

# MEMBRANE FILTRATION SYSTEMS



- MICROFILTRATION
- ULTRAFILTRATION
- NANOFILTRATION
- REVERSE OSMOSIS

***Specialists in the design, build and commissioning of customised membrane filtration plants***

## The Company

Axiom Process is a specialist in the design and build of membrane filtration systems. With over 200 man years of membrane filtration expertise, our engineers are specialists in product and process development, design, fabrication and commissioning of customised membrane filtration systems.

- Project design and management capabilities
- Project implementation to GAMP4
- Product and process development
- 3D drawings to customer specification
- Full materials traceability
- Technical and training support
- In-house machining, fabrication and polishing
- Validation, testing and qualification to the highest levels



## Membrane Technology

Membrane filtration is a pressure driven technology offering enormous potential for cost savings in terms of reduced water and energy costs, water recovery, treatment of effluent, product recovery and upgrading of waste products.

Membrane technology, which was first developed back in the 1960's, is now used extensively throughout the pharmaceutical, food and beverage, dairy and chemical industries as a cost effective solution to manufacturing, purification or waste treatment requirements.

Our expertise is in the concentration and separation of liquid streams utilising combinations of microfiltration, ultrafiltration, nanofiltration and reverse osmosis.

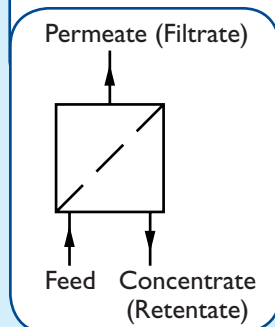
Technology	Operating Pressure (Bar)	Typical Membrane Pore Size	Typical Separation
Microfiltration	0.5 - 6	0.02 – 2.00µm	Proteins, fats, suspended particles
Ultrafiltration	1 – 10	0.002 – 0.2µm	Sugars, proteins, macromolecules
Nanofiltration	7 – 40	15 – 30Å	Divalent salts, dissociated acids, sugars
Reverse Osmosis	20 - 68	5 - 15Å	Monovalent salts, organics, undissociated acids

## Benefits of Membrane Technology Over Conventional Methods:

- No addition of chemicals to effect the separation
- Better and more absolute separation than standard techniques
- No special civils required, and much smaller footprint for given duty
- A physical separation process without the sensitivities of biological processing
- Wide range of separation cut-off available within the same equipment simply by change of membranes
- Both permeate and concentrate uncontaminated by pre-coat or chemicals, and so may be reusable

## Principles of Membrane Technology

Membrane filtration involves the separation of dissolved, colloidal or particulate constituents from a pressurised fluid using semi-permeable membranes.



## Typical Applications

Water and Effluent treatment	<ul style="list-style-type: none"> <li>• Recovery &amp; reuse of water</li> <li>• Condensate upgrade for reuse</li> <li>• Final filtration of bottled water</li> <li>• Animal and vegetable processing waste recycling</li> </ul>
Dairy/food	<ul style="list-style-type: none"> <li>• Whey protein concentration</li> <li>• Quarg cheese production</li> <li>• Dilute sugar stream concentration</li> </ul>
Chemical	<ul style="list-style-type: none"> <li>• Dyestuff desalting and concentration</li> <li>• Recovery of cleaning chemicals</li> <li>• Laundry waste recovery</li> </ul>
Beverage	<ul style="list-style-type: none"> <li>• Clarification and purification of fruit juice and beer</li> <li>• Cider and beer tank bottoms recovery</li> <li>• Process water recovery and waste volume minimisation</li> </ul>
Pharmaceutical	<ul style="list-style-type: none"> <li>• Fermentation broth clarification</li> <li>• Precursor purification</li> <li>• Enzyme concentration and purification</li> <li>• Organism concentration by physical means</li> </ul>

# Membranes

**Axiom Process is independent of any membrane supplier**

Using data from our trials and process database, which is constantly updated, we are able to select the most appropriate membrane for a given application.

