

United States  
Environmental Protection Agency  
Electric Power Research Institute  
Research and Development

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**EPR**

# **Symposium on Flue Gas Desulfurization**

## **Program**

The Diplomat Hotel  
Hollywood, Florida

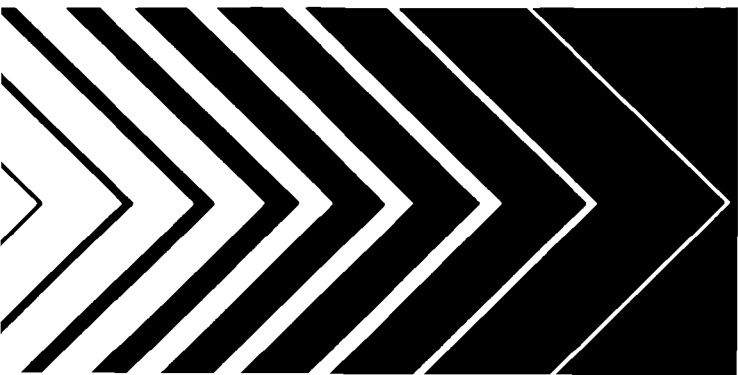
May 17-20, 1982

Sponsored by:

US EPA  
Industrial Environmental  
Research Laboratory  
Research Triangle Park NC 27711

and

Electric Power Research Institute  
Coal Combustion Systems Division  
Palo Alto CA 94303



<b>Symposium Purpose</b>	The purpose of the seventh symposium on Flue Gas Desulfurization (FGD) is to provide a forum for the exchange of technical and regulatory information and developments on the systems and processes applicable to utility and industrial boilers.
<b>Registration</b>	Convention Hall Foyer: Sunday, May 16, 4:00 p.m. to 8:00 p.m. Monday, Tuesday, Wednesday, and Thursday, May 17, 18, 19, and 20, beginning at 8:00 a.m.
<b>Fee</b>	Total registration fee—\$75.00. Nonoptional—\$55.00. Optional—\$20.00, Refreshment Breaks and Mixer. Charge for a spouse or guest at Mixer is \$15.00. Make checks payable to Research Triangle Institute. April 30 is the cutoff date for any refund of the registration fee.
<b>Meeting Rooms</b>	Convention Halls B and C
<b>Special Events</b>	Monday, May 17, 6:00 p.m. to 7:30 p.m. A Get-Acquainted Mixer with a cash bar will be held at Poolside.
<b>Information Center</b>	Incoming messages will be posted on a bulletin board near the registration area. Callers should dial (305) 457-8111 and ask for the EPA/EPRI symposium registration desk.
<b>Preprints</b>	Preprints of symposium presentations will be distributed to paid registrants.
<b>Proceedings</b>	Proceedings, when published, can be obtained from NTIS or the EPRI Research Reports Center (RRC), Box 50490, Palo Alto CA 94303.
<b>Symposium Chairmen</b>	Michael A. Maxwell IERL—RTP, US EPA, MD-61 Research Triangle Park NC 27711  Stuart M. Dalton Coal Combustion Systems Division EPRI Palo Alto CA 94303
<b>Program Chairman</b>	Julian W. Jones IERL—RTP, US EPA, MD-61 Research Triangle Park NC 27711
<b>Symposium Coordinator</b>	Franklin A. Ayer Research Triangle Institute P.O. Box 12194 Research Triangle Park NC 27709 (919) 541-6260

