

Project Archive – SBIR

Project Title	Primary Contractor	Project End Date
Integrating MEA Regeneration with CO2 Compression and Peaking to Reduce CO2 Capture Costs	Trimeric Corporation	2005
Carbon Dioxide Capture from Large Point Sources	Compact Membrane Systems, Inc.	7/10/2005
Carbon Dioxide Recovery from Combustion Flue Gas Using Carbon-Supported Amine Sorbents	Advanced Fuel Research, Inc.	4/12/2005
Multiple-Input Data Acquisition Systems (MIDAS) for Measuring the Carbon Content in Soil Using Inelastic Neutron Scattering	X-Ray Associates	4/12/2005
Instrumentation Systems for Monitoring and Verifying Carbon Sequestration in Terrestrial Systems	Zimmerman Associates	4/12/2005

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INTEGRATING MONO ETHANOL AMINE (MEA) REGENERATION WITH CO₂ COMPRESSION AND PEAKING TO REDUCE CO₂ CAPTURE COSTS

Background

In Phase I, Trimeric Corporation, in collaboration with the University of Texas at Austin, performed engineering and economic analyses necessary to determine the feasibility of novel MEA processing schemes aimed at reducing the cost of CO₂ capture from flue gas. These novel MEA-based CO₂ capture schemes are designed for integration into coal-fired power plants with the aim of reducing costs and improving efficiency.

CONTACTS

Sean I. Plasynski

Sequestration Technology Manager
National Energy Technology
Laboratory
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-4867
sean.plasynski@netl.doe.gov

José D. Figueroa

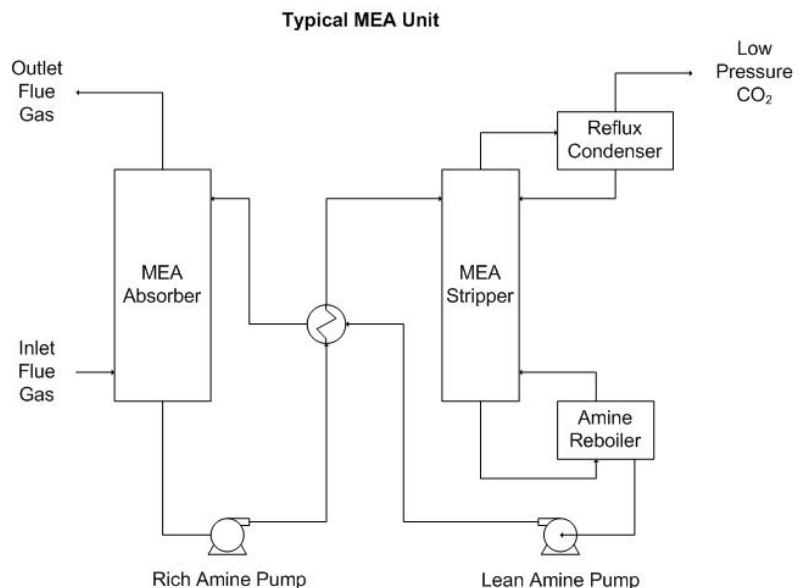
Project Manager
National Energy Technology
Laboratory
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-4966
jose.figueroa@netl.doe.gov

Kevin S. Fisher

Principal Engineer
Trimeric Corporation
107 S. Austin Street
Buda, TX 78610
512-431-6323
kevin.fisher@trimeric.com

Primary Project Goal

The primary goal of this project was to reduce the cost of MEA scrubbing for the recovery of CO₂ from flue gas by improved process integration.



PARTNERS

Trimeric Corporation
University of Texas at Austin

COST

Total Project Value
\$99,969

DOE/Non-DOE Share
\$99,969 / \$0

ADDRESS

National Energy Technology Laboratory

1450 Queen Avenue SW
Albany, OR 97321-2198
541-967-5892

2175 University Avenue South
Suite 201
Fairbanks, AK 99709
907-452-2559

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
304-285-4764

626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940
412-386-4687

One West Third Street, Suite 1400
Tulsa, OK 74103-3519
918-699-2000

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

Objectives

The objective was to evaluate various schemes for integrating MEA regeneration into the overall system to improve MEA economics and decrease the cost of CO₂ capture from the flue gas from coal-fired power plants.

Benefits

MEA-based processes are well established in industry for the recovery of acid gases from process streams. A major factor preventing their use for recovering CO₂ from stack gases is cost. This project demonstrated that significant cost reductions associated with the MEA scrubbing could be achieved, thus increasing the prospect of being able to capture and sequester CO₂ without a detrimental impact on our economy.

PROJECT facts

Sequestration

03/2006

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY



CARBON DIOXIDE CAPTURE FROM LARGE POINT SOURCES

Background

Capture of carbon dioxide at the source of its emission has been a major focus in greenhouse gas emission control. Current technologies used for capturing CO₂ suffer from inefficient mass transfer and economics.

