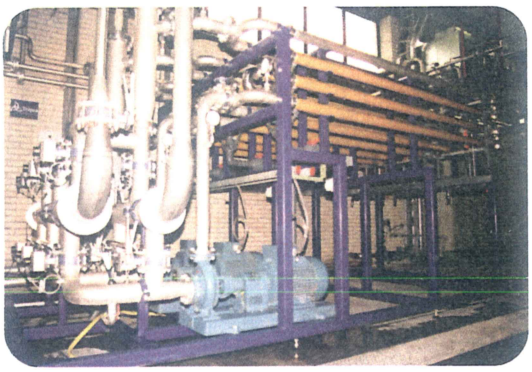
# MBR at the mill

● Membrane bioreactor-based treatment technology has been installed at a paper mill in the Netherlands.



*Full scale membrane unit at VHP Ugchelen.*



Manufacturing industry is continually exhorted these days to help the environment and the company balance sheet by increasing water efficiency in production processes. In the highly water intensive paper making industry, European companies have taken that message very seriously and with considerable success. One example of just what can be achieved has been recently reported by VHP Security Papermill Ugchelen BV of Apeldoorn, Netherlands.

The company produces about 5000tons of high quality paper a year for bank notes and other security purposes, using cotton as the raw material. The bleaching stage of production absorbs 10m³ of raw water per ton of paper and produces a highly alkaline effluent (pH 11-12), high in fibre and organic compounds, mainly cellulose (average COD 4.3kg/ m³). Because bleaching is a high temperature process the effluent temperature is also relatively high at 75 to 85°C.

With a view to reducing water and heating demand and effluent output, the company in 1999 experimented with effluent treatment on a pilot scale membrane bioreactor. A diffused air aeration unit was combined with a cross-flow ultrafiltration membrane in a thermophilic process that made best use of the retained heat in the bleaching effluent. Cotton fibre was filtered out upstream of the treatment units.

Tests by Triqua proved the plant capable of reducing effluent COD from around 4400mg/l to 600mg/l if the bioreactor temperature was controlled to a maximum of 50°C. This amounted to a COD removal in excess of 85% and further tests showed that at this quality the treated wastewater could be re-used in the bleaching process with only a 10% 'top-up' of bleaching chemicals.

On this basis it was decided to engage Triqua to build a full scale plant, partly financed by the Dutch government. Site work began in May 2000 and the plant was commissioned in November.

Removal of fibre from the wastewater in the full scale plant was to be achieved in a dissolved air flotation (DAF) unit and here the possibility of further savings was investigated.

In the pilot plant wastewater alkalinity had been adjusted to around 8.5 - 9 in the aeration tank by dosing with hydrochloric acid. But the production process gives rise to a carbon dioxide-rich waste gas. This was substituted for air in the DAF unit and, at a flow rate of 7m³ per 1m³ of wastewater, proved capable of reducing pH from 11 to an acceptable 8.2.

Operation of the full scale plant offered more good news, outperforming the pilot plant in terms of COD removal; after about 3 months of continuous operation this had reduced to between 450 and 500mg/l and was still decreasing. It was suggested this could be due to the biomass adjusting to the thermophilic conditions.

Treated effluent is now being used for 80 to 90% of the bleaching process without affecting product quality. Overall savings for the company and the environment are shown in the table.

The reduced wastewater discharge alone is said to be saving the company around Euros 227,000 a year and the tabled figures represent an annual reduction in fresh water demand of around 40,000 m³/year and a reduction in annual gas consumption of around 700,000 m³. To this can be added the savings on lower use of bleaching chemicals. ●

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*Influent tank, DAF unit and bioreactor of VHP Ugchelen.*

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## Savings by MBR application at VHP Ugchelen

| | Present | Future | Saving [%] |
|---|---|---|---|
| Fresh water intake for bleaching | 10 m³/ton | 2 m³/ton | 80 |
| Wastewater discharge (total) | 10,000 p.e.[1] | 5,000 p.e. | 50 |
| Gas consumption for heating (total) | 660 m³/ton | 520 m³/ton | 20 |

[1] p.e. : population equivalent