

The future of Innovation and Sustainability.

MEMBRANE SEPARATION SYSTEMS



Advanced solutions in separation systems

Customized technologies for industry and process and waste water treatment

Themis designs and creates **membrane separation systems** for various industrial applications. Thanks to a consolidated experience in the treatment of waste water, industrial sludge and separation processes, we have become a benchmark in the sector.

Our solutions are developed to measure, in close collaboration with customers, to optimize processes and ensure excellent performance.

We offer a complete service that includes:

- tests on pilot plants
- engineering
- design
- installation
- plants start-up

We support customers in the preliminary evaluation of processes, analysing the efficiency of separation, the chemical compatibility of materials, the operating parameters and the choice of the most suitable membrane. We also provide key data for industrial-scale plants and economic analysis to estimate operating and investment costs.

Through our Research and Development (R&D) activities, we tackle complex problems with innovative solutions. We take care of the entire project life cycle, from the preliminary study to engineering management, up to the commissioning of the system. We also offer a dedicated after-sales service to ensure optimal performance can be maintained over time.

Our systems:



MICROFILTRATION (MF) ULTRAFILTRATION (UF)



NANOFILTRATION (NF) REVERSE OSMOSIS (RO)



Applications

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Themis' **membrane solutions** are used across **various industrial sectors** for **separation**, **purification**, **and concentration**. These advanced technologies are employed in biotechnology, pharmaceuticals, food processing, chemical, and petrochemical industries, effectively tackling complex challenges with versatility and delivering excellent results.



PHARMACEUTICALS AND BIOTECHNOLOGY

Themis membrane systems are widely used in post-fermentation processing for the production of antibiotics and biological active ingredients.

The main applications include:

- Concentration and purification of antibiotics and APIs (active pharmaceutical ingredients)
- Clarification and concentration of fermentation broths
- Collection and separation of cells
- Sterilization of nutrient solutions
- Removal of cellular residues
- Concentration and purification of enzymes and proteins



BIOPROTEINS, BIOPLASTICS AND GREEN CHEMISTRY

Bioproteins, obtained by fermentation, replace natural ones. Membrane systems are used in post-fermentation for clarification, purification and concentration, essential in the production of bio-ethanol, biodiesel and bioplastics.

The main applications include:

- Purification and concentration of bioproteins and plant proteins
- Production of probiotics and nutraceuticals
- Fractionation and concentration of biopolymers
- Biomass concentration and separation

FOOD AND DRINKS

Membrane systems are widely used in the production and treatment of juices, sugars, starches, natural extracts, wine, beer, dairy products, edible oil and in water recovery.

Main applications include:

- Clarification and concentration of fruit and vegetable juices
- Beverage production and recovery
- Extraction and purification of natural ingredients
- Concentration and clarification of sugars
- Concentration of gelatin and food ingredients
- Starch recovery from wheat, corn and potatoes
- Water treatment and reuse, including
- water from meat and poultry processing

Waste water recovery

Themis develops and provides advanced solutions for waste water treatment with plants specially designed to pursue the goal of **'Zero Discharge & Water Recycling'.** These solutions are completely in line with the principles of Circular Economy, and allow the waste water to be recovered for other uses, by reducing water wastage to zero.

Reuse of water resources

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The **management of process waste water and discharges** is a major challenge for industries. Themis systems are able to treat water with high levels of contaminants, returning water that meets the discharge standards or is suitable for industrial reuse. To determine the best solution, we use preliminary studies and field tests, selecting the most suitable technology based on the features of the effluent and the quality of the water to be obtained.

Key factors in choosing the treatment method:

- Process adaptability to effluent specifications
- Environmental considerations such as noise, odors and climatic conditions
- Performance in terms of treated effluent quality and compliance with regulations for discharge or reuse
- Investment and management costs.

Membrane separation (microfiltration, ultrafiltration, nanofiltration and reverse osmosis) is the fundamental technology of our processes. It is a sustainable solution that does not require the use of chemicals or heat and does not generate air pollution or noise. This system removes contaminants, recovers water and enhances by-products.



CHEMISTRY AND FINE CHEMISTRY

Membrane technologies are used for the purification and recovery of chemicals, helping to reduce environmental impact and sustainability.

Main applications include:

- Recovery and purification of acids, alkalis and organic solvents
- Concentration and separation of polymers, salt solutions, oil, detergents
- Filtration of amines and glycols
- Recovery of catalysts
- Purification and reuse of solvents
- Purification and concentration of organic acids





Our solutions

Membrane separation is a versatile technology used in many industrial processes, offering efficient and precise solutions for a wide range of applications. Depending on the specific separation objectives, different types of membranes can be selected, each designed to meet particular needs for material, configuration and selectivity.

Membranes can be organic or inorganic, and vary in structure, with configurations including spiral, hollow fibre, tubular and plate designs. The choice of the most suitable type depends on the characteristics of the application and the specific requirements of the process, such as flow rate, permeate quality, and treatment efficiency.

Themis is focus on working closely with each customer, analyzing specific needs together and evaluating the most appropriate solution to ensure optimal results. Our experience allows us to select the most suitable technology for each type of separation, ensuring high performance and customer satisfaction at every stage of the process.



MOLECULAR



Microfiltration (MF) is a larger pore cross-flow filtration process used at low pressure to remove bacteria, fat, yeast and fungi. It is used to clarify chemical, biological, pharmaceutical and food solutions, purify products and treat waste water.

Ultrafiltration (UF) is a low-pressure filtration process that retains large molecules (1000 to 1,000,000 MW), allowing water, salts and low molecular weight compounds to pass through. It is used to concentrate and recover substances, remove contaminants, clarify solutions and as a pretreatment for reverse osmosis.

UF membranes are available in different configurations, including:

Inorganic tube (ceramic, sintered stainless steel) Inorganic plate (ceramic, silicon carbide) Polymeric tubular Polymeric spiral-wound Polymeric hollow fibre Polymeric flat plate and cases Submerged (flat or fibre) and inorganic polymer

- Nanofiltration & Reverse Osmosis

Nanofiltration (NF) is a pressure process similar to reverse osmosis (RO), placed between RO and ultrafiltration (UF). It allows the passage of monovalent ions and low molecular weight organic compounds, while retaining larger ones. NF membranes have a molecular cut-off between 150 and 500 MW, and are used in pharmaceutical preparations, food and chemical processes, as well as for the removal of color and hardness from water

Reverse osmosis (RO) is an advanced filtration process that uses semi-permeable membranes to separate dissolved solids and contaminants from water. In contrast to traditional systems, more advanced reverse osmosis technologies allow a higher concentration of dissolved solids, improving energy efficiency and membrane performance.





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