

**Destilación por membranas –
Proyecto iWAYS (www.iways.eu)**

Wolfgang Gernjak, wgernjak@icra.cat

Acknowledgements



Co-authors:

Gernjak Wolfgang, Tizchang Atefeh, Alcaraz Bernades Itzel, Morgan Abily – *Institut Català de Recerca de l'Aigua (ICRA & WG: ICREA)*

Quevedo Eduardo, Bilbatua Gorka – *Tubacex Group*

Marin Iñigo – *Krean Group*

Gabarró Jordi, Fa Carles – *TELWESA*

Collaborators:

Heinzl Wolfgang, Heinzl Tobias – *theVAP*

Joseba Izquierdo Arenaza - *Etxeguren*

Funding:

iWAYS project – **Innovative WATER recoverY Solutions through recycling of heat, materials and water across multiple sectors.** (Project no: 958274, <https://www.iways.eu>)



Membrane distillation – MD

- Not a new technology, but a boom around 2000-2010
- Industrial applications prevail over municipal ones
- Typical membrane process advantages: modular – flexible
- Can work up to very high concentrations
- Typical membrane challenges: fouling, pore wetting
- Distillation: Needs thermal energy and electrical energy

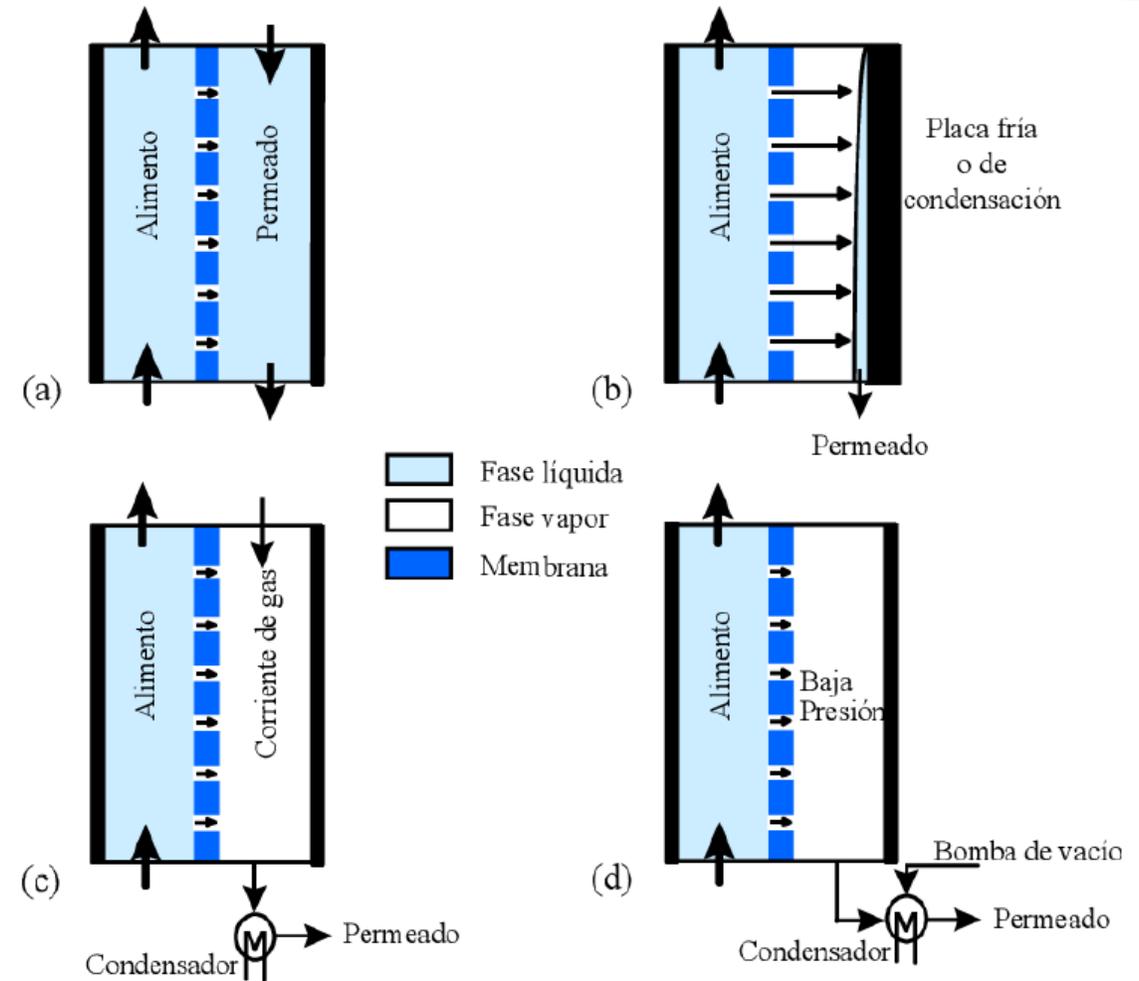


Figura 2. Configuraciones existentes en la destilación por membrana: (a) en contacto directo (DCMD), (b) con "gap" de aire (AGMD), (c) mediante arrastre de un gas inerte (SGMD) y (d) a baja presión (VMD).

