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New project for CO₂ value chain evaluation: Cement cArbon Storage Pilot for Emission Reduction (CASPER)

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Abstract

By 2045, Denmark aims to achieve net-zero emissions, marking a significant milestone in its transition toward a sustainable future. A key enabler of this goal is Carbon Capture, Utilization, and Storage (CCUS), a technology designed to capture CO₂ emissions from hard-to-abate industrial sectors, such as cement production, power generation, and chemical manufacturing. By integrating CCUS into its broader climate strategy, Denmark can significantly reduce industrial emissions that cannot be eliminated through conventional methods.

The CASPER project (Cement cArbon Storage Pilot for Emission Reduction) is a pioneering initiative that will demonstrate the full CO₂ capture and storage (CCS) value chain from a cement plant at pilot scale for the first time. Funded by Innovation Fund Denmark (IFD) under the INNO-CCUS program, CASPER is managed by DTU and welcomes international collaboration.

Project Objectives

The project will assess the feasibility of CCS for cement production by:

1. Capturing and conditioning at least 2 tons of CO₂ from flue gas during a 2025 pilot campaign.
2. Measuring CO₂ quality and comparing it with relevant storage standards.
3. Evaluating the effect of impurities on CO₂ transport in steel pipelines through corrosion testing, preparing for future infrastructure development.

Approach

The pilot campaign will capture CO₂ from Aalborg Portland's cement plant using a pilot-scale CO₂ capture facility with a capacity of 1 ton per day (Figure 1). The test will focus on long-term solvent performance, monitoring solvent degradation and emissions to identify key quality parameters for captured CO₂.

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Captured CO₂ will be liquefied and stored, with its composition analyzed against existing standards for CO₂ storage. This will help determine the necessary post-capture processing steps in a full-scale CCS implementation. Additionally, the project will assess CO₂-induced corrosion in steel pipelines, supporting the development of CO₂ transport infrastructure.



Figure 1: CO₂ capture pilot plant installation at Aalborg Portland

Expected Impact

CASPER will deliver the first-ever pilot-scale evaluation of a full CCS value chain from a cement plant, generating valuable insights for large-scale adoption in the sector.

Collaboration

The project is open to external collaboration, particularly for the use of captured CO₂, under appropriate funding conditions.

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