Carbon Capture and Utilization

Comprehensive portfolio of technology approaches based on:

- Solvents
- Solid sorbents
- Catalysts
- Membranes
- Hybrid systems

Strong process modeling and economic analysis expertise to optimize integration of our technologies to specific applications.

Various reactors and systems for performing high-throughput CO_2 capture experiments:

- Packed-bed
- Visual Fluidized bed
- Vapor Liquid Equilibrium-Calorimetry Measurement
- Bench-Scale Solid Sorbent CO_2 Capture Prototype System

RTI International is developing innovative solutions for capturing CO_2 from large industrial point sources, such as fossil fuel power plants and cement plants. Our primary research focus is improving the cost and energy demands of CO_2 capture and utilization compared to conventional technologies. Specifically RTI's solvent and solid sorbent based technologies can substantially lower the energy requirements for CO_2 capture.

Novel Non-Aqueous Solvent Systems

We are developing novel solvents and process technology that substantially reduce the parasitic power load and capital cost associated with conventional amine-based CO_2 capture. Four years of research at RTI have gone into the development of novel non-aqueous solvent (NAS) systems that remove CO_2 from flue gas via a low-energy CO_2/solvent pathway, lowering regeneration energy requirements by up to 40%.

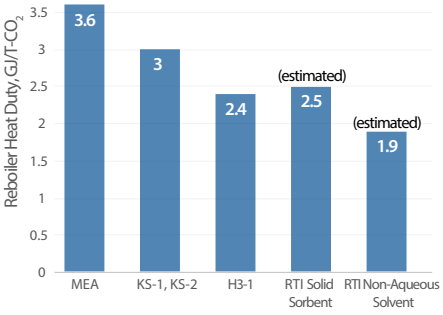
We have utilized highly automated solvent screening and characterization equipment to rapidly identify solvents and determine their key thermodynamic properties. Parallel efforts included extensive process and solvent evaluations through 1,000+ hours of on-stream testing in a unique lab-scale test system, detailed process modeling, and economic analyses. Through these efforts we have identified several promising NAS formulations and process configurations, and proven the process stability and economic attractiveness of this technology.

From 2015 to 2017, RTI, in partnership with the U.S. Department of Energy's National Energy Technology Laboratory, Linde, SINTEF and Gassnova, will conduct further research in SINTEF's Tiller plant to demonstrate all process components for the NAS process.

Solid Sorbent-Based CO_2 Capture

Solid sorbents are considered promising CO_2 capture materials because they exhibit high CO_2 loadings, low heat capacities, and do not have the potential toxicity and volatility issues of aqueous solvents. RTI has been active in solid sorbent CO_2 capture research for over 10 years and has built significant sorbent development, coupled with related process development expertise and laboratory resources for detailed characterization of solid sorbents.

Our solid sorbent technology development is funded by DOE's National Energy Technology Laboratory, with cofunding from Masdar. In partnership with Masdar Carbon, Masdar Institute and Pennsylvania State University, RTI's has developed and tested new amine-based solid sorbents with lower regeneration energy demands compared to conventional solvents.



Heat Duty Requirement for Selected Post-Combustion CO_2 Capture Technologies

Expanding upon 10 years of CO_2 capture research, RTI has been funded to develop third generation fluidizable solid sorbents based on hybrid-metal organic frameworks (MOFs) and fluidizable hybrid-P-dendrimers to achieve DOE's CO_2 capture process performance target of >90% CO_2 capture rate with 95% CO_2 purity and <30% increase in cost of electricity.

CO_2 Capture at Cement Plants

Cement plants are large CO_2 point sources - emitting CO_2 through fossil fuel combustion and decomposition of raw materials. Cement manufacturers are seeking cost effective methods for capturing CO_2 emissions. RTI and Norcem – part of HeidelbergCement Group – have partnered to carry out a pilot-scale CO_2 capture technology demonstration in Norcem's cement plant in Brevik, Norway utilizing our advanced, solid sorbent CO_2 capture process.

Pre-Combustion CO_2 Capture for Next Generation Gasification Plants

Modern gasification technology provides an efficient means for producing power from carbonaceous fuels because pre-combustion CO_2 capture is conducted before complete combustion. RTI is currently developing a high-temperature, regenerable, mixed oxide-based sorbent technology that can be integrated into advanced gasification systems. Our approach is compatible with our own warm syngas clean-up technology platform, which removes sulfur and other contaminants from gasification derived syngas at elevated temperatures.

Also under investigation is the use of these sorbents with water-gas shift catalysts to achieve in situ water-gas shift and CO_2 removal, thereby increasing the effectiveness of CO_2 capture and the generation of a hydrogen-rich product gas.

CO_2 Utilization

The researchers at RTI have specialized in several areas of CO_2 Utilization. We have a developed new catalyst technology for oxygen abstraction from CO_2. Promising applications currently being explored are dry methane reforming for CO_2 utilization and ethylene epoxidation for ethylene oxide production.

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