

**Efficient Membrane Filtration & Water
Reuse in the & Food and Drinks
Industry – IWEX 2007**



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Drivers For Reuse (in order of priority)

- Hydraulic limitations on incoming and outgoing water
 - (restriction on allowable discharge volume)
- Limitations on borehole abstraction
- High cost of municipal upgrade
 - ‘in-house’ solution desirable (commercial)
- ‘Background’ Legislative pressure
 - IPPC, Urban Wastewater, Water Framework and Landfill Directives
- Cost of incoming water supply and trade effluent discharge
- Independence, flexibility and ‘responsible’ image



Strategic Objectives for Reuse

- Discharge Limitations
- OPEX commercial savings for higher quality treated water allowing watercourse discharge and 'double' savings of chargeable 'reused' water in & out of factory
- Could enable factory growth if reuse capacity increased in the future



Practical Quality Objectives For Reuse

- Washdown/cooling towers (non potable) minimum EA watercourse quality, bacteria free (e.g. MBR or AS/SF/UF treated as minimum).
- To Boilers
 - Individual Boiler manufacturer requirements, generally preferred as softened (e.g. after RO) to reduce OPEX on anti-scalant and boiler chemicals
- To Factory (e.g. food area contact)
 - treated water proved to be safe - fully compliant with requirements of current UK Water Supply (Water Quality) Regulations
- UK Food Regulations DO NOT DISALLOW reuse to food contact. Recent legislation encourages reuse of 'safe' water to proven drinking water standards.
- Irrigation – Non potable acceptable (e.g. AS/Sand filter/UV or UF)



ECA Government Incentives (UK)

- ECA – Enhanced Capital Allowance Tax Incentive Scheme (UK Govt/DEFRA)
 - 100% of Capital expenditure is fully allowable in Year following start-up of ‘eligible’ plant reusing >40% of factory water
 - Includes all capital on single project to achieve >40% reuse i.e. civil works, pre-treatment, biological/secondary and tertiary plant



Govt. & Retailer Approvals



BIO-WISE
Biotechnology at work

ACTION PROFILE

“Through successful collaboration with Aquabio Ltd, Bourne Salads has managed to address key problems associated with its wastewater treatment on-site and reduce its dependence on the local effluent sewer.”

Will Rose,
Engineering Manager,
Bourne Salads, Geest PLC

Modular membrane bioreactor reduces cost and allows water re-use

This action profile describes the application and benefits of an in-process advanced membrane bioreactor/reverse osmosis/ultra violet wastewater treatment and water recycling plant installed at a food manufacturing company. Key benefits to the company include:

- Compliance with consent to discharge requirements
- Incoming mains water reduced by 45%
- Effluent treatment at source

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The challenge faced

Bourne Salads, part of Geest PLC a leading supplier of fresh prepared foods, employs approximately 450 people and produces prepared leaf salads for a variety of customers. The current factory in Bourne, Lincolnshire, was completed in October 1997 for an initial investment of £20 million and houses some of the most up-to-date technology for handling prepared leaf salads. Since 1997, the factory has expanded considerably to keep pace with the dynamic market growth in this sector.

To enable future compliance with effluent discharge consent conditions, Bourne Salads entered into partnership with Aquabio Ltd to install a water treatment system that could be expanded on a modular basis to suit the growing business. Although not a primary driver for the success of the project, the prospects of water re-use and process water discharge to a watercourse were attractive benefits providing a 3 to 4 year payback for the project.

Actions taken

Bourne Salads had volumetric restrictions to the trade effluent sewer. The costs of upgrading the sewer were restrictive and ongoing discharge costs would be expensive. Following the successful results of a pilot trial to treat approximately 5 m³/day of raw effluent through a membrane bioreactor, the company implemented a new advanced membrane bioreactor/reverse osmosis water recycling plant. The membrane bioreactor process is an intensive activated sludge (aerobic biological) process using membrane biomass separation in place of conventional settlement techniques. Treated water from the membrane bioreactor is bacteria free, but it is then taken to potable standards by a tertiary process of reverse osmosis and ultraviolet disinfection. The high molecular 'cut off' of the ultra-filter membranes optimises good hydraulic performance with excellent quality water which can be fed directly to the reverse osmosis/ultraviolet stage. The new plant has enabled the

company to reduce dramatically its trade effluent sewer volumes to well within the consented values. This has released capacity for the site to expand production in the future, as well as substantial cost savings, with a high proportion of the treated water being of good enough quality to go into the watercourse and potable re-use of up to 45% in the factory.

