

Pressure-Swing Adsorption for CO₂ Capture from Sour Syngas



Pressure-Swing Adsorption Beds

Air Products is active in developing technology for CO₂ capture from gasification processes. Our developments range from next-generation air separation to technologies for advanced acid gas removal.

The Challenge of CO₂ capture

Gasification is the conversion of a carbon-based fuel, such as coal, petcoke or biomass, into a syngas mixture that can be converted into a number of products, including power, hydrogen, chemicals, and fuels.

A key challenge for clean power or hydrogen projects via gasification is the need to reduce the overall cost while achieving significant levels of CO₂ capture.

To lower the CO₂ footprint of gasification, CO₂ must be captured from a typically sulfur (H₂S)-containing syngas stream. The current state-of-the-art technology for capturing CO₂ from sour syngas is based on solvent processes such as Selexol™ or Rectisol®, which selectively separate H₂S and CO₂ from the hydrogen. These two processes are capital-intensive and require significant utility consumption during operation, especially at higher levels of CO₂ capture.

Leveraging Air Products' Experience

Air Products has a wealth of understanding of advanced adsorption technology and has experience purifying and separating syngas from gasification in our facilities in Baytown, Texas. With this understanding and experience, Air Products is developing an alternative system that can achieve a higher level of CO₂ capture than the conventional technologies at significantly lower costs, using pressure-swing adsorption to replace solvent-based absorption.

CO₂ capture in gasification plants: an alternative to solvent-based absorption

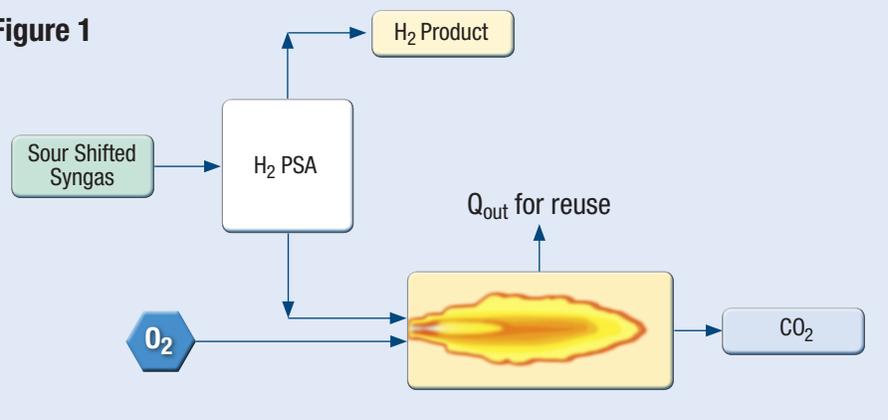
The development of pressure-swing adsorption technology targeted to CO₂ capture from sour syngas is based on years of experience in the design and operation of hydrogen pressure-swing adsorption (PSA) systems as operated in Air Products' numerous steam methane reformers.

Air Products recognized that hydrogen PSA technology adapted to handle sour feedgas (a "sour PSA") would allow use for CO₂ capture from gasification.

This novel PSA technology can be incorporated into a full CO₂ capture process, such as one described in Figure 1. This schematic shows:

- H₂ PSA technology adapted to handle sour feed gas
- Low-Btu oxyfuel burner technology
- CO₂ purification system with near 100% CO₂ capture possible

Figure 1





Air Products' pressure-swing adsorption technology for sour syngas offers a carbon capture solution applicable to a wide range of gasification technologies, including integrated gasification and combined cycle power plants, as well as gasification for hydrogen production and polygen schemes.

For additional information or to discuss our latest advancement in CO₂ capture technology, please see an Air Products representative or visit our website at: www.airproducts.com/CO2_capture.

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Air Products Acid Gas Removal and PSA units at Baytown, Texas

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