In Phase I, Compact Membrane Systems, Inc. will fabricate and test a membrane-based absorption system for the removal of carbon dioxide from a simulated power-plant flue gas. The stability of the membrane system under various operating conditions and chemical environments will be tested.

CONTACTS

Sean Plasynski

Sequestration Technology Manager

National Energy Technology
Laboratory

626 Cochran Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-4867

sean.plasynski@netl.doe.gov

David Lang

Project Manager

National Energy Technology
Laboratory

626 Cochran Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-4881

david.lang@netl.doe.gov

John Bowser

Principal Investigator

Compact Membrane Systems, Inc.

325 Water Street
Wilmington, DE 19804
302-999-7996

john.bowser@compactmembrane.com

Primary Project Goal

The primary goal of this project is to develop a membrane-based absorption system that reduces the cost of CO₂ capture from large point sources, such as power plant stacks.

Objectives

Phase I objectives:

- Fabricate perfluorinated membrane on appropriate hydrophobic hollow fiber membrane contactors
- Demonstrate carbon dioxide removal from simulated flue gas mixture via amine absorption using the fabricated membranes
- Examine chemical compatibility of the membrane with amines and demonstrate enhanced stability of the perfluoro coated membranes.
- Perform economic analysis and demonstrate that the perfluoro coated hydrophobic hollow fiber membrane contactors are superior to existing commercial carbon dioxide removal technology.



PARTNER

Compact Membrane Systems, Inc.

COST

Total Project Value

\$100,000

DOE/Non-DOE Share

\$100,000 / \$0

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1450 Queen Avenue SW
Albany, OR 97321-2198
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626 Cochran Mill Road
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Pittsburgh, PA 15236-0940
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Tulsa, OK 74103-3519
918-699-2000

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1-800-553-7681

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Accomplishments

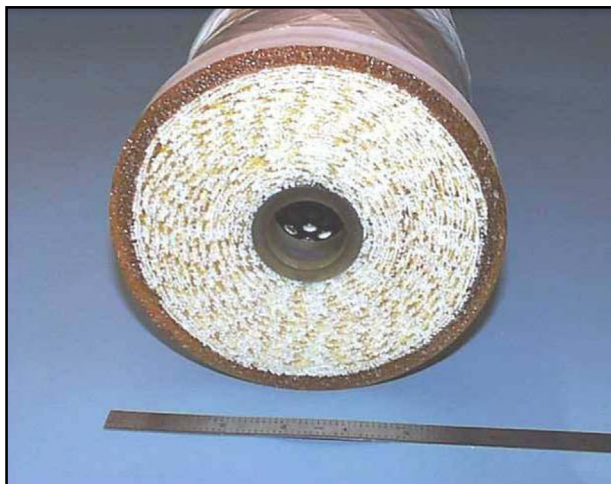
Phase I accomplishments included:

- Demonstration of CO₂ absorption into aqueous diethanolamine solution and subsequent regeneration of the absorbent liquor in membrane contactors at both high temperature (60 °C) and low temperature (25 °C).
- Integrated system successfully absorbed and desorbed simultaneously.
- Preliminary testing indicated the membranes are chemically compatible with amines.
- Preliminary economic analysis showed amine membrane contactor had economic advantage compared to conventional amine scrubbing towers.

Benefits

The United States has set a goal of reducing the CO₂ emissions intensity of economic activity (pounds of CO₂ emitted per dollar of GDP) by 18% by 2012.

In order to meet this goal, we must improve existing technology for capture of CO₂ from flue gas. Existing processes are technically feasible, but economically unsatisfactory. This project has the potential to move us forward toward the goal of an economically feasible process for capture of CO₂ from stack gases.



Commercial hollow fiber membrane cartridge [6" (D) X 17" (L)]

PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Sequestration

01/2005



CARBON DIOXIDE RECOVERY FROM COMBUSTION FLUE GAS USING CARBON- SUPPORTED AMINE SORBENTS

CONTACTS

Scott M. Klara

Sequestration Technology Manager
National Energy Technology
Laboratory
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-4864
scott.klara@netl.doe.gov

Philip Goldberg

Project Manager
National Energy Technology
Laboratory
626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-5806
philip.goldberg@netl.doe.gov

Marek Wojtowicz

Advanced Fuel Research, Inc.
87 Church Street
East Hartford, CT 06108
860-528-9806
marek@AFRinc.com

Background

In Phase I, Advanced Fuel Research, Inc. will initiate development of a novel sorbent for the removal of carbon dioxide from combustion/incineration flue gas. The sorbent, based on amines supported on low-cost activated carbon, will be produced from scrap tires. Liquid-based amine systems are limited to relatively low concentrations to avoid corrosion. Corrosion should not be a problem with a supported amine.

Primary Project Goal

The primary goal of this project is to develop a process using a supported amine for CO₂ recovery that exhibits better system efficiency, lower cost, and less corrosion than current liquid amine-based processes.

Objectives

The objective is to develop a process using a supported amine as a sorbent. Such a process should avoid some of the problems inherent in liquid-phase amine processes.