Operational challenges: fouling, pore wetting

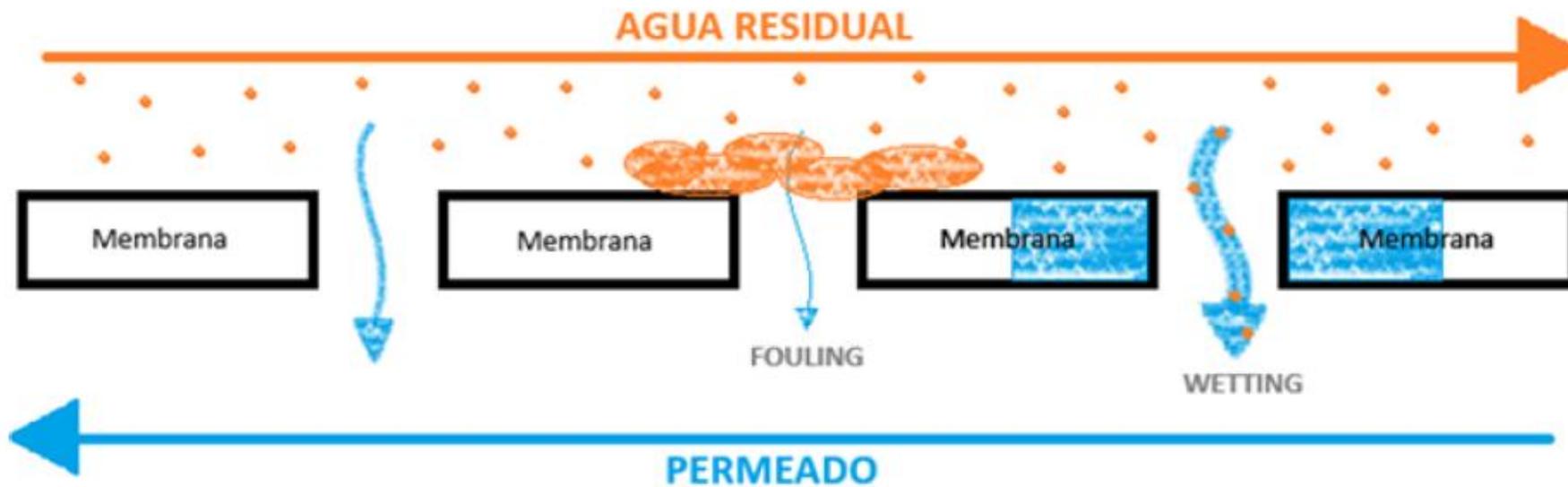
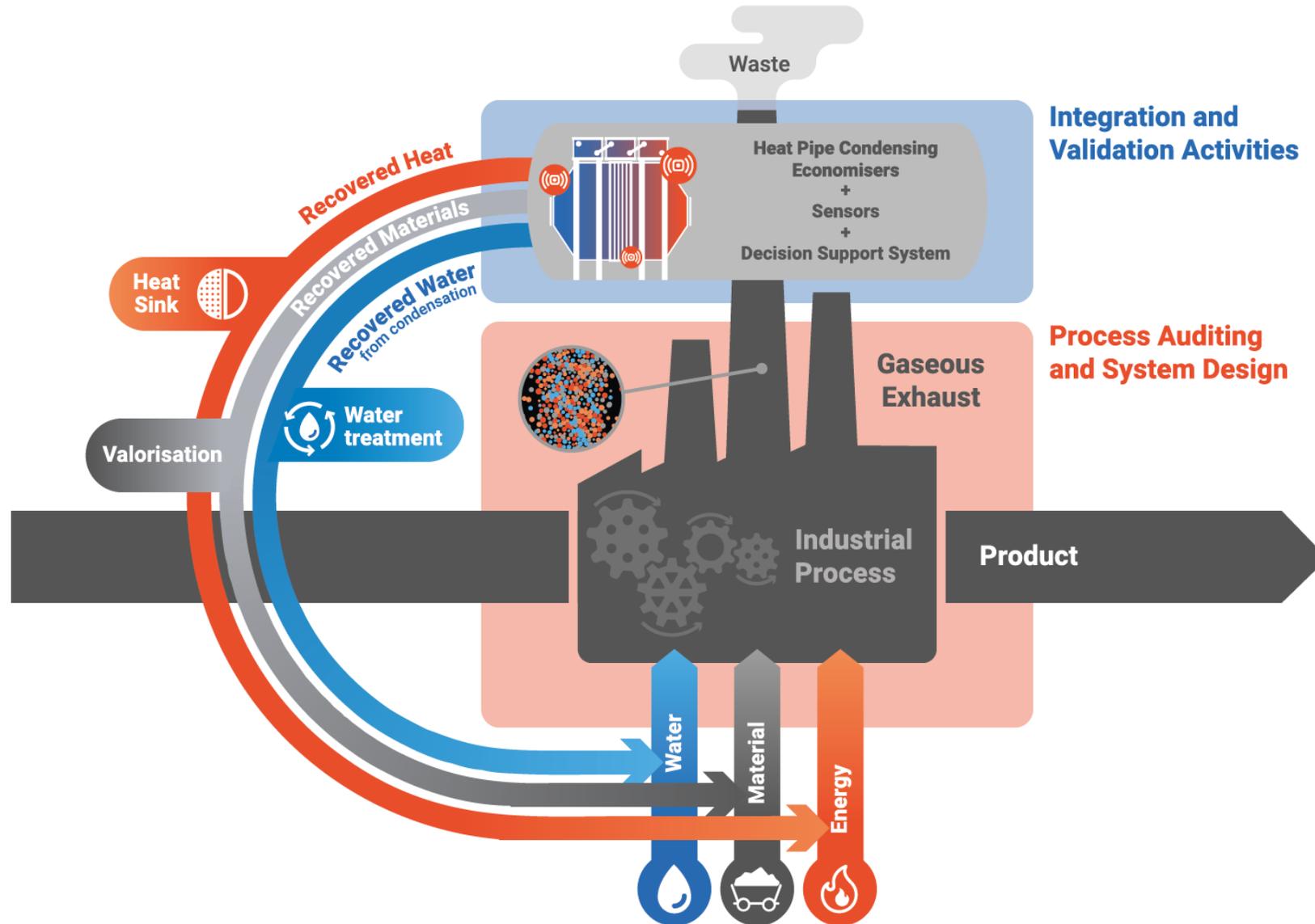


Figura 3. Esquema representativo de los dos problemas críticos principales que se presentan en el proceso de destilación por membrana.

