

SLIPSTREAM DEVELOPMENT AND TESTING OF SIEMENS POSTCAP CAPTURE AND SEPARATION TECHNOLOGY

primary project goals

Siemens Energy set out to design, install, and operate a pilot plant to treat a 2.5-megawatt (MW) flue gas slipstream from an operating coal-fired power plant to demonstrate the aqueous amino acid salt (AAS) solvent-based, post-combustion carbon dioxide (CO₂) gas capture technology.

technical goals

- Demonstrate the ability of Siemens Energy's POSTCAP technology to achieve 90 percent CO₂ removal while approaching a 35 percent increase in the cost of electricity (COE).
- Demonstrate the scalability and feasibility of developing the technology to a full-scale, commercial, post-combustion CO₂ capture (550 MW) application for coal-fired power plants and to full-scale commercial application for industrial sources of CO₂ emissions.

technical content

Siemens Energy worked to design, install, and operate an advanced CO₂ capture, solvent-based pilot plant. The Siemens POSTCAP CO₂ capture process utilizes an aqueous AAS solution as the solvent that offers cost and performance advantages when compared to state-of-the-art, amine-based solvents. The POSTCAP pilot plant was to be installed at Tampa Electric Company's (TECO) Big Bend Station and treat a flue gas slipstream equivalent to approximately 2.5 megawatt electric (MWe). Although the CO₂ source for this slipstream pilot-scale testing is from a coal-fired power plant flue gas, it would have provided an appropriate design and performance baseline for direct scale-up to many industrial applications.

The project encompassed the complete design, engineering, procurement, installation, operation, data analysis, and decommissioning of the CO₂ capture system and was to be completed in four phases. In Phase I, the engineering design and permitting for the project were completed. POSTCAP system mass and energy balances and pilot plant process flow diagrams were to be generated, and the host site was to be analyzed for integration of the pilot plant. Phase II was to encompass the equipment procurement, fabrication, delivery, and installation of the components at the host site with required tie-ins to plant interfaces. In Phase III, the pilot plant was to be commissioned and started up, the pilot program test campaigns were to be conducted, and the resulting data were to be analyzed. Phase IV was to cover the pilot plant decommissioning and disassembly.

technology maturity:

Pilot-Scale, Actual Flue Gas Slipstream

project focus:

POSTCAP Capture and Separation

participant:

Siemens Energy

project number:

FE0003714

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performance period:

10/1/10 – 2/29/12

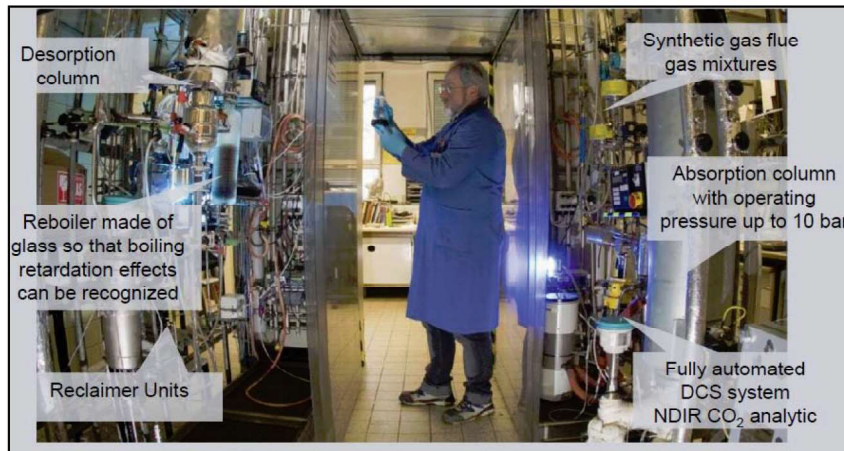


Figure 1: Siemens Lab Plant for CO₂ Capture Tests at Frankfurt Hoechst Industrial Park

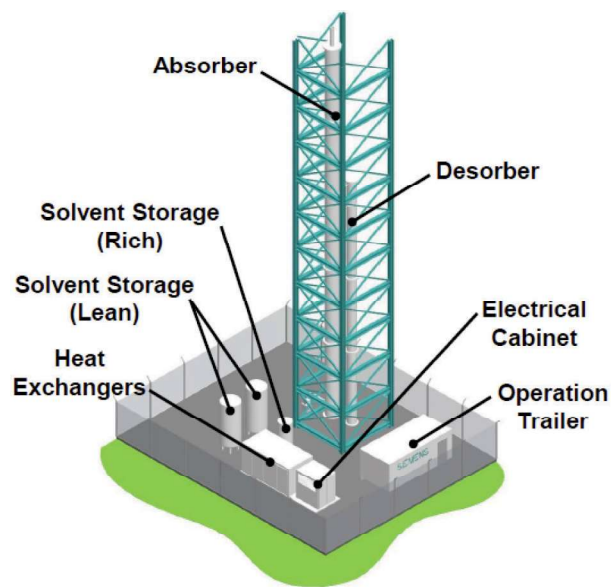


Figure 2: Basic POSTCAP Pilot Layout

technology advantages

- Lower energy consumption.
- Negligible solvent emission and degradation.
- High absorption capacity.
- Low environmental impact.

R&D challenges

- Developing solvent suppliers on a large, commercial scale.
- Minimize energy consumption.
- Available footprint for large-scale carbon capture retrofits.
- Combined cycle challenges to be overcome:
 - Low CO₂ concentration in flue gas.
 - High oxygen content in flue gas.
 - Operation with frequent load changes.
 - Fewer integration options for low-temperature heat from the capture plant.

results to date/accomplishments

Completed a preliminary design for a 2.5-MW POSTCAP pilot plant that was to be installed at the TECO Big Bend Power Station.

next steps

This project ended on February 29, 2012.

available reports/technical papers/presentations

Winkler, J.L., "Slipstream Development & Testing of Post Combustion CO₂ Capture and Separation Technology for Existing Coal-Fired Plants," presented at 2011 NETL CO₂ Capture Technology Meeting, Pittsburgh, Pennsylvania, August 2011. <http://www.netl.doe.gov/publications/proceedings/11/co2capture/presentations/2-Tuesday/23Aug11-Winkler-Siemens-Technology%20Slipstream%20Testing.pdf>.