

**LEHIGH UNIVERSITY'S
ENERGY
RESEARCH CENTER**

**RESEARCH PLANNING
WORKSHOP**

**“New Initiatives
Dealing with NO_x
and Hg Control”**

November 19-20, 2003



**Lehigh University
Bethlehem, Pennsylvania**

PURPOSE OF MEETING

The Energy Research Center wishes to identify utility sponsors for a group of research projects which focus on control of NO_x and mercury emissions from coal-fired boilers. The proposed objectives, benefits, technical approach, budget, and schedule for each of the projects will be described by the investigators. Where possible, comments and suggestions made by the attendees will be incorporated into the project plans.

WHO SHOULD ATTEND?

This workshop is targeted to corporate environmental managers, project engineers, and plant operations personnel with responsibilities for improving unit performance, reducing NO_x emissions, and assessing technologies for mercury control.

AGENDA

Wednesday, November 19

11:30 a.m. – 1:00 p.m.	Registration and Buffet Lunch
1:00 p.m. – 3:00 p.m.	Optimal Operation of Coal-Fired Boilers with SCR Systems
3:00 p.m. – 4:00 p.m.	Control of Air Preheater Fouling
4:00 p.m. – 5:00 p.m.	Formation and Control of SO ₃ Emissions

Thursday, November 20

8:00 a.m. – 8:30 a.m.	Continental Breakfast
8:30 a.m. – 9:15 a.m.	Removal of Ammonia from Fly Ash
9:15 a.m. – 10:00 a.m.	Overview of Options for Mercury Emissions Control
10:00 a.m. – 11:15 a.m.	Combustion Tuning for Mercury Emissions Control
11:15 a.m. – 12:00 noon	Summary and Discussion

REGISTRATION

- Deadline: November 10, 2003
- To Register, return the completed form to Jodie Johnson, Energy Research Center, 117 ATLSS Drive, Bethlehem, PA 18015-4729. You may also FAX (610-758-5959) or telephone (610-758-4090).

SYNOPSIS

OPTIMAL OPERATION OF COAL-FIRED BOILERS WITH SELECTIVE CATALYTIC REDUCTION (SCR) SYSTEMS

The Energy Research Center has been analyzing data from coal-fired units equipped with Selective Catalytic Reduction (SCR) systems to determine the effect of boiler operations on SCR performance. The data show large effects of boiler control settings, SCR operating conditions and boiler transients on stack NO_x levels, reagent usage, and SCR conversion efficiency. Based on these results, we believe there is significant potential to optimize the combined operation of a boiler/sootblowing/SCR system to achieve reduced operating costs.

This project will quantify the benefits of closely coordinating boiler and SCR control settings and boiler sootblowing practice through a series of field tests. The results will be used to develop a methodology for carrying out an optimization of this type.

CONTROL OF AIR PREHEATER FOULING

Air preheater fouling has become a serious problem for some utilities that burn Western fuels or operate SCR reactors. Typically, SO_3 and water vapor from the flue gas are involved in the fouling. With SCRs, SO_3 reacts with ammonia and forms ammonium sulfate and bisulfate salts that deposit in the cold intermediate or hot intermediate layers, where deposits are difficult to remove. With fuel ash rich in calcium, such as Western fuels, SO_3 reacts with calcium from fly ash and forms hard-to-remove cement-like deposits.

This project will identify and explain APH fouling mechanisms, determine possible mitigation techniques and develop guidelines for the project sponsors. The project will involve theoretical studies, laboratory and field experiments and, possibly, development of APH fouling advisory software.

FORMATION AND CONTROL OF SO_3 EMISSIONS

This project will focus on two aspects of the SO_3 emissions problem. A predictive model and software will be developed to compute the rate of formation and emissions of SO_3 as a function of boiler design, boiler and SCR operating conditions and fuel properties. This model will make it possible to estimate the effects of parameters such as unit load, economizer O_2 level, SCR temperature, and air preheater exit temperature on SO_3 emissions.

The second part of the project, concerned with techniques for control of SO_3 emissions, will consist of a critical assessment of the various techniques which have been proposed by various groups in the industry, followed by laboratory development of new processes.

REMOVAL OF AMMONIA FROM FLY ASH

For units equipped with either SCR or SNCR for NO_x control, some of the ammonia injected into the boiler is adsorbed onto the fly ash. Other power plants inject ammonia to control SO₃ emissions or to improve ESP collection efficiency, and in this case, as well, the fly ash adsorbs ammonia.

The ERC has developed a process for removing ammonia from dry fly ash. This process uses a fluidized bed to heat the ash to decompose the ammonium compounds on the ash. The background research has been carried out and the process has been tested at laboratory scale. Utility partners are sought for a project to scale up the process and test it at a power plant.

COMBUSTION OPTIMIZATION FOR MERCURY EMISSIONS CONTROL

The utility industry is exploring a variety of options for Hg capture, including injection of adsorbents and use of catalysts and reagents to increase oxidation of Hg. Results of computer models and laboratory tests on Hg oxidation suggest that the efficiency of mercury oxidation and capture can be influenced by boiler operating conditions.

This project, to be carried out at full-scale, will demonstrate the extent to which mercury emissions from coal-fired power plants can be reduced by optimizing boiler control settings and determine the economic trade-offs.

ABOUT THE ENERGY RESEARCH CENTER

The Energy Research Center is a multidisciplinary research group involving professional staff, faculty, and students. As the focal point for energy related research at Lehigh, the Center manages the University's energy research program and serves as the main energy research contact between the University, industry and government.

The Center was founded in 1973 to provide solutions to the Nation's energy problems. The faculty and staff of the Center participate in many aspects of energy research, with major emphasis on research dealing with energy conversion, power generation and environmental control. The Center's projects cover the spectrum from fundamental engineering and science issues to applied research topics.

Research within the Center is supported by contracts and grants from government and industry. The Center has particularly close ties with industry, with a significant number of joint research projects involving Lehigh faculty, staff and students and staff from private industry. The Center also operates the Energy Liaison Program, which provides consultation and problem-solving assistance to participating companies.

REGISTRATION FORM

I am registering for the Research Planning Workshop, "New Initiatives Dealing with NO_x and Hg Control," November 19-20, 2003, at Lehigh University in Bethlehem, Pennsylvania.

Name _____ Title _____

Organization _____

Address _____

City/State/Zip _____

Telephone () _____ Fax () _____

Return form to: Energy Research Center
Attn: Jodie Johnson
Lehigh University
117 ATLSS Drive
Bethlehem, PA 18015.

NOTE: YOU MAY FAX THIS REGISTRATION TO (610) 758-5959.

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Energy Research Center's website:
www.lehigh.edu/energy

For local area map, flying/driving directions,
and hotel information please visit our Visitors'
Guide at:
www.lehigh.edu/energy/visitors/visitors.htm