Possible solutions:

pre-treatments, optimized hydrodynamics, superhydrophobic membranes

The iWAYS project



The iWAYS project

19 partners

9 countries

3 demo
cases

4 technology
providers

48 months

> 10M€
EU funding



UK
Brunel University London
Econotherm Limited
IAMAS Technologies

SPAIN
Asociación de Investigación
de las Industrias Cerámicas
Innovación y Consulting
Tecnológico de Barcelona SL
Fundació Eurecat
Catalan Institute for
Water Research (ICRA)
Krean, S. Coop
LKS Ingenieria
Tubacex Tubos Inoxidables SA

SWEDEN
Alufluor AB

GERMANY
European Science
Communication Institute

BELGIUM
Water Europe

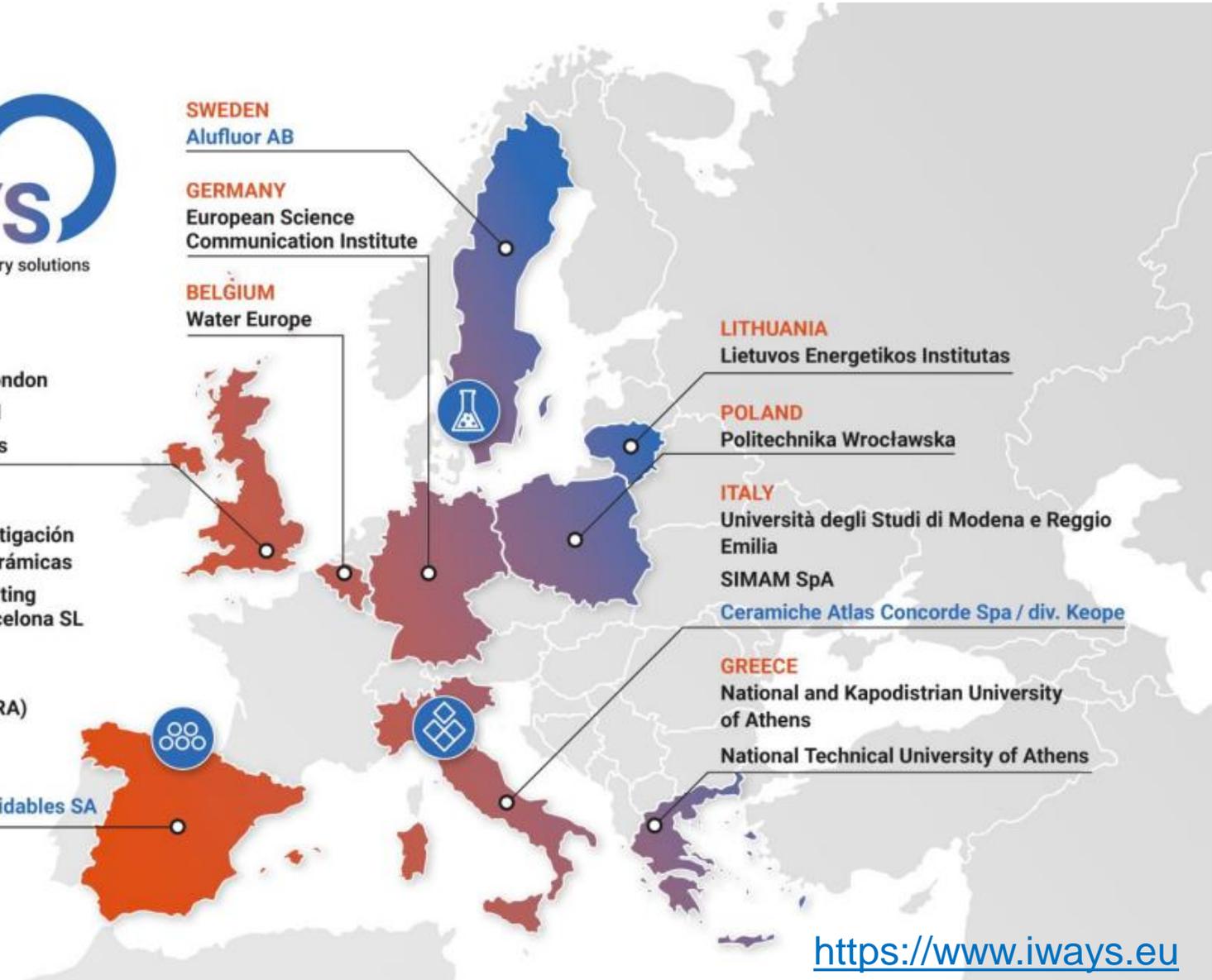
LITHUANIA
Lietuvos Energetikos Institutas