Benefits

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

PARTNERS

Advanced Fuel Research, Inc.

COST

Total Project Value

\$99,969

DOE/Non-DOE Share

\$99,969/\$0

The United States has set a goal of reducing the CO₂ emissions intensity of economic activity (pounds of CO₂ emitted per dollar of GDP) by 18% by 2012. In order to meet this goal, new CO₂ capture processes need to be developed. Although existing processes are technically capable of recovering CO₂ from stack gases, they are too expensive to be deployed without seriously impacting our economy. If successful, this project could advance our efforts to achieve our CO₂ emissions goal.

PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Sequestration

01/2005



MULTIPLE-INPUT DATA ACQUISITION SYSTEMS (MIDAS) FOR MEASURING THE CARBON CONTENT IN SOIL USING INELASTIC NEUTRON SCATTERING

CONTACTS

Scott M. Klara

Sequestration Technology Manager
National Energy Technology
Laboratory
626 Cochran Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-4864
scott.klara@netl.doe.gov

John Litynski

Project Manager
National Energy Technology
Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507
304-285-1339
john.litynski@netl.doe.gov

Michael Momayezi

X-Ray Instrumentation Associates
8450 Central Ave
Newark, CA 94560
540-494-9020
Momayezi@xia.com

Background

It has been demonstrated that Inelastic Neutron Scattering (INS) can be used to measure the carbon content of soil, rapidly in situ and non invasively. In Phase I, X-Ray Instrumentation Associates will initiate the development of a new, non-invasive technology for static and dynamic in-situ carbon monitoring in soils that will speed up the rate of analysis at reduced cost and improved accuracy. Specifically, X-Ray Instrumentation Associates will upgrade an existing exploratory system developed at Brookhaven National Laboratory (BNL) by adding novel multichannel data acquisition electronics and conducting performance evaluations that will aid in the design of a commercial prototype in Phase II.

Primary Project Goal

The primary goal of this project is to develop a low power, compact INS system which is compatible with field deployment.

Objectives

The objective of this project is to upgrade an existing exploratory INS system at BNL by incorporating new multichannel data acquisition electronics to produce a device that is small, low-power, and compatible with field deployment.





Benefits

The improvement to the existing system of adding an array of gamma ray detectors promises to increase sampling volume and improve accuracy while reducing measurement time. Such a system would greatly improve the ability to verify carbon sequestration in terrestrial ecosystems.

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

PARTNERS

**X-Ray Instrumentation
Associates**

Brookhaven National
Laboratory

COST

Total Project Value
\$100,000

DOE/Non-DOE Share
\$100,000/\$0

PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Sequestration

01/2005



INSTRUMENTATION SYSTEMS FOR MONITORING AND VERIFYING CARBON SEQUESTRATION IN TERRESTRIAL SYSTEMS

CONTACTS

Scott M. Klara

Sequestration Technology Manager
National Energy Technology
Laboratory
626 Cochran Mill Road
P.O. Box 10940
Pittsburgh, PA 15236
412-386-4864
scott.klara@netl.doe.gov

John Litynski

Project Manager
National Energy Technology
Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507
304-285-1339
john.litynski@netl.doe.gov

Patrick Johnson

Zimmerman Associates, Inc.
9302 Lee Highway
Fairfax, VA 22031
301-371-3584
pjohns@erols.com

Background

There is a need to develop an accurate, low-cost, airborne, remote-sensing technology that will directly determine terrestrial biomass and the carbon stored in aboveground vegetation. Zimmerman Associates will test a new technology, which uses a down-looking, very high frequency (VHF) synthetic aperture radar (SAR) that will provide a faster, more accurate, and less expensive method to conduct biomass and carbon surveys.

The proposed airborne VHF SAR system will be flown at 3,000 meters with a downward looking antenna. Radar pulses returned from the area at 150,000 pulses per second will be used to estimate biomass and carbon contained within the footprint of the radar. Phase I will investigate the use of a single VHF frequency between 30 and 80 MHz. The selected frequency will be used for field experiments to determine power and sensitivity levels required for radar operations. A preliminary design for an operational prototype will also be developed.

Primary Project Goal

The primary goal of the project is to develop an airborne remote sensing system that will have the ability to conduct carbon surveys at a rate of 300 square miles per day at a cost of \$0.25 per acre with an accuracy of $\pm 10\%$.



CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

PARTNERS

Zimmerman Associates, Inc.

COST

Total Project Value

\$99,836

DOE/Non-DOE Share

\$99,836/\$0

Objectives

The objective of the project is to develop an airborne VHF (30-80 MHz) SAR system that, when flown at 3,000 meters with a downward looking antenna, can conduct biomass and carbon surveys within the radar's footprint.

Benefits

The project will provide a fast, accurate, low-cost method to conduct surveys of biomass and carbon stored in aboveground terrestrial ecosystems. This technology could significantly improve our ability to verify terrestrial carbon sequestration and improve our ability to use this natural sink as a method for reducing CO₂ emissions.