

CarbonOrO

Carbon Capture Solutions for Industrial Flue Gases

About

CarbonOrO delivers carbon capture solutions to industrial CO₂ emitters across industries including waste management, energy, oil & gas and the production of glass, chemicals, steel, cement and concrete. In these hard-to-abate sectors, capturing and storing (or using) CO₂ is indispensable to reduce emissions.

Technology

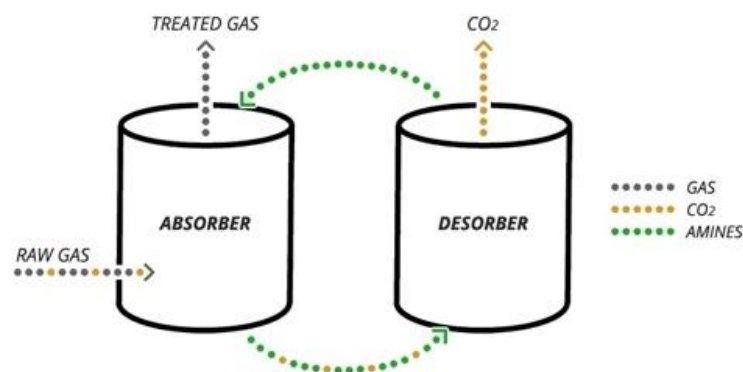
CarbonOrO's proprietary technology uses a unique bi-phasic amine solvent. It was developed with a strong focus on effectiveness in chemical absorption/desorption of CO₂, superb loading characteristics, energy efficiency and stability (low degradation). This allows for applications on a wide range of potential emission sources from 5-50% CO₂ for both new installation or to retrofit existing ones.

The bi-phasic solvent is a proprietary mixture of amines and water. Due to the unique properties of the solvent, desorption of CO₂ is not just driven by chemistry but also by a physical process (phase-shift). This allows for desorption of CO₂ at lower temperatures and with significantly less energy use than existing amine solvents.

Traditional solvents will release more CO₂ if temperature is raised in a straightforward (almost linear) chemical process. The CarbonOrO mixture encompasses a unique effect seen only in bi-phasic solvents: CO₂ is released in bulk above a certain threshold temperature (70 °C), triggering the phase shift in the solvent.

The unique properties of the bi-phasic solvent translate into:

- Low energy consumption from the combined chemical and physical effect. Energy consumption, expressed as 'reboiler duty', is at 2.4 GJ/t CO₂, significantly below the current industry (MEA) benchmark (3.6 GJ/t CO₂);
- Production of CO₂ at 95-120 °C and 4-6 bar, saving up to 20% in costs for compression and liquefaction in downstream CO₂ transport;
- Increased solvent lifetime (less degradation) due to low operational temperatures (thermal degradation) and reduced oxidative degradation.
- Compact installations, delivered on 20 ft container frames, that can be built off-site and in-series to reduce CAPEX and on-site installation.



Feasibility studies

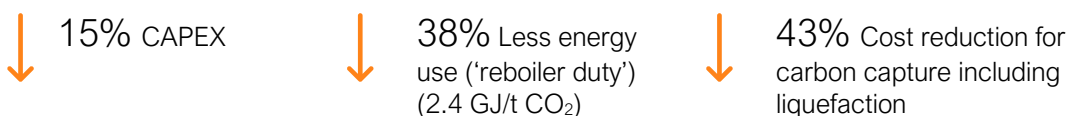
Benchmark MEA Studies

Two feasibility studies were executed with our technology in 2022 by independent third parties and commissioned by TotalEnergies (hydrogen plant) and a consortium of 6 cement producers, all members of the Global Cement and Concrete Association (GCCA).

Both studies arrive at over 40% costs savings per ton of CO₂ captured versus the MEA benchmark. Both studies were done for installations with capture capacities in the range of 800 kt/yr.

1. First study for TotalEnergies: the CarbonOrO process operates at 120 °C and CO₂ is released at 6 bar with 18% CO₂ in the flue gas.

Results versus MEA solvent:



2. Second study for GCCA: the CarbonOrO process operates at 120 °C and CO₂ is released at 6 bar with gas characteristics according to CEMCAP specifications for 2 types of gas content, with >90% capture rate.

Results versus MEA solvent:



Upcoming Industrial Pilots

A. CarbonOrO has secured a test project with industry partner AVR, the largest waste management company in the Netherlands, to further demonstrate commercial readiness. All testing and further developments will be performed in 2024 in close co-operation with Dutch technology institute, TNO, a leading European research CCS institute.

B. CarbonOrO has been awarded an EU-grant with Belgian research institute VITO, and mineral/cement producers, focusing on the pre-treatment of flue gasses and the production of CO₂ for mineral carbonatation into building materials. In 2023-2025 CarbonOrO will be testing the mineralisation of waste streams at an industrial sites of Vandersanden (bricks) in Belgium.