POLAND
Politechnika Wroclawska

ITALY
Università degli Studi di Modena e Reggio
Emilia
SIMAM SpA
Ceramiche Atlas Concorde Spa / div. Keope

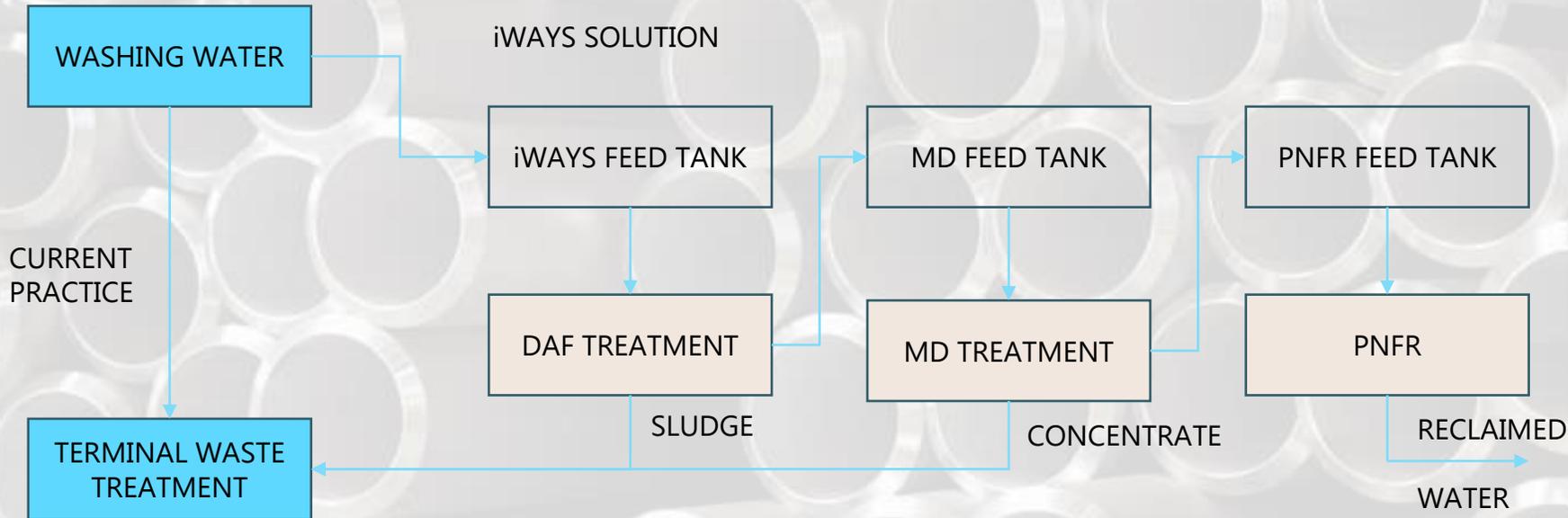
GREECE
National and Kapodistrian University
of Athens
National Technical University of Athens

 = Use case



<https://www.iways.eu>

Water recovery in steel pipe manufacturing at Tubacex



Water quality challenges:

