

Industrial Research by TNO involving CarbonOrO technology

Program: 3GAIN – 3rd Generation Absorption Technologies Demonstrated at Industry
Expected end-date 31/12/2020.

“Within 3GAIN, we (TNO) will demonstrate the process of CO₂ capture using CarbonOrO. CarbonOrO will be used to demonstrate low temperature (70C) desorption. The demonstrations will be performed using TNO’s mobile CO₂ capture plant (CRIS), which will be installed at Plant One in Rotterdam. Industrial flue gases will be used in the demonstrations. The project will bring CarbonOrO1 from TRL 4 to TRL 6 for the application of **flue gas**. The CarbonOrO system is at TRL 8 for biogas upgrading application.

The performance of CarbonOrO will be benchmarked against that of 30 wt% monoethanolamine (MEA) solution, the state-of-the-art solvent for CO₂ capture.

By performing an economic assessment of a full scale application, we will show that CarbonOrO has the potential of lowering the CO₂ capture costs by 30% as compared to state of the art MEA.

The technologies demonstrated in 3GAIN are solvents to be used in CO₂ capture, particularly in post-combustion cases. These technologies are suitable for multiple industries such as cement, steel, waste incineration, and power, in their quests to lower their CO₂ emissions by applying CCUS.

Therefore, CarbonOrO has potentially a large market. For reference, there are over 600 cement plants worldwide, 450 waste-to-energy operational plants in Europe (of which 12 in The Netherlands).

The activities can be divided into five work-packages (WP). In WP1, the necessary modifications to TNO’s mobile CO₂ capture plant (CRIS) will be performed. In WP2, benchmarking campaigns with MEA, CarbonOrO will be performed in the lab. After that, in WP3, CRIS will be transported to Plant One, where the demonstration campaigns for CarbonOrO will take place, using real flue gas. Finally, in WP4, we will perform a techno-economic assessment of the processes, and compare the results to that of MEA for a full scale application. Management and dissemination activities will be carried on in WP5.”

(Extract out of the “Inzet document PPS-toeslag project” Reference Number TKI2019-CCUS-3GAIN)

About TNO

The Netherlands Organization for Applied Scientific Research (TNO) based in Delft, is The Netherlands’ largest knowledge organization, with approximately 3000 employees, servicing companies, government bodies and public organizations. TNO provides contract research and specialist consultancy. TNO also grants licenses for patents and specialist software on a variety of different subjects and economic sectors. TNO has the mission to support innovation and increase the competitiveness of the Dutch industry.

Related to CCUS, TNO is the leading research institute in the Netherlands with involvement in many international projects for almost two decades, including the coordination of EU research programs for advanced capture technologies, CO₂ Utilization, Transport technologies and subsurface CO₂-storage in aquifers, gas, oil, and coalbed reservoirs.

TNO has performed national and international contract work for site-specific evaluations of CCUS projects and is a specialist in conceptual design of next generation capture systems, process and equipment optimization, technical modelling and process design and economic modelling and value chain analysis.

TNO has a leading position in post-combustion CO₂ capture within Europe. TNO’s pilot capture plant of Maasvlakte was the first European CO₂ capture pilot to be installed in a power plant, and TNO has been actively working on solvent development – own of for clients – for over 20 years. TNO’s mobile CO₂ capture plant has been used in industrial locations for validating solvents for real flue gas operations. Demonstrating STAR at PlantOne using real flue gas is a strategic step in the solvent development path.