

CASE STUDY

Pilot Plant Enables U.S. Dept of Energy to Test Large Scale Removal of Carbon Dioxide from Coal Power Plant Flue Gas

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JOB OVERVIEW

Key Features

- Continuous Process
- Gas-Liquid Membrane Absorption Unit
- Carbon Dioxide Sequestration Unit
- Liquid Ring Compressor

Challenges

- Engineering a process system for an untested technology
- Developing an alternative regeneration process after the client's experimental membrane system proved to be unsuccessful
- Overcoming challenges of compressing saturated flue gas

Impact

- Delivered a scalable process system for testing CO2 removal technology
- Avoided unnecessary delays through FEL, flexibility and engineering experience
- Faster and safer skid fabrication and installation due to modular design and off-site fabrication

THE EPIC SOLUTION

Using PFD's for a similar flue gas desulfurization process, this system replaces the typical sulfur absorption unit with a gas-to-liquid membrane absorption system tuned for capturing CO2. The gas-to-liquid separation system contains a liquid with an affinity for CO2 that traps it as emitted gas passes by the membrane. In a second processing step, CO2 is recovered and regenerated so that it can be reused instead of releasing it into the environment.

During EPIC's Front-End Engineering (FEE) process it was discovered that the second stage of the process – recovery and regeneration of the CO2 – could not be accomplished through the client proposed membrane process. Instead, EPIC implemented a more traditional thermodynamic separation process, which required changes to the process flow diagram. The thermodynamic approach uses heat exchangers and flash tanks to release and isolate CO2.

A challenge of the system was figuring out how to handle saturated flue gas at 100% humidity, rather than dry gas. EPIC's process team determined replacing traditional blowers with a liquid ring compressor would avoid any potential system malfunctions due to humidity of the gas.

As a full-service engineering and fabrication firm, EPIC was able to move the project along quickly. Any necessary modifications discovered during fabrication and assembly, such as configuration changes to the system's blower unit, were handled immediately through on-site collaboration between our engineers and skilled craftsmen.

