

A background image showing a complex molecular structure with glowing blue and orange nodes connected by lines, set against a dark teal background.

Membrane scale up for chemical industries

FOCUS ON RESULTS OF THE SECOND YEAR OF IMPLEMENTATION

The **MEASURED Project** is approaching its third year of implementation, and the first 2 years of activities have seen numerous accomplishments! Delve into this newsletter to uncover the strides made by the consortium and to gain insights into the forthcoming milestones. Stay in the loop with the latest updates by following MEASURED on [LinkedIn](#) and [Twitter](#)!

EXPLOITATION & BUSINESS PLAN

After the definition of the market analysis and a preliminary Business Model during the first year of the project, the activities followed the definition of the Key exploitable results (KERs) of the project in terms of commercialization and go to market for each of the MEASURED business cases. The KERs outline the partners' role (as contributor or beneficiary). The preliminary data collection was conducted by PNO through dedicated workshop with the partners directly involved in the exploitation and was related to:

- product solution description
- definition of Activities, Costs, Financing
- market and competitive environment
- legal, normative or ethical requirements
- IPR

The data collected have been then elaborated and will be displayed in the deliverable D1.5 – MEASURED exploitation and business Strategy – first report, written by PNO. Other than the Exploitation strategy, Work Package 1 focused on the definition and detail of the element that will constitute the core of the Final Business Model. Together with the Market Analysis and the Business Model workshop, the exploitation reports (first and final) will be the means for the definition of the final exploitation strategy and Business Plan definition at the end of the project.

MEMBRANES DEVELOPMENT AND SCALE-UP

Development of low-cost membranes for the three lines (pervaporation, gas separation, membrane distillation) has continued with the synthesis and testing of second and third generation membranes. Polymeric (PVDF) membranes for membrane distillation have been developed and tested by CNR, Unical and GVS, molecular sieve carbon membranes (AI-CMSM) for gas separation by Technalia, Rauschert and Eindhoven University of Technology and HybSi membranes for pervaporation by TNO and CTI. PVDF membranes were prepared using gamma-valero lactone as a greener solvent. Both prepared and commercial membranes when coated by Al-based inorganic layer showed significant enhancement of the hydrophobicity.

Moreover, coated membranes were successfully employed in MD, leading to stable fluxes in time. The coated membranes were scaled-up from the lab-size to the size needed for the module to be used in the pilot plant. The Al-CMSM were carbonized at different temperatures to optimize the pore size distribution and the hydrophilicity. The Al-CMSM 550°C has the best performance (higher permeance and CO_2/CH_4 perm-selectivity) and is selected for CH_4 polishing obtained from methanation of CO_2 . The developed HybSi Acid Resistant (AR) membranes on mono-channel tubular ceramic supports show a stable performance in pervaporation dehydration of acid-containing Arkema esterification reaction mixture for 2 months. HybSi AR membranes into multi-channel (7-channel) ceramic supports of CTI showed comparable results with good permeance and selectivity. In the coming period, the focus is on scaling up & production of 1-3 m² membranes to be used for TRL-7 demonstration of the MEASURED project at GVS, ENGIE, and Arkema.

ENGINEERING AND CONSTRUCTION

Currently, the 3 demonstration cases (Gas Separation, Pervaporation and Membrane Distillation) are in the phases of detailed engineering and procurement of equipment. With the progress in the WP3, membrane performance with estimated flux at permeate and retentate became more precise and it allows to know what condition would be expected during the demonstration to finalize sizing. In parallel, the safety studies (HAZOP, HAZID, ATEX...) are carried on identifying and treating industrial risk relative to the pilot exploitation.

Mechanical Engineering Book is in progress and all the 3 pilots are expected to be finalized for the summer 2025.



TECHNOLOGY DEMONSTRATION

Technology demonstration Field Tests for the 3 demonstration cases (Gas Separation, Pervaporation and Membrane Distillation), are scheduled to begin next year. In order to have a success Pilot launching, these two first years of the project were dedicated, with our laboratory and Engineering partners to

- Provide and Exchange data (operating conditions, industrial constraints)
- Follow membrane design, equipment design and PFD
- Considering the membrane skid design (size, needs of utilities, PHA)
- Define the interface conditions between the demonstration site and the membrane pilot. These Interface definition studies was performed independently, and the work was organised according to the following decision:
 - Gas Separation implementation was led by Engie with input from Tecnia and TU/e,
 - Pervaporation implementation was led by Arkema with input from Orelis, CTI and TNO,
 - Membrane Distillation implementation was led by GVS with input from CWT, UNICAL and CNR.

For each demonstration case, the Interface conditions included: PFD, PI&D, sizing of the main equipment, utilities and DCS request, SHE analysis.



MODELLING

The modelling within MEASURED is a multi-scale activity in which calculations are performed on a molecular level looking at material properties, at module level including transport mechanisms, at a system scale including process design and finally on a life cycle assessment level. In parallel with the development of membrane solutions, the modelling has so far studied the transport and the module level. Using CFD calculations, polarization phenomena are under investigation, focusing on concentration polarization in the gas permeation process and on temperature polarization in membrane distillation. The contributions of these polarization losses are then included in a 1D semi-phenomenological model of the membrane module, currently under development. This joins the simplicity of the model with the description of polarization phenomena. In the coming months, these models will be integrated into the overall process model to perform the process design, evaluate energy and material balances and assess the techno-economic performance. Based on the energy and material consumptions, an LCA and a social-LCA analysis will define the environmental and social impact of these newly proposed solutions.

DISSEMINATION & COMMUNICATION

WP7 – Dissemination & Communication has been active since the start of MEASURED and will continue throughout the project's duration. Drawing on results from previous work packages, WP7 supports the exploitation of project outcomes through targeted communication and dissemination activities. All channels, materials, and tools developed for the D&C strategy have been successfully delivered and are actively used to share updates and raise awareness about the project.

Want to learn more?

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PARTNERS



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