http://www.lequia.udg.edu/research/ongoing-projects/item/2301-ombreuse-osmotic-membrane-bioreactor-for-water-reuse.htm

OMBReuse

Osmotic membrane bioreactor for water reuse

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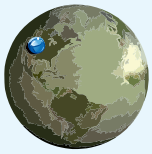
WATER SCARCITY



1. Need for unconvencional water resources!
2. Need for safe produced water!

WATER REUSE

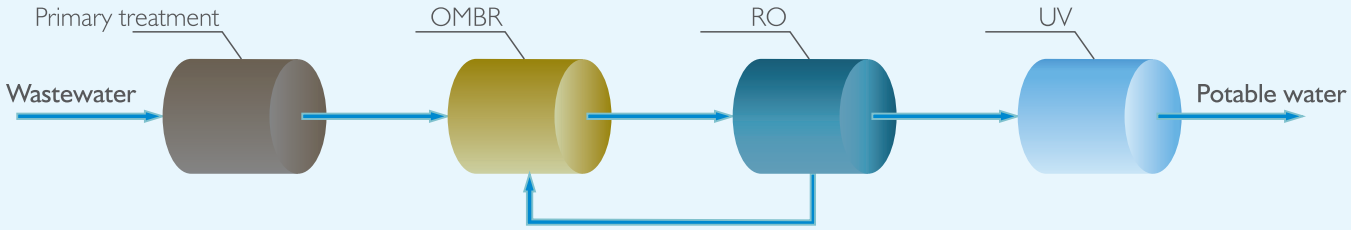
THE RESEARCH PROJECT: OMBReuse

TECNIOSPRING program:

Marie Curie and TECNIOSPRING fellowship (2 year post-doc, sept 2015-2017) Catalan - EU Co funding, focus on technology transfer at LEQUIA, a research group of the University of Girona (Catalonia, Spain).

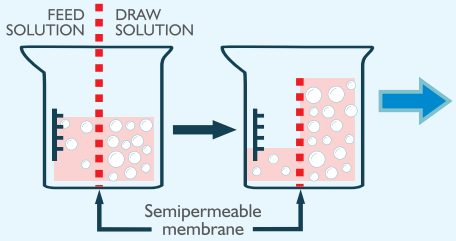
Objective:

To optimize osmotic membrane bioreactor (OMBR) to render it economically attractive while assuring a water quality satisfying water standards to support water reuse scheme.



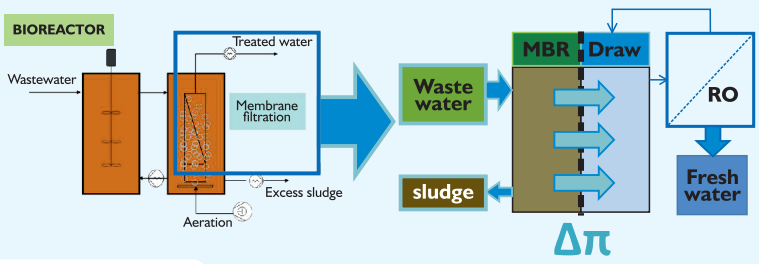
THE TECHNOLOGY: Osmotic membrane bioreactor

In forward osmosis (FO), a dense membrane is used and the permeation of water is driven by the difference in salinity gradient on both sides of the membrane. First, the water is withdrawn to an impaired water source thanks to a draw solution (typically seawater or NaCl). Then, the water is separated from the draw solution, typically using reverse osmosis (RO). As such, FO-RO is a double dense barriers process that is of interest for potable water reuse. FO has been tested in the context of MBR and is called osmotic MBR (OMBR) and demonstrated high rejections of contaminants and low fouling propensity Thus, OMBR represents a promising alternative to MBR to produce high quality water at reduced cost.