**Symposium on Flue Gas Desulfurization**  
**Symposium Chairmen: Michael A. Maxwell, EPA**  
**Stuart M. Dalton, EPRI**

**Monday Morning, May 17, 1982**

**Opening Session**

**Chairmen: Michael A. Maxwell, EPA**  
**Stuart M. Dalton, EPRI**

**Session 1**

- 9:00 Welcome and Introduction—Michael A. Maxwell, Chief, Emissions/Effluent Technology Branch, Industrial Environmental Research Laboratory, EPA, Research Triangle Park NC; and Stuart M. Dalton, Program Manager, Coal Combustion and Systems Division, EPRI, Palo Alto CA
- 9:10     **1A**     Keynote Address: Kilowatts from Coal—H. William Elder, Assistant Director, Division of Energy Demonstrations and Technology, Office of Power, TVA, Muscle Shoals AL
- 9:40     **1B**     Status of Air Legislation/Regulations—Walter C. Barber, Director, Office of Air Quality Planning and Standards, EPA, Research Triangle Park NC.
- 10:10    **1C**     Status of Solid Waste Regulations—Stephen A. Lingle, Chief, Technology Branch, Hazardous Industrial Waste Division, EPA, Washington DC
- 10:40             Break
- 11:10    **1D**     Trends in Commercial Applications of Flue Gas Desulfurization—Bernard A. Laseke, PEDCo Environmental, Inc., Cincinnati OH
- 11:40    **1E**     Economic Evaluation and Comparison of Alternative Limestone Scrubbing Options—T. A. Burnett, Robert L. Torstrick\*, and S. A. Sudhoff, TVA, Muscle Shoals AL
- 12:10             Lunch

**Monday Afternoon, May 17, 1982**

**Materials of Construction**

**Chairman: Charles E. Dene, Project Manager,**  
**EPRI, Palo Alto CA**

**Session 2**

- 1:30     **2A**     Materials Problem: Operating a Closed-Loop Limestone FGD System—Daniel A. Froelich\*, Burns & McDonnell Engineering Co., Kansas City MO; and Marcus Ware, South Mississippi Electric Power Association, Hattiesburg MS

- 2:00     **2B**     Fiberglass Reinforced Plastics and Their Successful Use in Flue Gas Desulfurization Equipment—Winston J. Renoud, Fiberglass Structural Engineering, Inc., Bellingham WA
- 2:30     **2C**     Full-Scale DA FGD Experience at Central Illinois Public Service Company's Newton Station—Jerry L. Simpson\* and Richard J. Grant, Central Illinois Public Service Company, Springfield IL
- 3:00             Break
- 3:30     **2D**     Laboratory and Field Evaluation of Materials for Flue Gas Desulfurization Systems—Gerhardus H. Koch\* and John A. Beavers, Battelle Columbus Laboratories, Columbus OH
- 4:00     **2E**     Materials of Construction Problems at Pleasants Power Station—William R. Cress\* and Terry L. Misner, Allegheny Power Service Corp., Greensburg PA
- 6:00–7:30        Get-Acquainted Mixer and Cash Bar
- Session 3**        **Tuesday Morning, May 18, 1982**  
**Dual Alkali**  
**Chairman: Norman Kaplan, Chemical Engineer,**  
**EPA, Research Triangle Park NC**
- 8:30     **3A**     Results of DOWA Technology Tests at the Shawnee Scrubber Facility—Gerald A. Hollinden\*, TVA, Chattanooga TN; Steven J. Pfeffer, UOP Inc., Norwalk CT; Daniel B. Smith, UOP Inc., Des Plaines IL; and Richard A. Runyan and Steve F. Newton, TVA, Chattanooga TN
- 9:00     **3B**     Full-Scale Dual Alkali Demonstration at Louisville Gas and Electric—Norman Kaplan\*, EPA, Research Triangle Park NC; and Elizabeth D. Gibson and Lawrence R. Woodland, A. D. Little, Inc., Cambridge MA
- 9:30     **3C**     Double Alkali Flue Gas Desulfurization Retrofit on an Industrial Cogeneration Facility—D. V. Francis\*, ARCO Chemical Co., Monaca PA; and R. S. Biolchini and J. D. Coons, FMC Corporation, Itasca IL
- 10:00    **3D**     Pilot Testing of Limestone Regenerated in Dual Alkali Processes—John C. S. Chang and J. H. Dempsey\*, Acurex Corporation, Research Triangle Park NC; and Norman Kaplan, EPA, Research Triangle Park NC
- 10:30             Break

