

PROJECT PARTNERS



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€ 7.971.409
BUDGET



48
MONTHS



17
PARTNERS



9
COUNTRIES

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MEASURED

Membrane scale up
for chemical industries

THE PROJECT

The project MEASURED aims at developing and demonstrating advanced membrane materials for Pervaporation (PV), Membrane Distillation (MD) and Gas Separation (GS) technologies applied to acrylic ester production, membrane manufacturing and gas separation from a carbon capture & utilization (CCU) stream.

PV targets 1 m² of membrane processing H₂O flux > 1.0 kg/m²·hr using a 55-channel tube in the industrial setting of ARKEMA, a stability > 90% over 3 months of testing, resulting in a CAPEX 30% lower compared to current cost - from 2100 €/m² to 1500 €/m². MD aims at treating the daily amount of generated wastewater (70 L/h) from the manufacturing facility of PVDF membranes at GVS Spa with energy supply via about 100 Solar/Photovoltaic collectors, showing higher chemical resistance (> 10%), >25% reduction of water footprint, permeability of reused MD for Microfiltration > 500 L/m²·hr·bar. GS prototype will be scaled-up to a membrane area of 12 m²/module using a 61-channel tube installed downstream the GAYA methanation unit of Engie, reducing the membrane cost (produced at large scale) from 1944 €/m² to 795 €/m² (almost 60%).

At the end of the project, the integrated MEASURED technologies will reach a TRL7 demonstration over 20,000 hours operation under (industrial) operational conditions.

MEASURED includes a thorough multiscale modelling and simulation techniques including a full Life Cycle Assessment and addresses the societal implications to increase the acceptance and further market readiness.

PROJECT PROGRESS AND KEY ACHIEVEMENTS

So far, we have observed that the project partners have been working in harmony, with all partners sharing responsibilities and collaborating under the leadership of the respective WP leaders to ensure high-quality outcomes. At this stage, all partners are diligently fulfilling their roles across the various work packages, ensuring alignment with the original project proposal. Activities, processes, and deliverables within the MEASURED project are fully in compliance with the Grant Agreement, including all associated annexes. Project processes and activities have been closely monitored to effectively reach the targeted outcomes, with quality being evaluated from both an outcome and process perspective.

The Market and Stakeholder Analysis has been completed, and 11 project KERs across the three business cases (gas separation, pervaporation, and membrane distillation) have been defined and analyzed. The preliminary exploitation routes for these KERs were defined through contributions from the project's partners via individual and group workshops. The first report on the MEASURED Exploitation and Business Strategy, which provides an overview of the current IPR status, ongoing protection measures, and potential challenges, has been completed.

Additionally, the project reached its first milestone: the creation of a business plan for a spin-off company by TUE-TEC, which was agreed upon with ENGIE and other consortium partners. Not only is the business plan finalized, but the spin-off company, named **X-MEM**, has also been established.

During the project's progress, the second milestone was achieved, identifying the best-performing membranes in terms of KPIs for the three business cases. The selected PVDF membrane will be used in the pilot for industrial wastewater treatment (GVS rinsing water) through membrane distillation. These MD PVDF membranes will enable the recovery of purified water with more than 25% reduction in the water footprint. The selected HybSi membrane will be scaled up for use in the pervaporation unit demonstration for dehydration of Arkema's esterification reaction mixture. This pervaporation membrane will replace distillation equipment, leading to at least 20% energy savings and improved final product quality (reduced catalyst loss and minimized byproducts). For the gas separation business case, advanced composite boehmite carbon molecular sieve membranes (Al-CMSM) have been selected for methane purification in ENGIE's existing GAYA R&D methanation platform. Compared to commercial polymeric membranes, Al-CMSM membranes offer lower footprint and higher efficiency. All required documents for the basic design package of the novel pilot units, including Process Flow Diagrams (PFD), Heat and Material Balances, and Piping and Instrumentation Diagrams (P&ID), have been prepared.

To optimize operational conditions during the demonstration, a digital twin model is being developed for the three demonstration lines. Based on the inventory of selected membranes, CFD simulations are being used to investigate polarization phenomena and refine membrane models.

