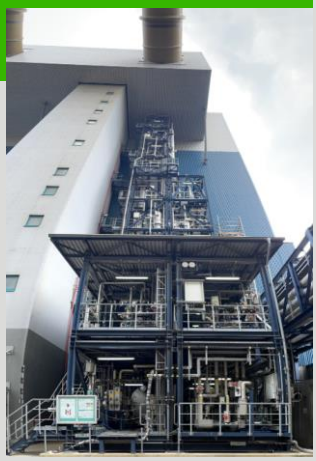
DRIVE

Newsletter No 2
July 2024

DEEP REMOVAL OF CO_2 & INNOVATIVE ELECTRIFICATION CONCEPTS



Welcome to the DRIVE project!

DRIVE envisions a future where industries achieve carbon neutrality or negativity, paving the way for a sustainable environment by 2050 through innovative technological solutions and comprehensive guidance on CO_2 reduction.

In this issue of the newsletter, we introduce the testing site for DEEP REMOVAL by amine-based post combustion capture with thermal solvent regeneration: **RWE's CO_2 capture pilot plant at Niederaussem, Germany**.

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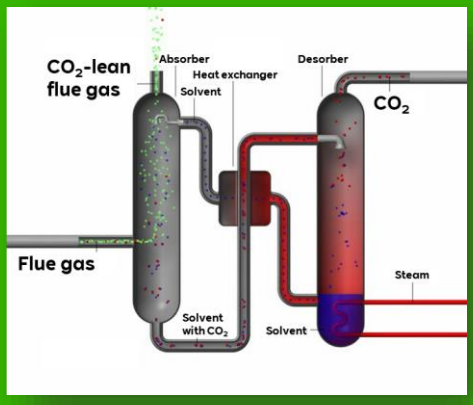
In the DRIVE project, for the first time a holistic evaluation of deep removal technologies is carried out, comprising technical, economic, and environmental analysis and validation of process models in long-time tests at real industrial conditions.

At the CO_2 capture pilot plant at Niederaussem, Germany the key performance data of amine-based CO_2 capture at highest CO_2 capture rates from 95 to >99% are assessed in five extended campaigns (24/7 operation) within total 10,000 testing hours.
Source of the flue gas with a typical CO_2 concentration of 15 vol.-% is a lignite-fired power plant. When highest CO_2 capture rates >99.8% are realized in the DRIVE project, the off gas of the capture plant that is released to the atmosphere has a lower CO_2 concentration than the ambient air, which is today 0.042 vol.-%. This means that in total CO_2 is removed from the atmosphere which is named “Negative Emissions”.
The capture pilot plant was commissioned 2009 as the first in Germany at a power plant and is more than 115,000 hours in operation until now. No structural modifications or installations of new components are necessary for the DRIVE tests.
The solvent in use has the name CESAR1 and is an aqueous solution of two amines (AMP and piperazine).

How does a capture process with thermal regeneration generally work?

Amine-based carbon capture is a regenerative process using an aqueous solution of one or more amines as solvent to remove CO_2 from flue gases at temperatures around 40°C. The CO_2 capture reaction takes place in an apparatus named *Absorber*. To regenerate the solvent that is loaded with CO_2 it is pumped to the *Desorber* where it is heated up to ca. 120°C. At that temperature, the CO_2 is released with very high purity >99%. The CO_2-lean solvent is pumped back to the Absorber to close the solvent loop.

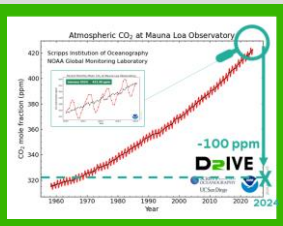


GOALS OF THE DRIVE TESTING PROGRAM AT NIEDERAUSSEM

Identify Optimal Process Configuration and Parameters

Validation of Computer Models with Operational Data

Assess Emissions and Solvent Degradation



Performance data for techno-economic Analysis

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TESTING AT NIEDERAUSSEM

2024

Three two-month testing campaigns are carried out with systematic variation of the operating parameters (process temperatures, solvent flow) and process configurations (variation of the height of the solvent feed into the absorber and of the locations of solvent cooling in the process) to investigate the deep removal regime at highest CO_2 capture rates. The received performance and process data are used to optimize computer models for deep removal.

2025

Based on the results from the analysis of the previous campaigns and the identified optimal process setting the fourth campaign will focus two month on the emissions from the capture plant during operation at highest capture rates. More than 20 different emission mitigation configurations can be tested at the CO_2 capture pilot plant at Niederaussem.

2026

In the fifth campaign the degradation behaviour of the CESAR1 solvent at deep removal operation will be investigated over six months. Generally, degradation processes are slow and need sufficient time to be appraisable. Additionally, to the main organic degradation products, metals and accumulated inorganic trace compounds are analyzed. The results will provide the key performance indicator specific solvent consumption which is important for the techno-economic analysis.

Co-funded by the European Union

This research was funded by CETPartnership, the Clean Energy Transition Partnership under the 2022 CETPartnership joint call for research proposals, co-funded by the European Commission (GAN°101069750) and with the funding organizations detailed on https://cetpartnership.eu/fundingagencies and call modules .

CET Partnership

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← WHAT'S NEXT

Our next scheduled activities for the DRIVE project

CETP Knowledge Sharing Workshop

On September 11th and 12th, the ACT and CETP workshop **will be organized in Oslo, Norway**. DRIVE coordinator Peter van Os will present an overview of the project and some first results in a presentation called: DRIVE: CO2 Capture electrification and deep removal

Participation at GHGT-17 conference

The DRIVE project is happy to announce that our partners will be presenting results from the first two testing campaigns on **Deep Removal at the 17th International Conference on Greenhouse Gas Control Technologies (GHGT-17)** in Calgary, Canada, from October 20th to 24th, 2024. **Read more…**

Next DRIVE Meeting in Niederaussem

Mid October 2024 the next DRIVE project meeting will take place at **RWE's Innovation Center at Niederaussem, Germany**. The partners will discuss the progress of their activities and next steps and will use the chance to visit the CO_2 capture pilot plant and demonstrators of other research projects at the site. **Read more…**

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