## Session 4

**Special Studies**

**Chairman: Dorothy A. Stewart,  
Project Manager, EPRI,  
Palo Alto CA**

- 11:00      **4A**      Chloride Ion Effects on Limestone FGD System Performance—John C. S. Chang\*, Acurex Corporation, Research Triangle Park NC; and Dennis Laslo, Peabody Process Systems, Inc., Stamford CT
- 11:30      **4B**      FGD Chemistry and Water Integration—Dorothy A. Stewart\*, EPRI, Palo Alto CA; and O. W. Hargrove, Jr., Radian Corporation, Austin TX
- 12:00      **4C**      Continuous Emission Monitoring of Flue Gas Desulfurization Systems—Peter R. Westlin, EPA, Research Triangle Park NC
- 12:30      **4D**      Full-Scale Utility Flue Gas Desulfurization System Characterization Results—Richard G. Rhudy, EPRI, Palo Alto CA; Wayne E. Morgan\*, Black & Veatch Consulting Engineers, Kansas City MO; and P. S. Lowell, P. S. Lowell & Company, Inc., Austin TX

**Tuesday Afternoon, May 18, 1982**

**No Formal Session Scheduled**

2:00–4:30      Optional seminar—"Limestone FGD Scrubbers: User's Handbook."

**Evening Panel  
7:30–9:30**

**Tuesday Evening, May 18, 1982**

**Panel: Reliability and Maintenance**

**Chairman: Thomas M. Morasky, Manager,  
Reliability and Nonrecovery  
Systems, EPRI, Palo Alto CA**

**How Reliable Should an FGD System Be?—  
David W. Joos, Black & Veatch Consulting  
Engineers, Kansas City MO**

**Failure Mode Analysis for Lime/Limestone FGD  
Systems—Harvey S. Rosenberg, Battelle  
Memorial Institute, Columbus OH**

**Reliability of Lime/Limestone FGD Tech-  
nology—Bernard A. Laseke, PEDCo Environ-  
mental, Inc., Cincinnati OH**

**FGD Reliability Improvement at the Bruce  
Mansfield Plant—Russell C. Forsythe,  
Pennsylvania Power Co., New Castle PA**

**Positive Thoughts about FGD Reliability—  
James H. Buckner, TVA, Chattanooga TN**

**Design Features of a Highly Reliable FGD  
System—Christopher P. Wedig, Stone &  
Webster Engineering Corporation, Boston MA**

Reliability Engineering: The Source of Dependable Plant Operations—G. Michael Curley, Utah Power & Light Co., Salt Lake City UT

**Wednesday Morning, May 18, 1982**

**Flue Gas Treatment (Combined SO<sub>x</sub>/NO<sub>x</sub>) Removal**

**Chairman: J. David Mobley, Environmental Engineer, EPA, Research Triangle Park NC**

**Session 5**

- 9:00      **5A** - SO<sub>x</sub> and NO<sub>x</sub> Removal for Coal-Fired Boilers in Japan—Jumpei Ando, Chuo University, Tokyo, Japan
- 9:30      **5B** EPA's Pilot Plant Evaluation of NO<sub>x</sub> and NO<sub>x</sub>/SO<sub>x</sub> Flue Gas Treatment Technology—Jack M. Burke\*, Radian Corporation, Austin TX; and J. David Mobley, EPA, Research Triangle Park NC
- 10:10     **5C** DOE's Electron Beam Irradiation Developmental Program—Edward C. Trexler, DOE, Washington DC

10:30      Break

**Session 6**

**Limestone/Organic Acid**

**Chairman: J. David Mobley, Environmental Engineer, EPA, Research Triangle Park NC**

- 11:00     **6A** Buffer Additives for Lime/Limestone Scrubbing: A Review of R&D Results—Gary T. Rochelle, University of Texas, Austin TX
- 11:30     **6B** Results of Industrial and Utility Boiler Full-Scale Demonstration of Adipic Acid Addition to Limestone Scrubbers—J. David Colley and O. W. Hargrove, Jr.\*, Radian Corporation, Austin TX; and J. David Mobley, EPA, Research Triangle Park NC
- 12:00     **6C** Commercial Application Experience with Organic Acid Addition at Springfield City Utilities—N. Dale Hicks\* and David Fraley, Springfield City Utilities, Springfield MO

12:30      Lunch

**Wednesday Afternoon, May 19, 1982**

**Lime/Limestone Utility Applications**

**Chairman: Charles C. Masser, Environmental Engineer, EPA, Research Triangle Park NC**

**Session 7**

- 2:00      **7A** Flue Gas Desulfurization Operations at Apache Station—Robert L. Maurice, Jr., Arizona Electric Power Cooperative, Inc., Cochise AZ

