

Emission characterizations from a pilot-scale combustor operating on a variety of coals

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Gaseous and particulate emissions generated from the combustion of coal have been associated with adverse effects on human health and the environment, and have therefore been the subject of regulation by federal and state government agencies. Detailed emission characterizations are needed to better understand the impacts of pre- and post-combustion controls on a variety of coals found in the United States. The U.S. Environmental Protection Agency (EPA) requires reporting by industry for criteria and many hazardous air pollutants (HAPs), but many of the methods for monitoring and measuring these gaseous and particulate emissions rely on time-integrated sampling techniques.

The current study not only characterizes emissions from three coals, but also investigates the use of instrumentation for improved measurement and monitoring techniques that provide real-time emissions data. This allows for updates to EPA's National Emissions Inventory while expanding potential emissions measurement capabilities for industry. Testing was completed using the U.S. EPA's Multi-Pollutant Control Research Facility, a pilot-scale coal-fired combustor using industry-standard emission control technologies, in Research Triangle Park, North Carolina. Emissions were calculated based on measurements from the flue gas (pre- and post-electrostatic precipitator), to characterize gaseous species (CO, CO₂, O₂, NO_x, SO₂, other acid gases, and several organic HAPs) as well as fine particulate (mass, size distribution, number count, elemental carbon, organic carbon, and black carbon). Comparisons of traditional EPA methods and those made via FTIR for CO, NO_x, and SO₂ are also reported.