AQUABIO LIMITED
Water, Wastewater & Air Treatment Processes
Project Management

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G's Beets Tax by Reusing Water with Aquabio

Aquabio Limited, based in Worcester has been designing, supplying, installing and commissioning industrial wastewater treatment and water reuse systems since 1998. In 2007 the company was deemed to be the European market leader in industrial water recycling and reuse in view of its pioneering of large scale installations in this field. The company is the leading supplier of industrial membrane bioreactors in the UK, exclusively applying its 'own technology' solutions. The exponential increase in water reuse using Aquabio plants is indicated in Figure 1.

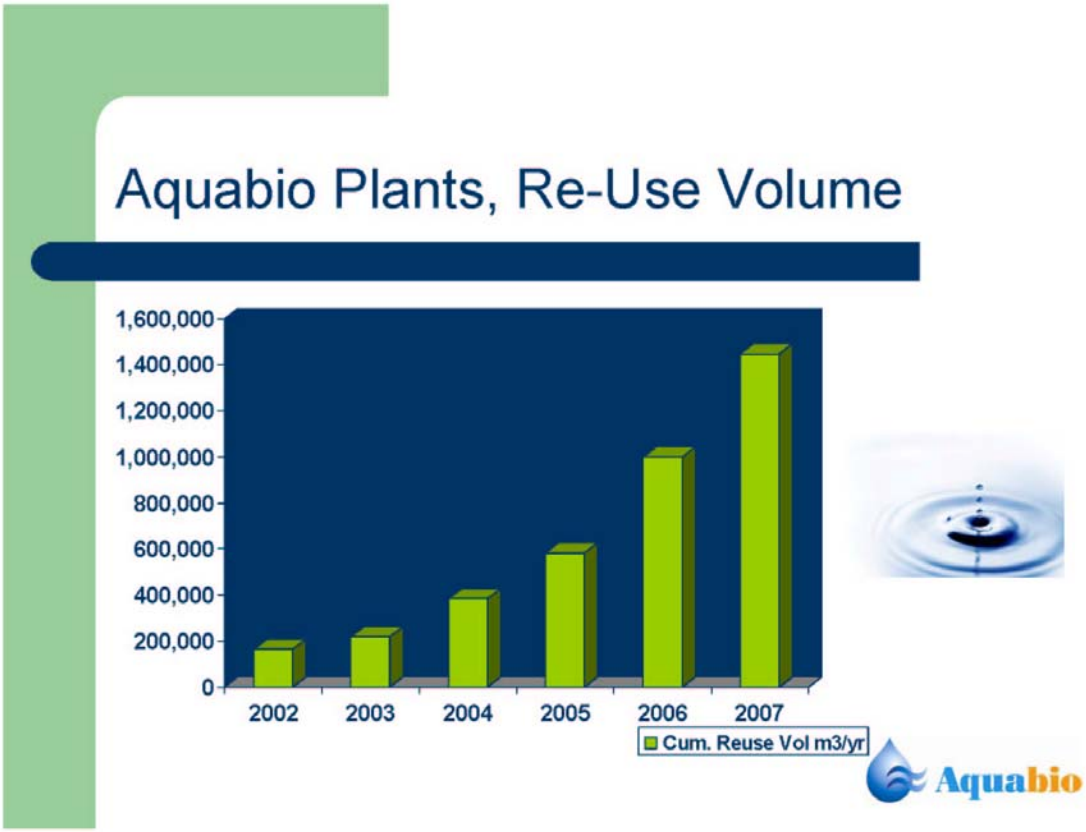

Figure 1: Potable quality reuse water from Aquabio industrial plants

In 2007 Aquabio completed and commissioned the wastewater treatment and reuse plant at G's Beetroot in March, Cambridgeshire. G's are one of the UK's most respected salads and vegetable processors. Their products are supplied to most of the major UK supermarkets as well as other large retail outlets.

The treatment and reuse project was driven by factory expansion due to a rise in the demand for beetroot products and increasing market share. This in turn resulted in very high and rising effluent treatment costs, as well as increasing water supply costs as the factory grew. Alongside consent compliance and operational cost savings, for G's the corporate goal of sustainable water use and process efficiency, coupled with water recycling, were important drivers.

This was the first project to be awarded an eligibility certificate under the Government's ECA scheme for efficient membrane systems (i.e. reusing greater than 40% of the site wastewater). This enabled G's to obtain a complete wastewater treatment and water reuse system with a 100% tax allowance in the first year on *all* of the capital cost spent on the project. The Aquabio system has easily exceeded the ECA target for reuse, with up to 70% of the wastewater produced being reused as potable quality water to the factory, and as 'soft' water to the boilers.

Figure 2. Award of the DTI's ECA eligibility Certificate by Stuart Ballinger to Graham Forber (G's Beetroot). Fred Foreman, G's Beetroot (left) and Steve Goodwin, Aquabio (right).

Prior to commencing the project a pilot trial study was carried out on site to fully evaluate the process in-situ. After a 3 month trial period using Aquabio's proprietary technology, the system was successfully proven for full scale design. Due to the use of large amounts of vinegar in the upstream process, and the washing, cutting and cooking of the beetroot, the raw wastewater is extremely strong (i.e. with a Chemical Oxygen Demand (COD) between 5,000mg/l and 20,000mg/l, 15 to 70 times stronger than domestic sewage). The plant is designed to treat 130m^3/day of raw

wastewater and produce a potable water volume of up to 90m^3/day. Most of the recycled water from the plant is returned to the factory mains water tank, where it is monitored for conductivity and 'topped up' with towns water from Anglian Water. A proportion is also reused directly from the RO unit as demineralised boiler feed water, saving heat and softening/antiscalent chemicals, as well as significantly reducing boiler blowdown frequency (saving even more water, energy and treatment chemicals).