## Typical membranes available:

Membrane Configuration	Membrane Range Available	Typical Application
Hollow-fibre	Ultrafiltration, Microfiltration	Pharmaceuticals, plasma, low solids effluents. Can be backflushed to maximise performance.
Plate and frame	Ultrafiltration, Microfiltration	Electrophoretic paint, food products.
Spiral	Ultrafiltration, Microfiltration, Nanofiltration, Reverse Osmosis	Whey processing, water purification and softening, sugar waste recovery, textile water recycling. Designed for high operating pressures and temperatures, with high packing density.
Tubular	Ultrafiltration, Microfiltration, Nanofiltration, Reverse Osmosis	Pigment purification, starch and sugar recovery, landfill leachate processing, juice clarification. Can be used for streams containing significant solids without prefiltration.



## Membrane Trials

Trials can be carried out either at Axiom or on site at our customers' premises.

Variety of membranes tested to ensure that the best membrane for a given application is selected

Test protocol agreed with customer prior to trials

Samples taken for analysis and detailed report issued

Recommendations for plant design and suggestions to reduce plant costs issued



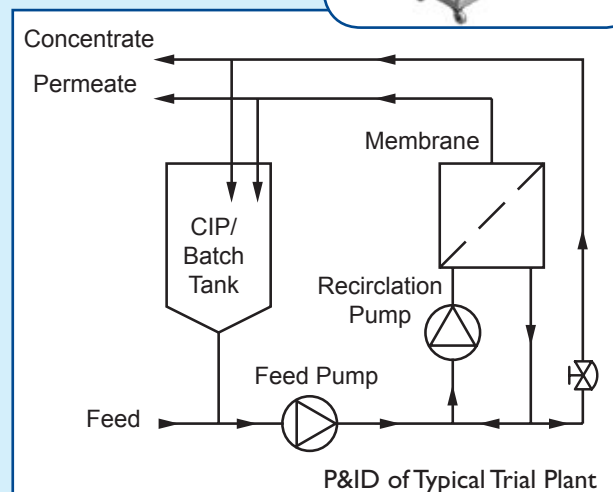
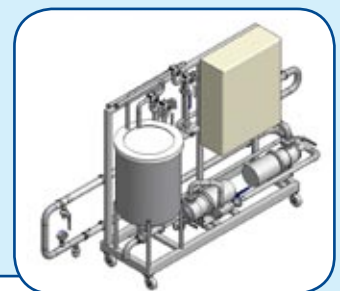
## Pilot Plants

Our range of mobile membrane filtration plants is available for customers wishing to evaluate membrane technology as a cost effective solution to their process requirement. The pilot plants can be used for both "in-process" applications or for waste stream concentration or purification.



## System Design

We work closely with our customers to ensure that we have a clear understanding of their process requirements, their feed streams, characteristics and chemistry, as well as their anticipated outputs. Membrane systems can be configured for batch, fed-batch, or continuous operation, depending on customer requirements. Choosing the right membrane system is determined by a number of factors including costs, energy input, flow channel size, risks of fouling, packing density and ease of membrane cleaning.



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Axium Process is an ISO 9001 registered company and operates rigorous procedures to ensure that all aspects of material selection, design, production, packaging and delivery conform to customer specification

- Surface finishes to 0.10  $\mu\text{m Ra}$ , full Ra testing and certification
- Boroscope direct view and video
- Dye penetrant testing
- Radiography
- Pressure testing to 110 bar
- Nitric acid or citric acid passivation
- Ferroxyl testing and certification
- Full materials certification
- Weld maps and weld logs
- Orbital welding with printed records
- Mechanical and electrochemical marking
- Ultrasonic cleaning and vacuum packing
- Welders and procedures Notified Body approved to ASME IX/BS EN 287
- Manual & orbital welding
- In-house machining, fabrication, polishing

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