SCIENTIFIC PORTFOLIO

Membrane Bioreactors (MBR) and osmotic MBR, NF and RO

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Name of scientists in charge

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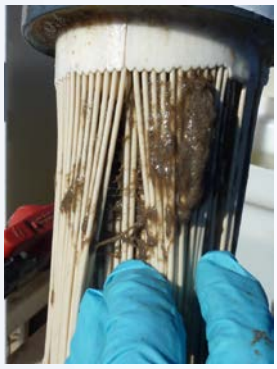
Technology description

> Basic and applied research for a better understanding of the processes of membrane-based systems and its practical application for an improvement of design, operation and control of membrane bioreactors (MBRs) with/without nanofiltration (NF) or reverse osmosis (RO) and osmotic MBRs (OMBRs) for wastewater treatment and reuse.

MBR pilot plant

Fouling in MBR



Ragging in MBR

Research expertise

> Membrane fouling and clogging: from basic research of the responsible parameters to practical aspects for cleaning and monitoring.
> Use of MBR for waste gases treatment.
> Osmotic MBR for wastewater treatment.
> MBR for grey water treatment and reuse.
> Integration of MBR and NF or RO (i.e. integrated membrane systems) for advanced water treatment and reuse.
> Pharmaceuticals and their transformation products in integrated membrane systems for wastewater reclamation.
> Modelling and simulation of membrane bioreactors at different scales.
> Monitoring and automatic control of MBRs to optimize biological nutrient removal, while minimizing fouling and saving energy
> Development and validation of decision support systems for the integrated and knowledge-based supervision of MBRs.

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Most relevant projects

> **SSAMBRA** – Strenghtening Smart Air MBR Applications. ACCIÓ – TECNIOSPRING program. 2015-2017.

> **OMBReuse** – Osmotic membrane bioreactor for water reuse. ACCIÓ – TECNIOSPRING program. 2015-2017.

> **BiogasApp –** Innovative technologies for biogas upgrading: from basic research to technology assessment. Spanish Ministry of Economy and Competitiveness. 2015-2017.

> **WaterFate –**The fate of micropollutants and disinfection by-products in integrated membrane systems followed by diseinfection. The potencial of indirect and direct potable reuse. Spanish Ministry of Economy and Competitiveness. Competitiveness. 2012-2015.

> **DemEAUmed -** Demonstrating integrated innovative technologies for an optimal and safe closed water cycle in Mediterranean tourist facilities – European Commission – FP7-ENV-2013. 2013-2017.

Most relevant publications

> Atanasova et al. (2017). Optimized MBR for greywater reuse systems in hotel facilities. *Journal of Environmental Management*, 193, 503-511.

> Blandin et al. (2016). Efficiently combining water reuse and desalination through forward osmosis – reverse osmosis (FO-RO) hybrids: a critical review. *Membranes*, 6, 37.

> Mamo et al. (2016). Fate of NDMA precursors through an MBR-NF pilot plant for urban wastewater reclamation and the effect of changing aeration conditions. *Water Research*, 102, 383-393.

> Monclús et al. (2015). Full-scale validation of an air scour control system for energy savings in membrane bioreactors. *Water Research*, 79(1), 2015, 1-9.

> Gabarrón et al. (2015). Optimization of full-scale membrane bioreactors for wastewater treatment through a model-based approach. *Chemical Engineering Journal*, 267, 34-42.

> Iglesias et al. (2014). Guía Técnica para la Implantación de Biorreactores de Membrana. CEDEX. Centro de Publicaciones, Ministerio de Fomento. Depósito Legal: M-25758-2014

> Gabarrón et al. (2014). Assessment of energy-saving strategies and operational costs in full-scale membrane bioreactors. *Journal of Environmental Management* 134, 8-14.

> Dalmau et al. (2014). Towards integrated operation of membrane bioreactors: Effects of aeration on biological and filtration performance. *Bioresource Technology*, 171, 103-112.

> Dolar et al. (2012). Removal of emerging contaminants from municipal wastewater with an integrated membrane system, MBR-RO. *Journal of Hazardous Materials*, 239-240, 64-69.

> Ferrero et al. (2012). Automatic control systems for submerged membrane bioreactors. A state-of-the-art review. *Water Research*, 46(11), 3421-3433.

Patents

> **Real time control of MBRs** (Spanish Patent ES2333837), 50% UdG 50% GS INIMA.

> **Operation of OMBRs** (European Patent ES2333837), 85% UdG 15% ICRA.

Collaborations: We collaborate with the "Technologies and Evaluation" area of the Catalan Institute for Water Research (ICRA).

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