- 2:30      **7B**      Evaluation of Alternative FGD System Removal Efficiency and Reliability Improvement Options at APS Four Corners Units 1, 2, and 3—David W. Joos\* and W. E. Morgan, Black & Veatch Consulting Engineers, Kansas City MO; J. G. Noblett, Jr., P. S. Lowell & Co., Inc., Austin TX; and C. D. Allen, Arizona Public Service Co., Phoenix AZ
- 3:00      Break
- Session 8**      **By-Product Disposal/Utilization**  
**Chairman: Julian W. Jones, Chemical Engineer, EPA, Research Triangle Park NC**
- 3:30      **8A**      Characterization and Environmental Evaluation of Full-Scale Utility Waste Disposal Sites: March 1982 Status Report—Chakra J. Santhanam\*, Charles B. Cooper, and Armand A. Balasco, A. D. Little, Inc., Cambridge MA; and Julian W. Jones, EPA, Research Triangle Park NC
- 4:00      **8B**      Summary of EPRI FGD Sludge Disposal Research—Dean M. Golden, EPRI, Palo Alto CA
- 4:30      **8C**      Utilization of FGD By-Product Gypsum—Stephen D. Jenkins\*, Tampa Electric Co., Tampa FL; and William Ellison, Ellison Consultants, Monrovia MD
- 5:00      **8D**      Characteristics of By-Products from Dry Scrubbing Systems—Carol May Thompson\*, Radian Corporation, Austin TX; and Richard G. Rhudy, EPRI, Palo Alto CA
- Session 9**      **Thursday Morning, May 20, 1982**  
**Dry FGD Systems**  
**Chairman: James D. Kilgroe, Manager, Dry Scrubbing Program, EPA, Research Triangle Park NC**
- 9:00      **9A**      Current Status of Dry Flue Gas Desulfurization Systems—Mary E. Kelly\*, Radian Corporation, Austin TX; James D. Kilgroe and Theodore G. Brna, EPA, Research Triangle Park NC; and Richard G. Rhudy, EPRI, Palo Alto CA
- 9:30      **9B**      Dry FGD Pilot Plant Results: Lime Spray Absorption for High Sulfur Coal and Dry Injection of Sodium Compounds for Low Sulphur Coal—Eric A. Samuel\*, Thomas W. Lugar, Dennis E. Lapp and Owen F. Fortune, General Electric Environmental Services, Inc., Lebanon PA; Theodore G. Brna, EPA, Research Triangle Park NC; and Ronald L. Ostop, Department of Public Utilities, City of Colorado Springs, Colorado Springs CO

10:00	9C	EPRI Spray Drying Pilot Plant Status and Results—Gary M. Blythe*, John M. Burke, Mary E. Kelly, and Larry A. Rohlack, Radian Corporation, Austin TX; and Richard G. Rhudy, EPRI, Palo Alto CA
10:30		Break
11:00	9D	Demonstration of SO <sub>2</sub> Removal on a Coal-Fired Boiler by Injection of Dry Sodium Compounds—Lawrence J. Muzio* and T. K. Sonnichsen, KVB Inc., Irvine CA; Richard Hooper, EPRI, Palo Alto CA; George P. Green, Public Service Company of Colorado, Denver CO; and N. D. Shah, Multi Mineral Corporation, Grand Junction CO
11:30	9E	Dry Scrubbing at Northern States Power Company Riverside Generating Plant—S. M. Kaplan, Niro Atomizer, Inc., Columbia MD; Robert C. Hyde, Joy Manufacturing Company, Los Angeles CA; and Carl A. Sannes* and Michael F. Skinner, Northern States Power Co., Minneapolis MN
12:00	9F	Atomization—The Key to Dry Scrubbing at the Coyote Station—Merrill F. Lewis*, Montana-Dakota Utilities Co., Beulah ND; and Dennis C. Gehri, Rockwell International Corporation, San Francisco CA
12:30	9G	SO <sub>2</sub> Control with Limestone in Low NO <sub>x</sub> Systems Development Status—Dennis C. Drehmel*, G. Blair Martin, and James H. Abbott, EPA, Research Triangle Park NC
1:00		Closing Remarks—Michael A. Maxwell, EPA Stuart M. Dalton, EPRI
1:15		Adjournment