

## **FLUIDIZED-BED REACTOR AND HOT GAS CLEANUP FACILITY**

### **CONTACT POINTS**

**Steven W. Richardson**

Mechanical Engineer  
(304) 285-4185  
steven.richardson@netl.doe.gov

**Diane (DeeDee) Newlon**

Technology Transfer Manager  
(304) 285-4086  
r diane.newlon@netl.doe.gov

### **ADDRESS**

**National Energy  
Technology Laboratory**

3610 Collins Ferry Road  
P.O. Box 880  
Morgantown, WV 26507-0880  
(304) 285-4469 fax

626 Cochran's Mill Road  
P.O. Box 10940  
Pittsburgh, PA 15236-0940  
(412) 386-4604 fax

### **WEBSITE**

[www.netl.doe.gov/products/r&d](http://www.netl.doe.gov/products/r&d)

### **Capabilities**

As part of the National Energy Technology Laboratory (NETL) Advanced Gasification and Hot Gas Cleanup Facility, a 907 kg (1 ton) coal-per-day (10-inch inside diameter) jetting fluidized-bed gasifier provides realistic fuel gas for testing and developing high-temperature, high-pressure components and processes in a reducing (gasification) and oxidizing (combustion) environment. Operated mainly as a gasifier, the 0.25-m (10-inch) diameter reactor produces up to 227 kg/hr (300 lb/hr) of coal gas at 1,200 K (1,700 °F) and 30 atmospheres (425 psig) for downstream testing. The raw coal gas is sampled for major and trace species and sent to a filter vessel capable of operating at 894 K (1,150 °F) and 20 atmospheres (300 psig) of pressure. After particulate removal, the gas can be transported to any of five sampling or reaction vessels for fluid-bed desulfurization; transport desulfurization; chloride, alkali, or other contaminant removal; or recovery processes. The fluid-bed desulfurizer is capable of being isolated, purged, or exposed to an oxidizing environment for sorbent regeneration or other oxidation reaction. Isokinetic sampling of hazardous air pollutants (HAPS) is provided upstream and downstream of particulate removal.

Many hours of operation have been completed in support of six separate Cooperative Research and Development Agreements (CRADAs). These research agreements involve candle filters and materials testing, direct sulfur recovery from sorbent regeneration tail gases, and gasifier development. More recently, the gasifier has been used to successfully test alternative feedstocks, including slurries and several biomass and coal blends.

### **Opportunities**

- Provide testing for advanced Integrated Gasification Combined Cycle (IGCC)
  - Filtration experiments at 1,150 °F, 20 atm
  - Cyclic (reducing/oxidizing) reaction atmosphere for sorbent testing
  - Slipstreams for contaminants removal
- Provide testing for advanced Pressurized Fluidized Bed Combustion (PFBC)
- Hardware and operational control strategy testing
- Provide testing for alternative feedstock applications
  - Slurried feedstocks
  - Solid feedstocks
  - Blended feedstocks



# FLUIDIZED-BED REACTOR AND HOT GAS CLEANUP FACILITY

## The Facility

NETL's **Fluid-Bed Gasifier** and the **Modular Gas Cleanup Rig** (MGCR) combined form the **NETL Gasification and Hot Gas Cleanup Facility**.

This unique facility is used to develop and test components, and to test technologies suitable for integrated gasification, combined-cycle — or IGCC — power-plant systems.

The **MGCR** is mainly used to test components, such as desulfurization sorbents, hot particulate-removal filters, and filter materials.

Testing is done at a pressure of 300 pounds per square inch and a temperature up to 1,150 °F.

The **Fluid-Bed Gasifier** is at product-development-unit (PDU) scale.

The 10-inch diameter reactor gasifies 80 pounds per hour of coal to produce 300 pounds per hour — or 5,000 standard cubic feet per hour — of combustible, low-Btu coal gas.

The gas is produced at high temperature — 1,700 °F — and high pressure — 425 pounds per square inch.

NETL hopes to use this Gasification and Hot Gas Cleanup Facility to facilitate commercialization of advanced power systems that can significantly reduce pollutants while increasing fuel efficiency — at the lowest possible costs.

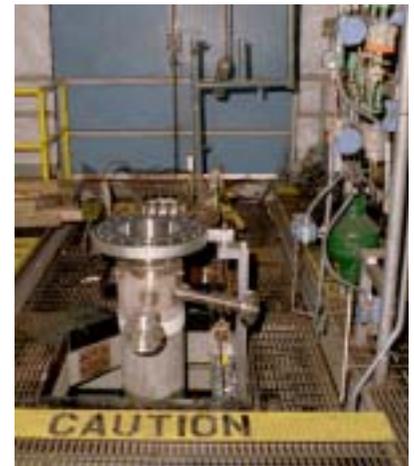
The uniqueness of the combined Modular Gas Cleanup Rig and Fluid-Bed Gasifier is that testing is done with gas that has a realistic composition and contains the trace metals and species inherent in the feed material.



*NETL's Modular Gas Cleanup Rig (MGCR), at left, and Fluid-Bed Gasifier, on the right, combined form the NETL Gasification and Hot Gas Cleanup Facility.*



*NETL's Fluid-Bed Gasifier*



*MGCR Particulate Removal and Desulfurization Equipment*