The installation of the new wastewater treatment and water recycling plant has resulted in the following benefits:

- Incoming mains water reduced by around 45% (450 m³/day of treated water is returned to the factory, saving approximately 55p/m³ incoming and the equivalent volume of trade effluent).
- Reduced incoming water costs as well as trade effluent discharge costs giving 'double' savings and increased return on investment.
- Ultra-filtered water can be discharged directly to the irrigation ditch to Environment Agency standards, or re-used for non-critical applications.
- The plant is compact with a small 'footprint'.
- The design enabled re-use of a high proportion of the existing infrastructure.
- The 'out of tank' modular biomass separation system reduces maintenance and gives clean operating conditions.
- Organic load reduction is achieved almost exclusively in the biological stage, minimising chemical use in the process.
- Overall improvement in water quality (ie the reverse osmosis/ultraviolet treated water is cleaner than the incoming mains water).

Biotechnology supplier

Aquabio: www.aquabio.co.uk

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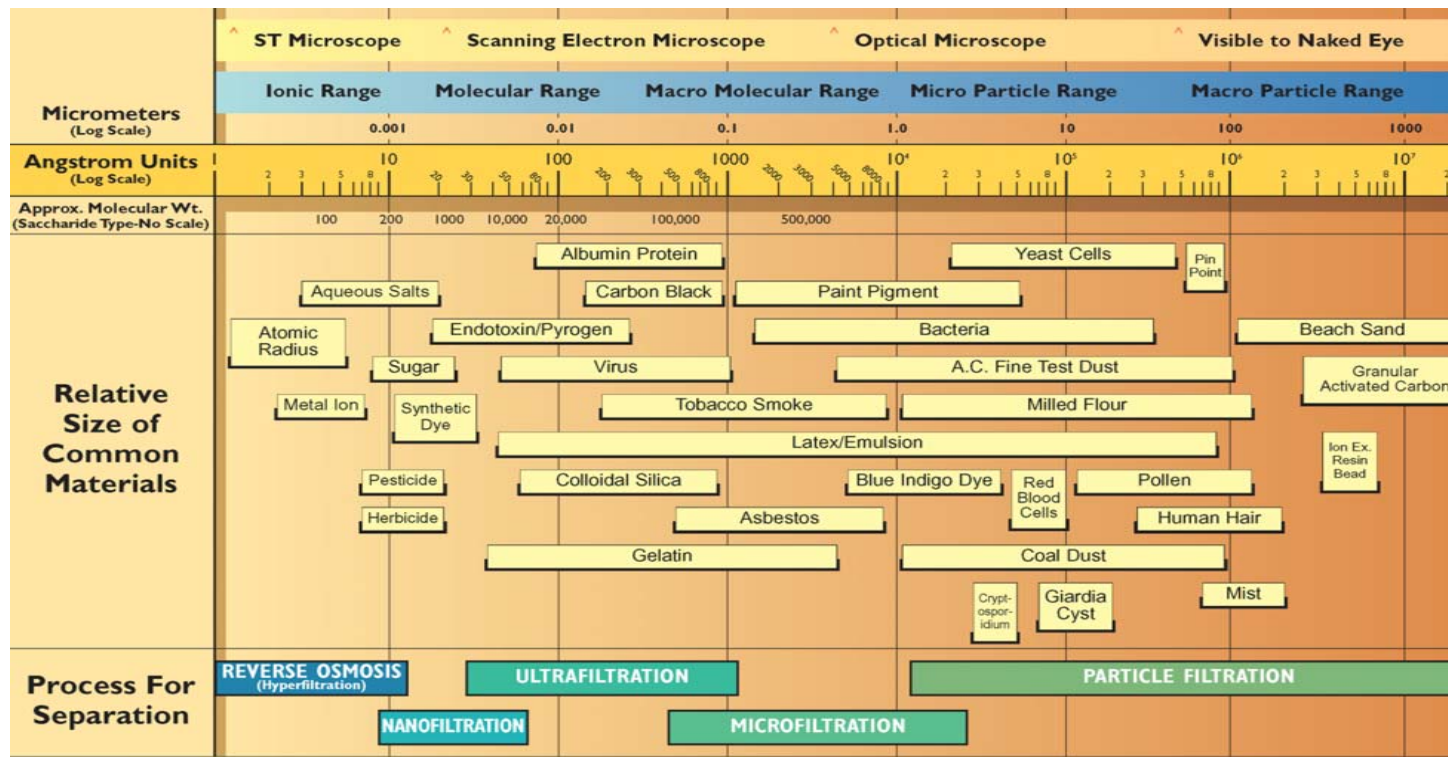
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- Co-operation with regulators to ensure conformity to current legislation
- Know the allowable limits in current local legislation & regulation
- Acceptance by Major Customers (e.g. supermarkets in food sector)



