

PROJECT facts

Advanced Research

09/2005

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



O₂/CO₂ RECYCLE COAL COMBUSTION TO MINIMIZE POLLUTANTS

Description

O₂/CO₂ recycle coal combustion is a promising, retrofittable technique for electric power production, while producing a nearly pure stream of CO₂ for subsequent use or sequestration. Most pollutant emissions, including NO_x, are lower in this process, compared to conventional pulverized coal combustion. However, laboratory and pilot-scale tests to date have shown a wide variation in the fractional reduction of NO_x when adopting this technology, suggesting that further improvements in NO_x reduction are possible, given a better understanding of the dominant routes of NO_x production and destruction in these systems.

CONTACTS

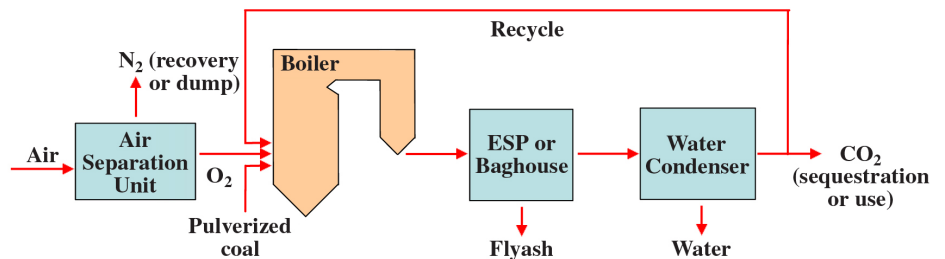
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Goals

The goal of this project is to determine the relative influence of three different mechanisms likely to contribute to observed reductions in NO_x: reburn of recycled NO_x in the volatiles flame zone; reduced formation of thermal NO_x; and increased NO_x reduction on coal char. Once the dominant routes of NO_x formation and destruction are better understood in these systems, burner design and operation can be tailored to minimize NO_x emissions. This project will use both the Multifuel Combustor (MFC) and Char Combustion Laboratory (CCL) at Sandia National Laboratories, in addition to plug flow chemistry modeling and single-particle chemistry modeling to achieve this goal.



Schematic diagram of O₂/CO₂ recycle coal combustion system.



Accomplishments

ADDRESS

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PROJECT DURATION

October 1, 2004 –
September 30, 2006

PROJECT COST

\$450,000

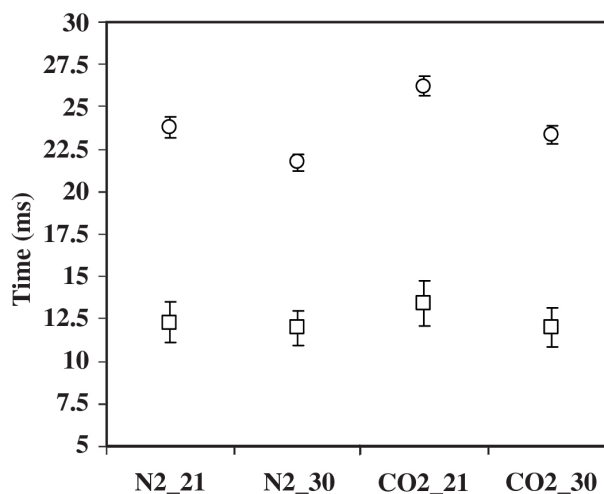
CUSTOMER SERVICE

1-800-553-7681

WEBSITE

www.netl.doe.gov

The gas supply and control system for the MFC has been modified to allow firing of the system in an O₂/CO₂ mode. In addition, measurements have been collected on the effect of elevated oxygen levels and the presence of CO₂ diluent on the heating and ignition of pulverized coal and char particles. These processes are important to thermal NO_x formation and NO_x reburn in the flame zone. Measurements have also been performed on the effect of CO₂ on the reduction of NO on char surfaces.



Measured mean coal particle ignition times (circles) and devolatilization times (squares) in 21% and 30% O₂, with N₂ or CO₂ diluent gas, for 115 μm particles of Pittsburgh seam coal in a 1,250 K environment.