PROJECT facts

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

Advanced Research

09/2005

SEMI-CONDUCTOR METAL OXIDE TECHNOLOGY FOR *IN SITU* DETECTION OF COAL-FIRED COMBUSTION GASES

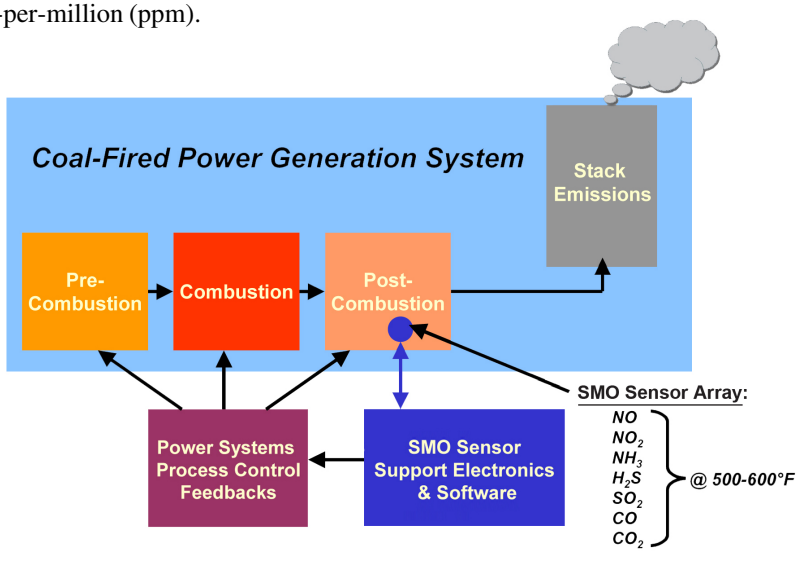
Description

Sensor Research and Development Corporation is developing a robust prototype sensor system for *in situ*, real-time detection, identification, and measurement of coal-fired combustion gases. The sensor system is comprised of several unique semi-conducting metal oxide (SMO) sensor arrays in tandem with novel gas prefiltration techniques. The sensor array will be able to selectively detect and measure nitric oxide (NO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon dioxide (CO_2), carbon monoxide (CO), and ammonia (NH_3).

The SMO sensor array is the heart of the combustion gas analyzer being developed for the detection and identification of gases in the post-combustion stage of the coal-fired power plant. As the system detects and analyzes the combustion gas stream, it provides continuous real-time data to help optimize the combustion process for cleaner, cheaper, and faster power. The sensors will provide cheaper energy while helping the plant to conform to stricter air quality demands.

Goals

The SMO technology is expected to offer a robust, continuous, low cost, sensor array system for the detection and measurement of gases in coal-fired power plants. The sensor array will detect, identify and quantify target combustion gases in the low parts-per-million (ppm).



Envisioned placement and use of SMO micro sensors.

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PROJECT DURATION

September 2004 – March 2006

COST

Total Project Value
$568,630

DOE/Non-DOE Share
$431,553 / $137,077

CUSTOMER SERVICE

1-800-553-7681

WEBSITE

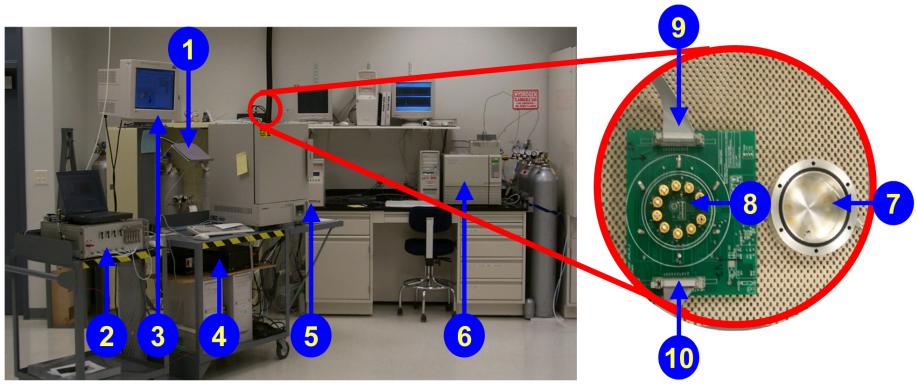
www.netl.doe.gov

Benefits

A low cost, highly sophisticated array system with real-time monitoring will bring great benefits to coal-fired power plants, including the ability to identify and quantify target flue gases. The technology's rugged *in situ* operation will be able to withstand the harsh environments (300 – 600 °F) in a coal combuster with accurate, highly sensitive (<ppm) detection capabilities that can be interfaced with existing technologies.

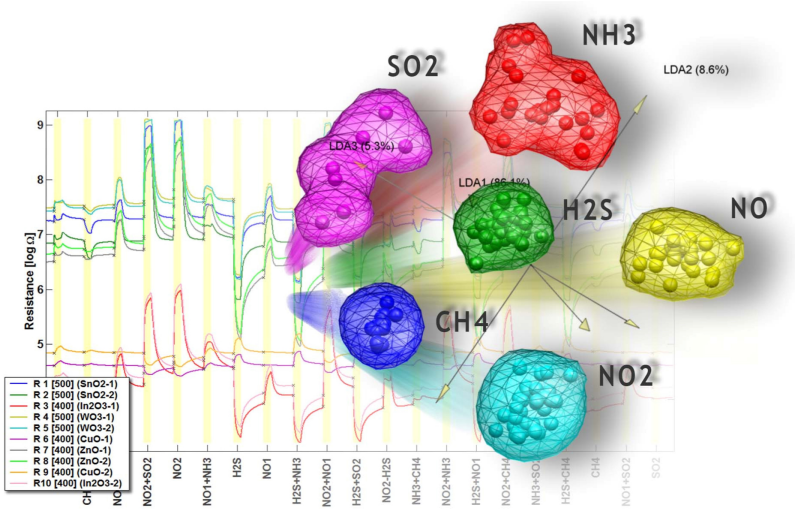
Accomplishments

Currently, a laboratory-based combustion gas analyzer has been developed with a post-combustion environment simulation and gas delivery system. This system is being converted to a field-testable prototype for beta testing.



1. Source of flue gases
2. Automated gas simulation system
3. Data acquisition & control
4. Sensor support electronics
5. Chemiluminescence analyzer (NO/NO_2)
6. GC/TCD system
7. Gas-sampling chamber
8. 10 single SMO sensors
9. Resistance measurement connections
10. Heater control connections

Laboratory gas simulation system and micro sensor test equipment.



Response of SMO sensors to flue gases and the PCA algorithm for identification.