PAUL S. FARBER
PRINCIPAL
P. FARBER & ASSOCIATES, LLC
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EMISSIONS CONTROL CONSULTING

SUMMARY:

- Over 35 years of experience in the development and evaluation of environmental control options for fossil fuel power plants.
- Development of emissions control options for regulatory compliance
- Expertise with FGD and Sorbent Injection systems including process evaluation and design, performance testing, and field technical assistance.
- Assistance to clients with the selection, specification, and technical assistance for electrostatic precipitators (ESP's), fabric filters, and flue gas desulfurization (FGD) systems.
- Development of emissions monitoring systems including the development of performance and emission test plans
- Environmental due diligence reviews, emission estimating, condition assessments, and feasibility/siting studies

SUMMARY OF QUALIFICATIONS:

More than 35 years of professional environmental engineering experience including all phases of environmental engineering from research through permitting and control system startup. Involvement in numerous projects encompassing being the responsible engineer for the design and engineering of over 10,000 MW of environmental control systems, upgrades to more than 800 MW of dry scrubbing systems to meet new permit requirements, analysis, design, and specification for 5,000 MW of emissions control systems on existing coal fired plants, and the analyses of control options for numerous plants (over 10,000 MW) for the most economical and technically efficient scenario for compliance.

Independent engineering review of potential environmental liabilities and costs associated with the acquisition of fossil and nuclear units; specification of, and responsible charge for the compliance and performance testing of wet and dry FGD systems, dry sorbent injection and mercury reduction systems. General consultant for FGD and particulate control technologies as well as emissions source sampling and testing.

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PROFESSIONAL EXPERIENCE:

- For a US Utility developed test plans to evaluate trona, sodium carbonate, and hydrated lime for SO_2 emissions reduction. Evaluated proposals for supply of sorbent injection systems and emissions testing. Supervised wide range of dry sorbent injection tests, evaluated test results, and recommended emissions reduction approach to client.
- Developed test plan for coal-fired utility to evaluate hydrated lime for emissions reduction and compliance with MATS regulations. Evaluated test results and recommended modifications to existing emissions control equipment and implementation of lime injection systems to improve Unit performance with minimal capital outlay.
- As a manager of air pollution control with Chemical Waste Management, an allied company to Waste Management Inc. was deeply involved in hazardous wastes incineration including the design and startup of the first hazardous waste incineration system in Hong Kong and assisted Waste-to-Energy facilities within Waste Management in addressing issues both with wastes combustion (mass burn systems) as well as their related air pollution control systems.
- Assisted an international utility in evaluating proposals for 3 FGD systems and recommending the preferred technical approach. Subsequently worked with the Utility technical & commercial staff in finalizing conformed specifications and commercial contract.
- Evaluated options for emissions reduction and regulatory compliance for several utilities. Studies compared installation of fabric filters versus upgrades to existing ESP's, SO_2 emissions reduction with wet & dry FGD and sorbent (sodium and calcium based) injection, and mercury emissions reduction using carbon and/or fuel additives. Recommendations presented and procurement specifications developed for recommended systems.
- Evaluated emissions data to determine compliance necessary under Utility MATS for coal-fired unit operations. Recommended cost-effective compliance approaches and developed bid specifications for sorbent injection and ESP upgrades.
- Working with a Utility developed and managed a test program of multiple carbons for mercury emissions control. Based on the test program results recommended carbon type for full scale testing, managed the test program, and analyzed the data. Data analysis was able to demonstrate to regulatory authorities compliance with New Source Review requirements.
- Evaluated operation of particulate removal and wet and dry FGD systems for several utilities and recommended options for performance improvement. Developed specifications for upgrades to existing emissions control systems and worked with utilities to implement these in a cost effective manner.

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- As the lead environmental engineer for the performance testing and system evaluation of new Wet FGD systems at the Duck Creek, Coffeen, and Sioux Power Stations developed the testing plans, supervised the test contractor, and evaluated the performance test data to determine supplier compliance with system performance guarantees, reagent, and power consumptions.
- Lead environmental engineer in the development of a test program to evaluate mercury emissions reduction with cement compatible carbons in fly ash. The testing program included evaluation of the mercury reduction potential as well as the quality of concrete produced from the carbon containing fly ash.
- Was the lead engineer of a multidisciplinary team to correct operating and compliance issues with several hazardous wastes incinerators. Developed corrective recommendations for operation of the incinerators and the related air pollution control equipment.
- Expert testimony and depositions related to operating and design problems of a circulating dry scrubber system on a wastes incinerator.
- Expert opinion in a civil suit regarding the location of a hazardous waste incinerator and air pollution control system.
- Expert opinion on possible causes for an industrial accident with an air pollution control system.

EDUCATION

University of Illinois - M.S. Energy Engineering - 1980

City College of New York - B.S. Chemical Engineering - 1968

REGISTRATIONS

Licensed Professional Engineer — Illinois, Ohio

Board Certified Environmental Engineer — American Academy of Environmental Engineers

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DETAILS OF PREVIOUS ASSIGNMENTS

- **MidAmerican Energy**

  Lead environmental engineer for the specification, design, and installation of the Selective Catalytic Reduction (SCR) and dry FGD system for the 850 MW Walter Scott (formerly Council Bluffs) Unit 4. Responsibilities included development of the specifications, conformance of the technical sections of the contract, review of drawings, flow model tests, and other process information and analysis of performance test data.

