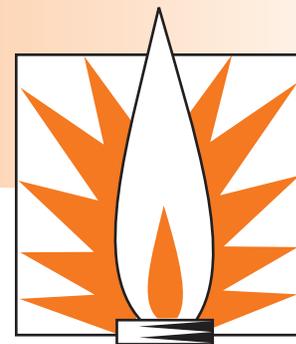


# COMBUSTION

## Project Fact Sheet



## ENERGY-CONSERVING TOOL FOR COMBUSTION-DEPENDENT INDUSTRIES

### Benefits

Per multi-gas analyzer unit:

- Provides on-line feedback for combustion tuning, resulting in lower energy use
- Offers energy and capital savings of up to 70 percent compared to comparable monitoring devices
- Measures criteria pollutants and hazardous air pollutants, such as formaldehyde and ammonia, that are not traditionally monitored by continuous emissions monitoring (CEM)
- Reduces space requirements for measuring equipment by 94 percent
- Reduces maintenance and performance verification time, resulting in an 83 percent reduction in labor costs

### Applications

Department of Energy (DOE) Office of Industrial Technologies (OIT) focus industries that use boilers and combustion-turbine generation will benefit from the new CEM system. The chemicals, forest products, and petroleum industries show potential for process monitoring and cogeneration when used to reduce electrical costs and thermal supply. Engine manufacturers in the OIT Advanced Turbine Systems Program and utility power companies with boilers and/or turbines will also benefit.

### Project Partners

NICE<sup>3</sup> Program  
Washington, DC

Connecticut DEP Bureau  
of Waste Management  
Hartford, CT

Advanced Fuel Research, Inc.  
East Hartford, CT

Air Pollution Characterization  
and Control, LTD.  
Tolland, CT

Eastmount Environmental Services, LLC  
Newburyport, MA

MKS Instruments, Inc.  
On-Line Products Group  
East Hartford, CT

Pratt & Whitney  
East Hartford, CT



## NEWLY DEVELOPED TECHNOLOGY COMBINES DESIGN, ELECTRONICS, AND SOFTWARE INNOVATIONS TO BRING ENERGY SAVINGS TO INDUSTRY

Advanced Fuel Research (AFR), in conjunction with the On-Line Products Group of MKS Instruments, Inc., other industrial partners, the Connecticut Department of Environmental Protection (DEP), and with financial assistance from the Department of Energy's NICE<sup>3</sup> Program, is demonstrating and commercializing a new system that benefits combustion-dependent industries. The technology greatly improves continuous emissions monitoring (CEM), while providing an on-line combustion-tuning tool. This innovation will increase operational efficiency, as well as reduce fuel requirements and subsequent air pollution.

Current combustion-monitoring techniques are unable to effectively or efficiently monitor all combustion gases, including difficult-to-separate hydrocarbons such as formaldehyde. Typically, CEM systems monitor a limited number of gases with an expensive collection of multiple single-gas analyzers. This unwieldy system requires a temperature-controlled room, shed, or trailer, and a substantial ongoing investment to maintain operation and calibration of the facility. Also, some compounds require physical transport back to a laboratory for analysis, a time- and cost-intensive process.

### MULTI-GAS ANALYZER UNIT



The Advanced Fuel Research multi-gas analyzer system reduces space requirements needed for traditional systems by 94 percent.

The AFR multi-gas analyzer is portable, compact, low cost, and energy efficient. It allows real-time measurements of criteria emissions and hazardous air pollutants. The dramatic improvements in dependability and efficiency brought by AFR's analyzer potentially lowers CEM operational energy costs by 70 percent and labor costs up to 83 percent.

### Project Description

**Goal:** Perform three simultaneous 1-year demonstrations of a new, portable, low cost, energy efficient multi-gas analyzer to prove it is a dependable state-of-the-art CEM, as well as an on-line combustion-tuning tool that will save substantial energy and operational costs while reducing environmental emissions.

The AFR system combines Fourier Transform Infrared spectroscopy (FT-IR), advanced mechanical/optical design, advanced electronics, and unique software for data analysis. Industry often monitors gas-phase streams by using electromagnetic radiation in the infrared spectrum, and FT-IR spectrometers are well known for providing advantages in measurement speed, sensitivity, and the ability to gauge multiple species simultaneously. However, FT-IR systems also have a reputation for not functioning well in industrial environments and for requiring an expert for successful operation. This project will prove otherwise for AFR's current state-of-the-art multi-gas analyzer.

The FT-IR base product to be demonstrated in this project offers the most advanced, high-speed, rugged, and portable FT-IR spectrometer available and is user friendly. Huge racks of single-gas analyzers will no longer be the norm for combustion process monitoring and CEM.

Advanced Fuel Research, Inc., is demonstrating this new technology with the assistance of Air Pollution Characterization and Control, the Connecticut DEP Bureau of Waste Management, Eastmount Environmental Services, the On-Line Products Group of MKS Instruments, Inc., Pratt & Whitney, and the NICE<sup>3</sup> Program in the Department of Energy's Office of Industrial Technologies.

### Progress and Milestones

- Instruments and sample transfer assemblies built and prepared for three installations during July 2000.
- Three multi-gas analyzers installed and operators trained during August 2000.
- Integrated data systems completed at three sites during September 2000.
- Complete long-term demonstrations and commercialization activities by September 2001.
- Conduct evaluations and continue commercialization activities through December 2001.
- Report commercialization activities annually for 10 years.



**NICE<sup>3</sup> – National Industrial Competitiveness through Energy, Environment, and Economics:**  
An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to \$525,000. Grants fund up to 50% of total project cost for up to 3 years.

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Order # NICE<sup>3</sup> CO-15  
November 2001