- High pH
- High turbidity
- High COD
- Surfactants

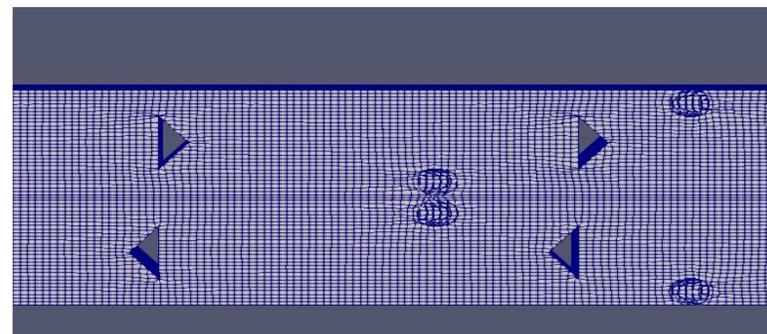
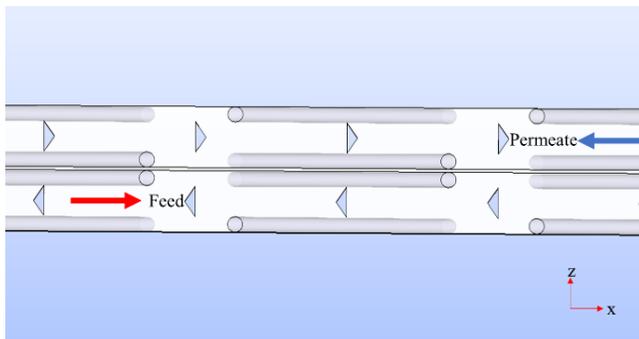
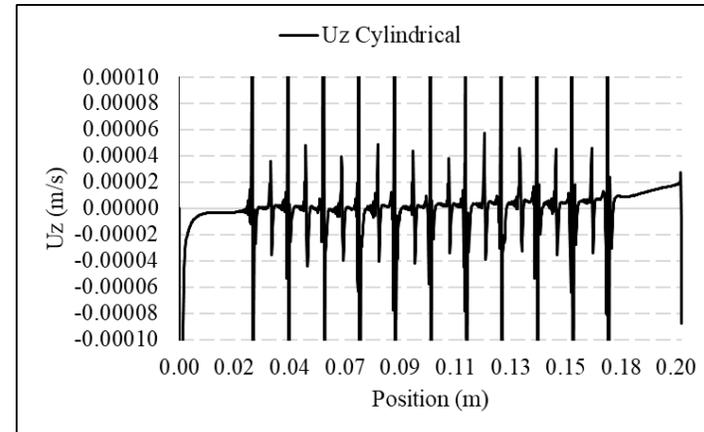
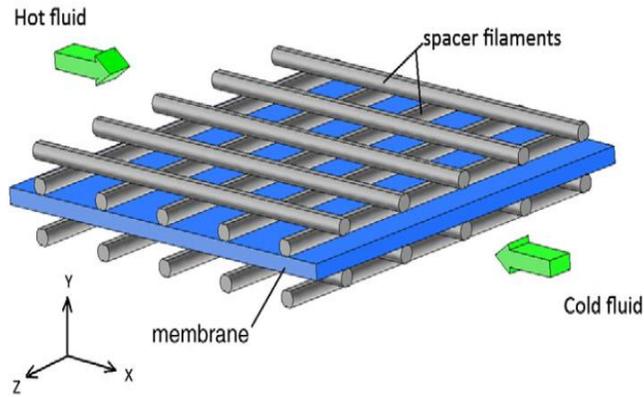
Pre-treatment in laboratory:

- Acid H_2SO_4 – approx. 5 – 7 kg/m³
- Coagulant $FeCl_3$ – doses 10 – 20 mmol/L (0.55 – 1.1 kg Fe / m³)
- Flocculent Chemifloc PA 15 – low molecular weight (0.5 – 1 kg / m³)

