

Membrane-assisted Dissolved Oxygen Removal from Amine solution for CO₂ capture

Publieke samenvatting / Public summary

Aanleiding

The deployment of post combustion CO₂ capture (PCCC) technology is deemed vital to keep the increase in global average temperature below 2°C. PCCC is currently the only technology operational at full- industrial scale (e.g. Boundary Dam power plant in Canada and AVR WtE plant in The Netherlands), but reduction in costs and increased stability of operation are required to accelerate its deployment. Without a proper solvent management strategy in place, the costs associated with solvent make-up and waste disposal may represent a major contribution to the OPEX of PCCC plants. Cost-efficient solutions to mitigate solvent degradation will accelerate large scale implementation of CCS. Within ALIGN-CCUS (funded by ACT1), TNO has developed and patented the Dissolved Oxygen Removal Apparatus (DORA): a membrane contactor used to remove dissolved O₂ from the amine-based solvent, limiting degradation and prolonging solvent lifetime. The DORA concept is designed to be solvent independent and has been tested with MEA, CESAR1 and MDEA/PZ. Using MDEA/PZ, the concept was brought to TRL7 in a 3-month pilot campaign at the HVC waste incinerator in The Netherlands.

Doelstelling

MeDORA will advance the DORA technology, bringing it to TRL8 by demonstrating stable long-term operations at HVC (Waste-to-Energy using MDEA/PZ for up to 2 years) and RWE (power plant in Niederaussem using CESAR1 for 1.5 year). With 2 solvents, 2 industrial flue gases, and more than

Projectinformatie / Project information

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Subsidiebedrag / Grant amount
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Algemene informatie / General information

Penvoerder / Secretariat
TNO

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20,000 hours of operation, the operational robustness of DORA will be demonstrated. The project aims at demonstrating sustained 90% oxygen removal, resulting in major benefits in terms of solvent management OPEX (up to 70% reduction) and environmental impact of the capture plant (less waste generation, reduced emissions) due to increased lifetime of the solvent. Moreover, the oxygen removal will lead to higher purity of the CO₂ product out of the stripper. This will be systematically tested varying the O₂ content in the flue gas (solvent: MEA) in the SINTEF pilot facility at Tiller. MeDORA aims at obtaining less than 10ppmv of O₂ in the CO₂, which complies directly with strict geological storage specifications (e.g., Northern Lights, NO₄).

Korte omschrijving

MeDORA is executed by a strong industry-based consortium covering the entire value chain. End-users RWE (DE, lignite-fired power generation, sewage-sludge-to-energy plants) and HVC (NL, WtE plant) have a strong commitment towards CCUS. Both companies are already involved in testing DORA and will apply the MeDORA technology in their CCUS pilot plants. ACC (NO) is positioned as one of the main amine-based CO₂ capture technology providers, currently building 2 PCCC plants (WtE in NL and cement in NO) and also offering CO₂ capture as a service (end-user). The company participates in the MeDORA project by contributing to the techno-economic assessment (TEA) and has a major role in the exploitation activities as a possible first licensee of DORA. The research partners in the project are SINTEF (coordinator, NO), TNO (inventor of DORA3, NL) and NTNU (research infrastructure, NO) and they all have a long tradition in developing CCUS technologies, in particular amine- and membrane-based processes.

Resultaat

The large industrial involvement and the high levels of expertise of the research partners ensure the ambition and commitment of the MeDORA consortium to prepare the technology for

commercialization in 2026, strengthening the competitiveness of the companies involved in deploying CCUS technologies to the market. For that end, the MeDORA campaigns will run on commercially available membrane technologies (porous and asymmetric). The timely roll-out is supported by a growing Advisory Board, with potential licensees (see Letters of Support), which will be engaged along the MeDORA project. The project is divided into 4 Work Packages (WP). WP1 is dedicated to project management, knowledge sharing and exploitation. WP2 supports the field tests by performing lab tests. WP3 will validate MeDORA at TRL8 through long-term test campaigns at industrial sites. The outputs of WP3 will be used in WP4 for the techno-economic and life cycle assessments (TEA and LCA).

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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