R & D facts

U.S. Department of Energy
National Energy Technology Laboratory

Sequestration

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Small-scale Facilities for Air Pollution Research

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Capabilities

NETL is conducting research on the cleanup of flue gas produced by combustion of fossil fuels. This effort directly supports the goal of the Advanced Research and Environmental Technology Program to ensure continuing utilization of coal in an environmentally and economically acceptable manner. Novel technologies are being developed that can abate the air pollutants found in flue gas, such as sulfur dioxide (SO_2), nitrogen oxides (NO_X), hazardous air pollutants (also referred to as air toxics) and fine particulates, and carbon dioxide (CO_2).

Research at NETL has focused on: (1) investigating air toxics produced by burning various coals, with a particular emphasis on the speciation of mercury and the control of the various mercury species; (2) dry, regenerable sorbent processes that use a metal-oxide sorbent to simultaneously remove SO_2 and NO_X; (3) catalysts for selective catalytic reduction (SCR)-type NO_X control; and (4) the capture of CO_2 removed from flue gas produced by fossil fuel combustion.

Examples of results that can be obtained in NETL's various small-scale reactor facilities include:

- Using a thermogravimetric analyzer and a microbalance to investigate adsorption or regeneration kinetics of dry, regenerable sorbents used to remove CO_2, SO_2, and NO_X from simulated flue gas. The large flow of gas over the small charge of sorbent (~ 50 mg) approximates a differential reactor, facilitating the interpretation of the kinetics by changes in weight.
- Using packed-bed reactors to screen sorbents or sorbent/catalysts for their reactivity toward the removal of certain gaseous pollutants. Continuous emissions monitors that can analyze for the various gas constituents at the reactor exit follow the behavior of the substance of interest.
- Coupling continuous analysis (atomic fluorescence spectrophotometer) of a difficult-to-measure gaseous pollutant (mercury) with a reactor scheme to screen novel sorbents for the removal of mercury from flue gas.
- Using unique schemes to investigate CO_2 capture: a bench-scale, packed-column scrubbing apparatus to study improved efficiency for wet chemical scrubbing of CO_2 from flue gas.

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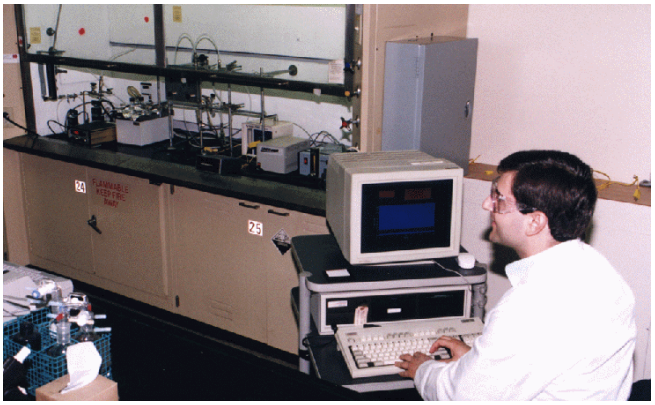
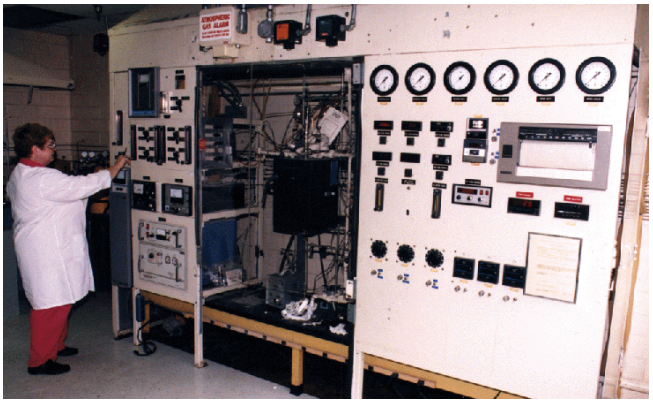
Opportunities

- Develop kinetic expressions for various gas-solid reactions.
- Screen various sorbents for removal of specific pollutants from flue gas.
- Characterize catalytic and non-catalytic gas-solid reaction systems by establishing experimental databases.
- Evaluate dry and wet scrubbing techniques for the capture of greenhouse gases.
- Work with industry using the various NETL facilities.

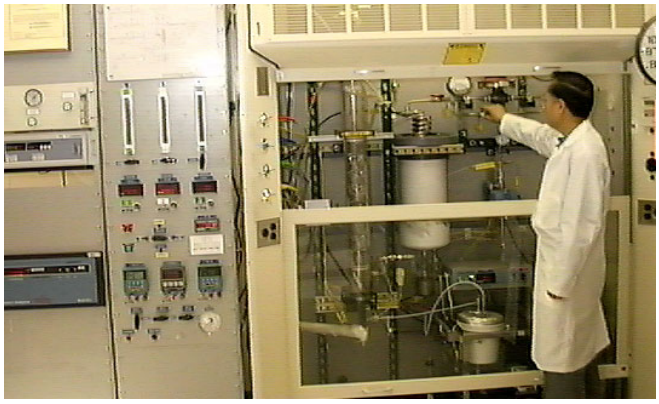


Data Acquisition System Linked to Mercury Analyzer

Solid Sample Being Loaded Into Thermogravimetric Analyzer



Packed-Bed Reactor Setup



Packed-Column Scrubbing Apparatus