Advanced Effluent Treatment for Fine Chemical Manufacturing

FACTSHEET

In January 2000, BOC commissioned a unique advanced effluent treatment facility for Hickson and Welch in Castleford, West Yorkshire. The plant incorporates Loprox and Vitox technology to ensure destruction of hard organic wastes to enable discharge directly to the River Aire.

Previously, Hickson and Welch only carried out a limited amount of pre-treatment of waste on-site and then either pumped it to treatment works or removed it for off-site disposal. The costs of this were high and likely to increase in the future. Furthermore, the company was under pressure from the Environment Agency to review their effluent disposal policy. By installing a facility on site they were able to operate independently of the town's sewage works and discharge directly into the river beside the plant.

Loprox unit at Hickson and Welch, Castleford, Yorks

Several systems were looked at for the site before the Loprox and Vitox combination was selected. The main reasons for this choice were the ability of the combined system to treat all effluent (both biodegradable and non-biodegradable) and the fact that the Vitox plant is compact and could be located on a congested site.

The technology combination is not the only unique part of this partnership. BOC also owns and maintains this £10 million plant over a 15-year period. This means that Hickson and Welch do not tie up any capital in non-core activities. BOC managed the plant for an initial 12 month proving period and then the day to day control was handed over to Hickson and Welch.

The first discharge took place in January 2000 and fell well within the Environment Agency's consent levels, despite having a variable effluent stream from many different processes. The COD destruction levels far exceeded the 75% target and reductions of greater than 83% were achieved.

This plant has enabled Hickson and Welch to considerably reduce costs and they now have the flexibility to treat an even greater range of wastes on site. They also have peace of mind provided by – BOC's maintenance support and can produce non-toxic effluent which falls within their environmental consent.

The LOPROX process

The Loprox wet oxidation process can treat a wide range of complex and toxic wastes. When the wastewater enters the plant, additives and pure oxygen are introduced. The mixture remains in the reactor for between two and four hours at a pressure of 10 to 20 bar and at a temperature of 120 to 200°C.

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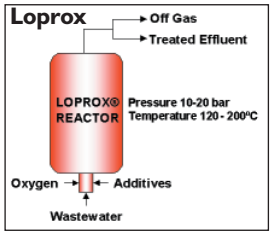
Under these conditions, the organic compounds are almost completely oxidised.

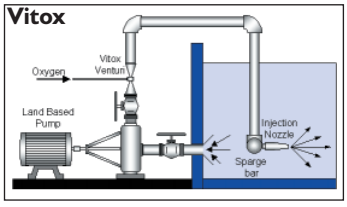


Any residual organics are converted into easily biodegradable compounds which can then be removed in a biological wastewater treatment plant. The system is licensed by Bertrams and BOC is the sole UK licensee.

The VITOX system

The Vitox system replaces air with oxygen in the activated sludge process for treating wastewater. Conventionally, the required oxygen is supplied by mixing air into the water with various types of mechanical aerators. By using pure oxygen instead of air, a far higher population of biomass can be maintained, thereby allowing a higher degree of treatment and lower secondary sludge production to be achieved in a given hydraulic volume. Vitox can be used as a retrofit on existing plants or as the basic process for new green-field installations.

The process eliminates the surface agitation caused by mechanical aerators, thus reducing airborne organic compounds and odours caused by the stripping action of large volumes of air passing through the wastewater. Surface foaming generation is also reduced.



Oxygen vessels, ammonia stripping columns and Loprox unit


Vitox biological plant at Hickson and Welch

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Advanced Wastewater Treatment at Paper Mill

FACTSHEET

BOC has designed and built an advanced oxygenation treatment plant at Shotton Paper Company, Deeside, North Wales. The 30 tonne a day oxygenation system combines both oxygen and air using Vitox oxygenation and mixing systems.

Shotton Paper is the largest integrated pulp and paper mill in the UK, producing 460,000 tonnes of newsprint a year. The mill uses approximately 22,000 m^3 of water per day and was treating water through a conventional activated sludge system. In the autumn of 2000 Shotton Paper decided that this current system needed to be upgraded and selected BOC because of its successful track record and acknowledged process and engineering expertise.

BOC and Shotton Paper together treating waste water together

The system that was designed for Shotton Paper includes a version of the newly patented Long Main variety of Vitox system. This provides a very energy efficient system over a wide range of oxygen demands and is particularly suited to the rectangular shaped oxygenation lagoon. The process incorporates six pumps, each capable of pumping nearly 2000 tonnes of water per hour and together dissolving up to 30 tonnes of oxygen per day. At lower oxygen demands one or two pumps can be shut down, providing savings in power. This system provides excellent dissolution of oxygen and sub-surface mixing with low levels of Volatile Organic Compound (VOC) emission, noise and foam creation.

Oxygen is supplied to this system using a Novox PSA on-site generation unit, with a liquid oxygen back up for periods of high demand. The system also includes a separate CO_2 stripping unit to give pH control via two air compressors which discharge into the centre of the lagoon through two distribution headers.

The plant was commissioned in April 2001 and Shotton Paper are very pleased with its performance. The plant has enabled them to have more stable control of their treatment processes, allows easier operation and control and also ensures greater compliance with the strict discharge consents into the River Dee.

The NOVOX PSA process

The Novox PSA is a 24 tonne per day on-site oxygen generator and is one of the latest lithium based sieve plants offering improved performance in terms of power efficiency and product capacity.

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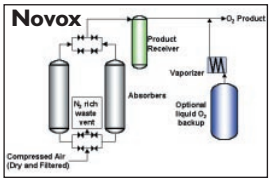
The process operates at ambient temperature to separate oxygen from air by means of Pressure Swing Adsorption. This principle relies on the properties of certain adsorbents to preferentially adsorb one component of a gas mixture, combined with the characteristic that the adsorption capacity increases with operating pressure. In this case, the adsorbent material, zeolite molecular sieve, has a higher adsorption capacity for nitrogen than for oxygen.



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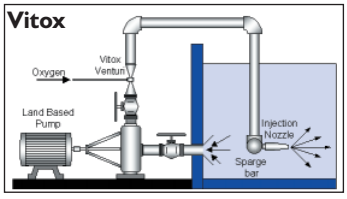

The *Long Main Vitox system* uses long distribution headers to ensure a greater oxygen distribution throughout the entire length and breadth of a large aeration lagoon.


Sparger pipework in the lagoon at Shotton Paper


Vitox pump alongside oxygen control kiosk at Shotton Paper

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