  Lead environmental engineer for the design and installation of the dry FGD system at the 800 MW Louisa Generating Station. Responsibilities included development of design criteria, preparation of specifications, review and analysis of proposals, conformance of the specifications into the final contract, review of documents and drawings, and review and analysis or the performance test results,

- **Portland General Electric**
  - Lead environmental engineer in the development of a test program to evaluate mercury emissions reduction with cement compatible carbons in fly ash. The testing program included evaluation of the mercury reduction potential as well as the quality of concrete produced from the carbon containing fly ash. Evaluation of the dry FGD systems to achieve mandated State emission levels, development of estimated for design and construction of system for 600 MV PRB-fired power plant.

- **Midwest Generation**

  - Lead environmental engineer in Owners Engineer Team for installation of SCR and dry FGD system on the 1800 MW of PRB-fired boilers at the Powerton Station. Review of EPC Contractor and OEM Supplier drawings and documents, technical assistance to client and participation in meetings with Contractor and OEM.

- **Dynegy Midwest Generation**

  - Lead environmental engineer for the design and installation of 2,400 MW of dry FGD systems at the Havana and Baldwin Power Stations. Responsibilities included the development of the specifications for the dry FGD systems, evaluation of received proposals, conforming of specifications, and review of supplier submitted documents and drawings. Development of startup and operating procedures for dry FGD and carbon injection systems for mercury emissions reductions.

  - Design and specification for activated carbon injection systems for mercury control. Review of documentation from selected supplier.

  - Development of performance test plans for baghouses and activated carbon injection systems for mercury emissions reduction. Analysis of data from mercury reduction

performance testing.

- **American Electric Power**

  - Design and analysis of dry FGD systems and baghouses at 4 550 MW Units of the Welsh and Flint Creek Power Plants. Assignments included development of General Arrangements, sizing of all major equipment and development of cost estimates.

  - Condition assessment of lime-based wet FGD systems at Conesville Power Plant. Preparation of study detailing installation of new FGD capability at Conesville as well as potential for upgrading lime-based wet FGD systems to limestone including installation of forced oxidation modules.

  - Design and specification of emissions control systems for Turk, new 600 MW, coal fired power plant

- **Great Northern Power Development, L.P.**

  - Develop emissions control options for 2x250 Mw Circulating Fluidized Bed power plant. Specify technology for sulfur dioxide, nitrogen oxides, and particulates control to meet BACT (2002)

- **Tucson Electric Power**

  - Lead process engineer for upgrades to 2 existing 400 MW coal-fired boilers and assistance on overview of new 400 MW unit. Condition assessment of existing flue gas desulfurization systems to determine needed improvements. Development of plans and specifications for upgrades to FGD system. Worked with TEP staff to coordinate engineering and construction of additions to FGD system. Review of environmental systems designs for new coal-fired unit including flow model reviews.

- **Hyundai Engineering**

  - Perform engineering review of plans and specifications for flue gas desulfurization (FGD) system planned for KEPCO power plant. Assist Hyundai in a technical review of proposals as well as provide expertise in the construction and operation of FGD systems. (2002)

- **Exelon Corporation**

  - Participated in due diligence review of the generating asset securitization project undertaken to support a bond offering by Exelon involving more than 142 existing fossil, nuclear, and hydroelectric units in the U.S. Midwest and East. (2000)

- **NRG Energy**

  - Development of test plan for evaluation of halogenated and non-halogenated carbons

for mercury emissions reduction at the Indian River Station. Participation in field testing and evaluation of mercury reduction and particulates emissions data. Recommendations t Indian River Staff on type of carbon and injection levels best suited for compliance with mercury reduction regulations. Development and participation in compliance testing including oversight of testing contractor and interaction with State Regulatory Inspector.

- Participated in due diligence review of the Pike County combined cycle project in Mississippi, covering environmental matters. (2001 -2002)

- Development of specifications for the upgrading, including installation of forced oxidation systems, of the wet FGD systems at the Limestone Power Plant. Assist NRG in conforming the technical contract with the selected contractor.

- **Confidential Client (Southwest U.S.)**

  - Participated in due diligence review of the generating assets at several stations being considered for purchase by a major electric utility in the Southwest. Covered environmental matters. (2001)

- **El Paso Natural Gas**

  - Handled environmental aspects of the due diligence review of the Macae project in Brazil, which consists of 20 simple cycle combustion turbines. (2002)

- **Confidential Client (Midwestern U.S.)**

  - Handled environmental aspects of the due diligence review of a boiler replacement project for a coal-fired plant in the Midwestern U.S. (2001-2002)

- **Owensboro Municipal Utilities**

  - Develop specifications for catalysts, mixers, and reagent systems for NO_x removal on all units. Responsible for supplier selection and guidance of engineering design for SCR reactor and associated systems including flow model testing, as well as for equipment and systems for non-catalytic NOx reduction. (2001 to 2002)

- **Southern Illinois Power Cooperative**

  - Development of Risk Management Plan for anhydrous ammonia storage system including leading and participating in HAZOP development and review, development of Emergency Response Plan and supervision of dispersion studies for chemical release scenarios. (2001 to 2002)

- **Confidential Client**

- Independent engineering review of potential environmental liabilities and costs associated with the acquisition of fossil and nuclear units. Included development of emissions trading scenarios to maintain compliance and minimize economic impacts. (2000 to 2001)

- **First Energy**

  - Evaluation of feed systems for SCR unit. Development of process economics as well as technical and safety factors of alternative chemical choices. (2000 to 2001)

- **Reliant Energy**

  - Analysis of control options for 8 plants (10,000 MW) for most economical and technically efficient scenario for compliance. Analysis of operating data from all plants and development of load profiles for annual and ozone season operations. (2000 to 2001)

- **MidAmerican Energy**

  - Design of SO2 emissions reduction systems for new 840 MW coal fired power plant. Development of specifications for supply of needed equipment and systems, and coordination with other disciplines to integrate the project execution.