PRESS INFORMATION

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TITLE: **CRYNANT WwTW QUALITY SCHEME**

Largest biological contactor and reed bed in Wales installed
By Joe Merry MEng, MIChemE

Dwr Cymru Welsh Water (DCWW) have completed an upgrade of the Waste Water Treatment Works at Crynant to meet a tighter effluent consent standard using a 'low carbon' process solution. Crynant WwTW provides full treatment for all incoming flows up to 90 l/s. The works serves a design population of 5680 PE. The new discharge consent (10 mg/l BOD, 15 mg/l SS and 5 mg/l AmmN) came into effect on 1st April 2008. The Standard solution for this works discharge upgrade would have been the provision of an energy intensive activated sludge plant followed by sand filtration, including inter-stage pumping. However, in line wit DCWW's Sustainable Strategy which includes responding to climate change, a low carbon footprint solution comprising the largest rotating biological contactor RBC and reed bed installation in Wales has been installed.

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Detailed design, procurement, construction and commissioning were carried out by Morrison Construction (civil) and Imtech Process (process and M&E) working as part of the Welsh Water Asset Management Alliance and specifically with the operator Kelda Group.

Process Design

Previously, the treatment process at Crynant comprised preliminary treatment, primary settlement, biological filtration and humus settlement to achieve compliance with a discharge consent of 16 mg/l BOD and 28 mg/l SS. The poor condition of the old process units and the imposition of a new discharge consent, including a first time ammonia standard, necessitated a complete redesign of the treatment process.

However, process selection and design was constrained by several complicating factors including high infiltration and difficult ground conditions for construction. The topography of the site is very flat with an estimated drop of only 2.5-3.0 m from the inlet works to the outfall.

The existing rectangular primary settlement tanks had no effective method of sludge collection and removal which made de-sludging a manual labour-intensive process. Two of these tanks were modified to operate as storm tanks. A re-suspension pump was installed in each tank to provide an effective cleaning system.

The existing circular storm tank was modified for re-use as a primary settlement, but could only accommodate flows up to 50 l/s, so that all flows above this value bypass the primary stage. It was felt that the provision of additional settlement capacity (either new or modifying existing rectangular tanks) did not justify the considerable associated cost.

For biological treatment, activated sludge processes were not favoured because treatment of dilute wastewaters can result in sludge settle ability problems. Nitrifying biological filters (using plastic media) followed by tertiary sand filtration were considered; however, this option required construction of 2No. new biological filters and 2No. new humus settlement tanks, and required at least one stage of intermediate pumping.

The preferred process solution was to use Rotating Biological Contactors (RBCs) to achieve carbonaceous oxidation and nitrification, followed by tertiary downflow reed beds for 'effluent polishing'. These processes have relatively low hydraulic losses across them, meaning that no intermediate pumping stage was required. Also, the ability of the reed bed to cope with relatively high solids loads meant that only 1No. new humus settlement tank (15m diameter) was constructed for flows up to 50 l/s, with higher flows being passed to the reed bed without settlement.

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The other main reasons for preferring the reed bed option were slightly lower Capex and Opex, a relatively simple construction scheme, and a process that was considered 'green'. However, to justify the 'green' tag, quantification of the greenhouse gas emissions for the different options was required.

There are 6No. RBCs (supplied by KEE Process) operating in parallel, each unit comprising 6 banks of 4.5m diameter discs. This is believed to be the largest RBC installation in Europe.

Tertiary treatment comprises 2No reed beds each measuring 16m by 75m by 1m (deep). Only one bed operates at a time; typically, the duty bed is

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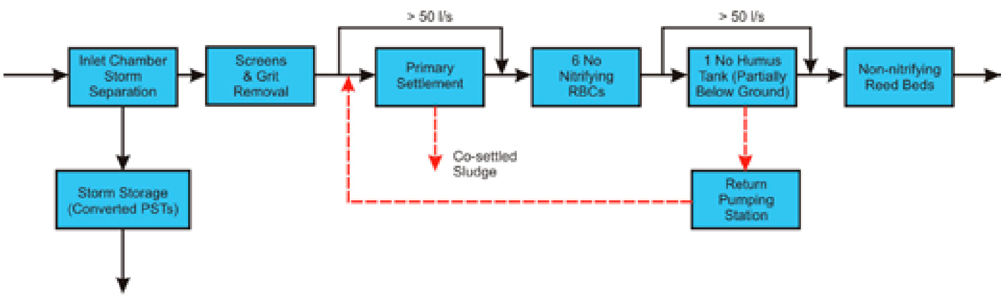
operated for two weeks at a time during which the standby bed is allowed to rest, encouraging the biodegradation of any accumulated solids. To minimise the footprint required, downflow reed beds were used. A network of pipes is used to distribute the flow across the entire surface of whichever bed is in operation. Humus sludge is pumped back for co-settlement in the primary settlement tank. A new sludge storage tank (200m3 capacity) has also been provided.



Flow diagram of Cynant WwTW

Treatment Process	Consent	TOTAL	Electricity Consumption	Other	Sludge Transport	Sludge Treatment	Sludge Disposal
Nitrifying RBCs & Tertiary Reed Bed	10 mg/l BOD 15 mg/l SS 5 mg/l AmmN	437	99	45	1	218	74
Nitrifying RASP & Tertiary RSand Filters	10 mg/l BOD 15 mg/l SS 5 mg/l AmmN	487	135	36	1	240	75
Biological Filters (Existing Process)	16 mgBOD/l 28 mgSS/l	375	66	36	1	199	73

Table quantifying the Carbon Footprint

Quantification of carbon footprint

An initial comparative assessment considered only emissions associated with cement (construction) and electricity consumption. This indicated that the reed bed option had lower emissions than the biofilter option (particularly for construction) and both had significantly lower emissions than for a conventional nitrifying AS plant with tertiary filtration.

The absolute carbon footprint was also quantified for the existing process, the preferred solution and the nitrifying AS plant, and the results are tabulated.

NOTE: This exercise excluded embodied emissions associated with construction.

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