Filtration Spectrum



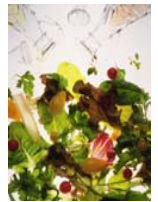
Kanes Foods



**Up to 70% Reuse
Operating Since 2000**



BOURNE SALADS (GEEST Bakkävor)

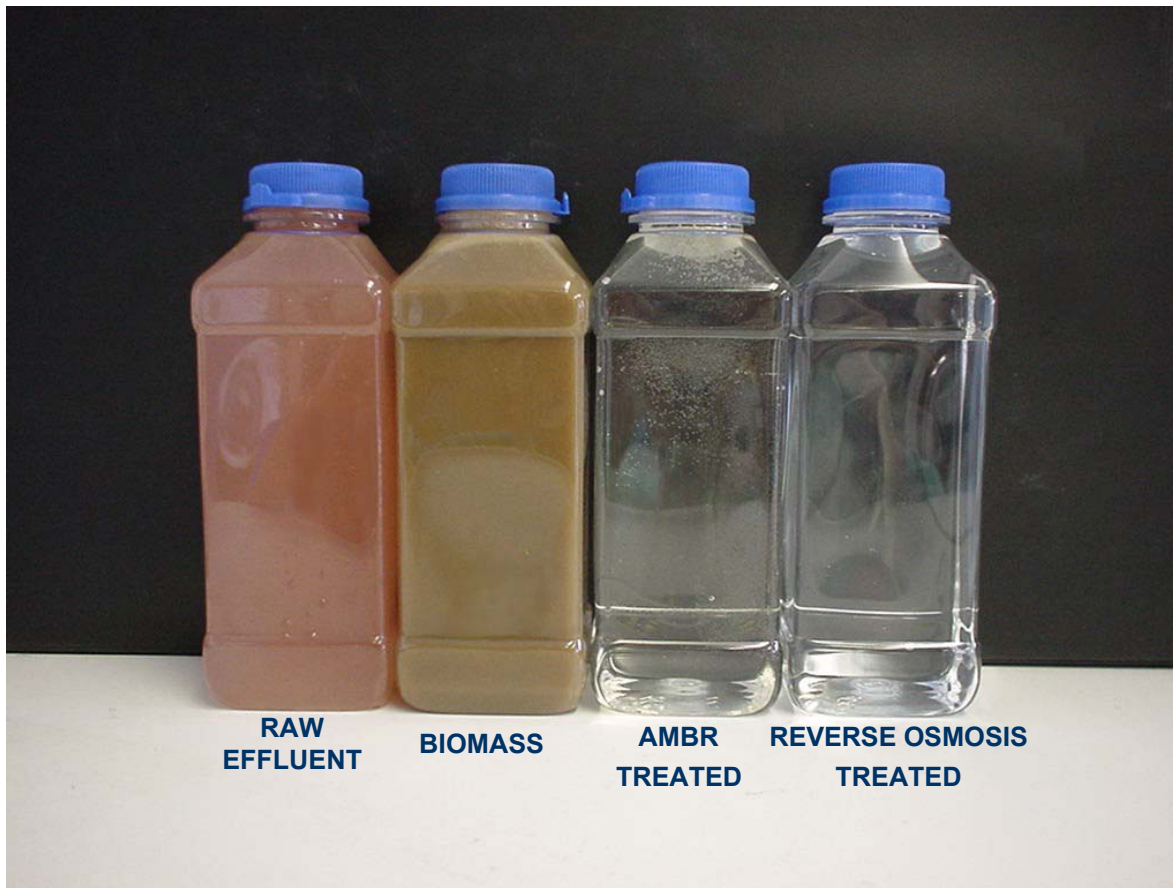


Nano Filtration (NF)/Reverse Osmosis Plants

- Demineralisation
- Tertiary organics removal
- Softening for Boiler feedwater
- Potable water reuse

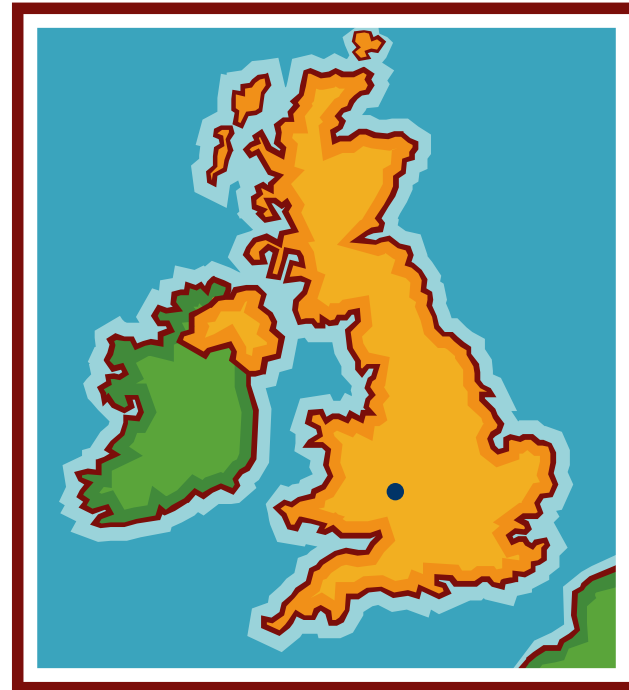


Treatment Stages



Aquabio – Who we are

- Head office Worcester
- Employ 20 people
- 2 divisions
 - Process Design and Basic Engineering
 - Control panels and systems manufacturing
- Leading Industrial AMBR supplier in the UK
- Installed first wastewater treatment and re-use scheme to achieve ECA



European Market Leader – Industrial Wastewater Reuse



Frost & Sullivan Research placed Aquabio Ltd as 2006 European Market Leader in Industrial Wastewater Recycling & Reuse, and winner of their Pioneering Market Strategy Award



Aquabio – Industrial Customers



Aquabio – Municipal Customers



YorkshireWater



DŴR CYMRU
WELSH WATER



SCOTTISH
WATER



STATES OF GUERNSEY



Capabilities in Wastewater Engineering & water recycling

- Process and Engineering Evaluation
 - Pilot plants
 - Lab trials
- Turnkey Design and Build
- Project Management
- Process Design and Basic Engineering
- Specialist Equipment Supply to Municipal and industrial markets
- Upgrade of Existing Facilities



Aquabio core technologies

- AMBR,
 - Membrane Bioreactors
 - AD/MBR
- RO/NF/UF
 - Membrane Systems
- ASTRASEPARATOR & ASTRASAND
 - separation technology and biofiltration
- Jet & Slot Aeration and Mixing
- Dissolved Air Flotation



Automation & Control, Data capture

- PLC to SCADA Automated Solutions
- Operator Interface HMI or PC Based
- Ethernet, Profibus, ASI and Proprietary Networks
- Modem, Internet Remote Access VNC