To extract and purify water from the feed solution

At low/no energy cost!
High rejection of contaminants
Low fouling



FO+MBR=OMBR

Co-funded by the 7th Frameword Programme of the European Union

TECNIOspring Tech transfer through researchers' mobility

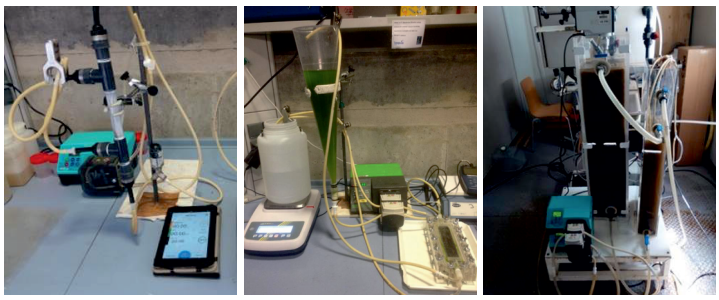
ACCIÓ

Generalitat de Catalunya

OMBReuse

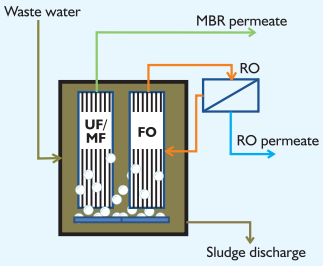
Lab forward osmosis expertise and setups

Solid forward osmosis expertise has been developed at Lequia. Fully controlled cross flow setups as well as small scale pilot were design and build up allowing advanced understanding and evaluation of numerous membrane designs (hollow fiber, flat sheet, submerged system) and applications (OMBR, wastewater purification, microalgae concentration).



Development of OMBRetrofit concept

Retrofitting (party or fully) and upgrading existing MBR into OMBR offers the advantage of limited investment costs since it reuses some existing MBR equipment and is flexible in operation (MBR/OMBR) so that the water production can be adapted to seasonal needs required quality (fit for purpose). A proof of concept was performed and then the idea has been patented.



Sol·licitud de Patent Europea

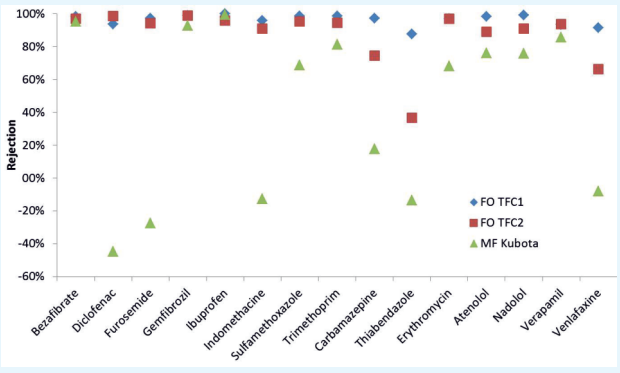
Documentació aportada amb la sol·licitud

Número sol·licitud :	16382307.3
Enunciat :	"Method for operating a membrane bioreactor of a water treatment system and corresponding membrane bioreactor and water treatment system"
Sol·licitud prioritària :	--
Organisme Oficial :	Oficina Española de Patentes
Titulars :	UNIVERSITAT DE GIRONA i FUNDACIÓ INSTITUT CATALÀ DE RECERCA DE L'AIGUA (ICRA)
Data sol·licitud :	29 de juny de 2016

Scientific / technical results

Pilot scale comparison of MBR/OMBR performances over several months demonstrate that:

- OMBR can already be operated at constant flux above 10LMH and will be improved thanks to new module designs.
- Standalone OMBR operation is limited by salinity build up that affects biological activity and permeation flux.
- Fouling also occurs in OMBR but can be removed easily by osmotic backwashing.
- Membrane degradation was observed and should be further studied.
- OMBR allow for high (>90%) rejection of micropollutants. Non-biodegradable micropollutants are concentrated in the reactor and released in the UF permeate.



Other outcomes

Towards industrialization:

- Larger scale pilot testing will start soon (2m3/h pilot)
- Definition of key monitoring and control tools (validation of innovative bluetooth based technologies from Instrument works)
- Economic evaluation and comparison with MBR-RO
- Contacts with water companies

Scientific collaboration related to forward osmosis:

- Microalgae concentration
- Membrane degradation
- Membrane drying issues

Dissemination to numerous conferences, and scientific papers:

- FICWTM 2017, Palermo, Italy
- MEMDES 2017, Gran Canaria, Spain.
- IMSTEC 2016, Adelaide, Australia.
- Efficiently Combining Water Reuse and Desalination through Forward Osmosis—Reverse Osmosis (FO-RO) Hybrids: A Critical Review. *Membranes, 6.*
- Can osmotic membrane bioreactor be the next solution for water reuse? Perspective paper in npj clean water *(submission 06/2017).*

Co-funded by the 7th Framework Programme of the European Union