The treatment scheme is shown in the basic process flow diagram below:-

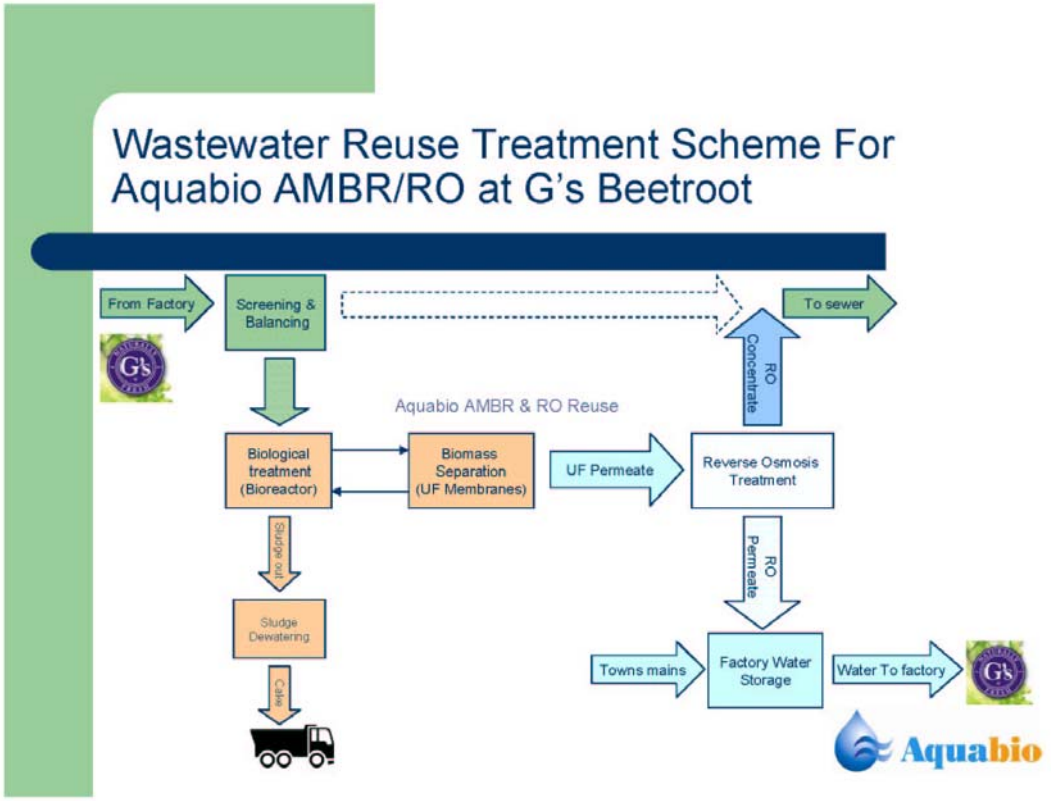

Figure 3: Process Flow Diagram of the G's Plant

The treatment stages through the Aquabio plant are shown in Figure 4. From right to left: raw wastewater; biomass; AMBR treated water and reverse osmosis treated water for reuse.

Figure 4: Process stages

Aquabio's AMBR Membrane Bioreactor technology has a number of specific benefits/advantages:-

Figure 5 : AMBR Bioreactor, air blowers and JETOX aeration

- It is very compact and low 'footprint' even compared to other membrane bioreactors. This saves both space and cost.
- Membrane costs are significantly less than other MBR's and modular standardisation of the set up allows a choice of membrane suppliers.

Figure 6 : Compact containerised plant for ease of expansion

- The AMBR has reliable and high 'flux' performance and permits 'out of tank' operation and maintenance of the membrane separation system, giving 'clean', fully automated and safe operation.
- AMBR Membrane cleaning frequency is very low (i.e. once every 3 to 4 months).
- At G's construction is modular and 'containerised' – Ideal for expansion at a later date.

Figure 7 : The AMBR & RO membrane systems

- High molecular 'cut off' (≈0.04 micron) membranes are used to optimise good hydraulic performance with high quality treated water. This is particularly important when feeding on to the tertiary reverse osmosis system (reducing long term membrane fouling).

The Aquabio wastewater reuse plant at G's Beetroot has shown that very high strength food processing wastewater can be cost effectively treated to extremely demanding standards for reuse

in a food factory environment. The product water is reliable, safe and of a higher standard than potable water available from the mains. The water returning to the factory consistently and reliably exceeds the prescribed concentrations, values (PCVs) and indicator values of The Water Supply (Water Quality) Regulations.

Water efficiency is one of the key areas being tackled through the Environment Agency Integrated Pollution Prevention Control (IPPC) Process. It is increasingly important to closely monitor water used per tonne of product produced. Water recycling/reuse in internal loops and 'end of pipe' becomes an important means of meeting stringent IPPC requirements. The reuse of water to process and softened recycled water to boilers for more efficient energy generation is particularly beneficial.

This project coupled with the high profile award of the DTI's ECA eligibility certificate, has directly resulted in an increasing level of interest of high quality water reuse in UK industry. Since the project at G's, a further certificate has also been granted to an Aquabio plant at Unilever Marmite and several other projects are now in the application stage under the scheme. Aquabio water reuse plants offer an environmentally and commercially attractive option for industrialists who are looking for local control over their water as a key sustainable resource in their factories