptionally well and producing final effluent with an average quality of:

6 : 5 : 0.6 (BOD : SS : AmmN). ■

Note: *John Pokojski, was Design Engineer, and Andrew Gulliford, Process Commissioning Engineer, on the above project*