

Sculthorpe WwTW, Fakenham, Norfolk.

Bio-Bubble SBR – provides full secondary treatment for all flows

Anglian Water's Sculthorpe WwTW, situated approximately two miles west of Fakenham, was mainly constructed during the war to serve Sculthorpe and the nearby US Air Force base and consisted of circular biological filters with settlement tanks and sludge storage. Extensive improvements were needed to meet revised consent limits for final effluent quality complying with River Needs Consent (RNC) and storm overflow discharges to meet AMP3. The surrounding area is particularly sensitive and includes a Site of Special Scientific Interest (SSI).



Sculthorpe WwTW (courtesy Anglian Water).

It was considered that full secondary treatment of all flows, including storm flows must be taken into account owing to the sensitivity of the surrounding area and SSI. In addition to meeting the revised River Needs Consent (RNC) limits and storm overflow AMP3 obligation, operational requirements including sludge production were also considered.

Basis of design

Population	1500PE
DWF	306m ³ /d
Formula A flow	2387m ³ /d
Flows to full treatment (FFT)	27.6 l/s
SS	5 mg/l
BOD	10mg/l
Amm,N	2mg/l
Consent compliance	95%ile

Project value **£0.95m**

The final recommendations held preference for a Bio-Bubble SBR, which was considered to be the best possible option capable of meeting the revised RNC consent whilst producing the least volume of sludge. Sludge would be retained within the reactors and treated to a highly stabilised level by way of the extensive sludge age of the process and, the volume of surplus sludge would also be considerably reduced through endogenous decay. This in turn would eliminate any need for additional sludge storage.

When compared to other processes, the system also held other notable advantages including lower capital installation and reduced operational costs.

In practical terms, the system was able to deliver the following benefits:

- * a new secondary treatment plant with small footprint allowing installation to take place whilst the existing plant remains in full service throughout the entire contractual installation phase
- * high quality performance producing a final effluent to meet the RNC consent limits;
- * a plant capable of receiving all storm flows to full treatment removing the need for storm tanks in addition to continually imparting a quality effluent discharge throughout storm periods;
- * markedly low and highly stable sludge producing up to 95% less in volume than other processes;
- * a sludge concentration of 3% DS that can be achieved direct from the second treatment reactors, contributing to notably reduced tanker movements;
- * low manpower operational requirements with minimal site operatives attention & negligible process technician input.

Confidence in the Bio-Bubble SBR process already exists within the Anglian Water region where several plants have already been installed. It has been particularly noted during bad storm periods

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that Bio-Bubble plants have remained within consent and required no site attendance. Furthermore, annual sludge production from existing Bio-Bubble plants has been demonstrated to be significantly low.

Process

Screened sewage enters the Bio-Bubble Sequencing Batch Reactor (SBR) balance tank where air mixing is promoted to alleviate odours and variations in the incoming influent strength.

There is no storm overflow and all storm flows receive full secondary treatment. Two Reactors provide secondary treatment receiving screened sewage direct from the Balance tank via one of two screw centrifugal transfer pumps.

The Bio-Bubble SBR incorporates an internationally patented Intelligent Reaction control system that has an infinite range of operating parameters to control all flows including peak storm flows. The process will automatically change to suit incoming flow conditions and, where a full load is not available, the Reactor will not discharge, but will select a minimum aeration cycle, reducing energy utilisation by up to 75%..

Bio-Bubble's patented variable buoyancy decanter is pneumatically controlled and will simply raise and lower so that only the required volume of final effluent will be discharged. Full protection is provided to instantly disengage decanting sequences either automatically or by manual selection. The decanters are manufactured in stainless steel and are practically maintenance free with a service life of plus 20 years.

The Bio-Bubble SBR process pursues the natural qualities of an over-extended sludge age and proliferation of higher life organisms. This approach contributes to significant improvements in sludge stability, which is highly mineralised, nutrient rich with extremely low pathogen counts and, concentrated to a 3% DS waste sludge discharge direct from the Reactors. Results are, therefore, reflected by a high quality final effluent but with very low sludge production that is significantly lower than other treatment processes. Sludge production of the fully established plant is anticipated to be 0.16 m³/d.

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