the ENERGY lab

PROJECT FACTS

Gasification Technologies

Monolith Traps for Mercury and Trace Metal Control in Advanced Gasification Units

Description

The focus of the U.S. Department of Energy's Advanced Integrated Gasification Combined Cycle (IGCC) Program is to develop advanced, gasification-based technologies to reduce the cost of coal-based IGCC plants; to improve the thermal efficiency; and to achieve near-zero atmospheric emissions of all pollutants, including carbon dioxide, nitrogen oxides, mercury (Hg), and sulfur dioxide.

Gasification is a process that converts any carbon-containing feedstock into synthesis gas (syngas), a mixture composed primarily of carbon monoxide and hydrogen, which can be used as a fuel to generate electricity or steam or as a basic raw material to produce hydrogen, high-value chemicals, substitute natural gas, and liquid fuels. Gasification can produce syngas from coal, as well as from a range of low-value carbon feedstocks, such as petroleum coke, high-sulfur fuel oil, and biomass.

Conventional methods for removing sulfur and other contaminants from syngas typically rely on chemical or physical absorption processes operating at temperatures of 100 °F or less. The gas stream has to be cooled and then re-heated after contaminant removal, adversely impacting the plant's thermal efficiency. Processes amenable to higher operating temperatures would reduce this efficiency loss and improve the gasification plant's commercial viability.

Because syngas streams contain a wide variety of contaminants at low concentrations—ammonia, hydrogen chloride, arsenic (As), mercury (Hg), selenium (Se), and cadmium (Cd)—multiple unit operations are often needed to affect removal to acceptable levels. Unit operations that could remove multiple contaminants at elevated temperatures would simplify plant design, operation, and improve process economics.

The University of North Dakota Energy and Environmental Research Center (UNDEERC), in partnership with Corning Inc., will develop an integrated system to remove trace metals from coal-derived syngas. Corning Inc. has developed a high surface-area, impregnated carbon monolith; Corning Inc. and UNDEERC have both developed Hg sorbents functional at over 400 °F. This project will merge these two technologies, and

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PARTNERS

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COST

Total Project Value
$7,409,604

DOE/Non-DOE Share
$5,926,319 / $1,483,285