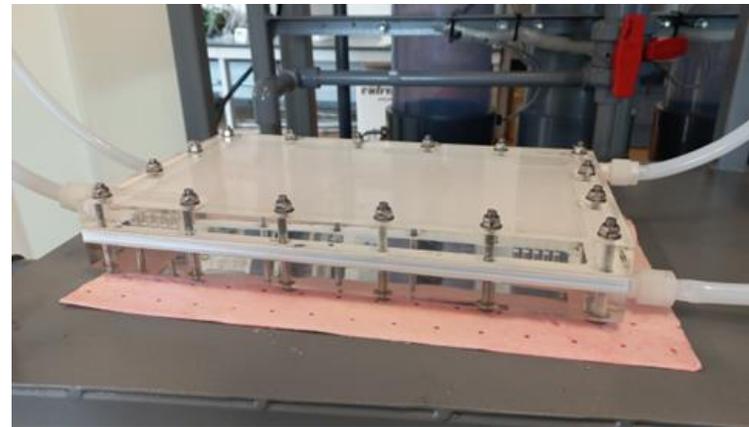
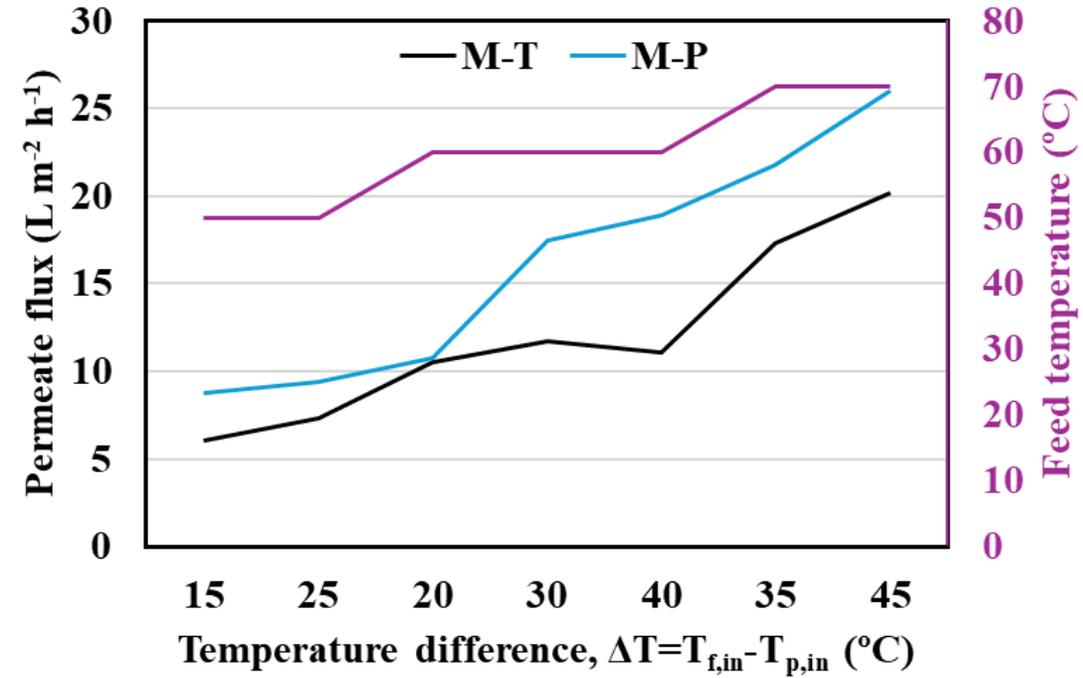


Membrane module optimization – CFD

Work particularly on spacer arrangements to verify if we can achieve additional mixing near the membrane surface



MD optimization - Validation



From lab to pilot



From lab to pilot

theVap

 **TELWESA**



Installation at Tubacex in 01/2025

Membrane distillation is energy intensive – will only work if there is not only a water integration but also an energy integration.

Operational challenges are still an issue & experiences, such as in the iWAYS project, are still needed.

Very flexible, no limits to your fantasy – particularly concentrate treatment, zero liquid discharge and concentration operations.



<https://www.iways.eu>