

RETROFIT OF AIR POLLUTION CONTROL EQUIPMENT AT THE SPSA/NAVY POWER PLANT

Matthew J Clark, PE
Site Manager
HDR Engineering, Inc.

R. William Sutton, PE
Senior Mechanical Engineer
HDR Engineering, Inc.

R. Lane Brown
Plant Manager
Southeastern Public Service Authority of Virginia

ABSTRACT

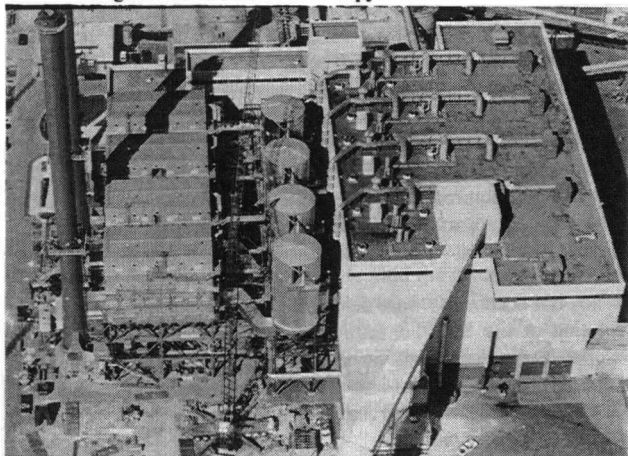
This paper will take the reader beyond the project management aspects of the described air pollution control retrofit at the SPSA/Navy power plant. It takes an inside look at the detailed issues of design, construction and operation of all equipment associated with this project. This paper will highlight many of the lessons learned and experience gained on the production side of the project.

Although requiring considerable extra effort by many of the parties involved, the project has thus far proven to be very successful and the air pollution control systems have operated well within the requirements of the contract documents and the EPA Emissions Guidelines.

INTRODUCTION

The Southeastern Public Service Authority of Virginia (SPSA) operates a 2000 ton per day refuse derived fuel (RDF) and coal fired power plant, shown in fig. 1, for the US Navy at the Norfolk Naval Shipyard in Portsmouth, Virginia. SPSA responded to the 1991 EPA "Emission Guidelines", a 1992 state of Virginia consent agreement and the forthcoming federal regulations (40 CFR 60, Subpart Cb) by proceeding with an air pollution control equipment retrofit.

Figure 1: Norfolk Naval Shipyard Power Plant



DESIGN

Plant Arrangement

The power plant consists of four stoker fired boiler trains designed to burn RDF(500 tons per day each) and/or coal on the grate. Each boiler produces 180,000 PPH of steam at 700 psig (47.6 atmospheres) and 750° F (399° C). The steam is used to drive three condensing steam turbines which produce electric power for parasitic load at the power plant and the shipyard with any excess sold to Virginia Power. Extraction steam is exported to the shipyard for building and ship-board heating. The flue gas from each boiler train passes through individual mechanical collectors and hot side electrostatic precipitators (ESP) for particulate collection. Flue gas leaves the economizer and enters the ESP at approximately 650° F (343° C). A regenerative Ljungstrom air heater recovers residual heat from the flue gas prior to exiting to the stack by way of the I.D. fan.

Design Considerations

Driven by the Emissions Guidelines and the consent agreement with the state of Virginia, SPSA contracted with HDR Engineering in 1991 to conduct a study to investigate available technologies for control of SO₂ and HCl as well as particulate, dioxin/furans and heavy metals. One of the first steps of the study was to contract for flue gas sampling and analysis to establish a baseline for current plant performance. This was necessary because no baseline for emissions other than opacity existed and from plant instrumentation it appeared that boiler performance had deteriorated from the original design. The study concluded that a Spray Dryer Absorber (SDA) and Fabric Filter (FF) would be required to meet Maximum Achievable Control Technology (MACT).

In order to establish the performance requirements for the SDA/FF retrofit, flue gas samples and measurements were taken downstream of the economizer. These measurements included flue gas flow rate, flue gas temperature and the emissions rates for acid gases, heavy metals, and dioxin/furans. From these tests, field instrumentation and original plant design data, the performance requirements for the SDA/FF retrofit were developed. Table 1 shows the original design conditions for the boilers and the design conditions for the SDA/FF retrofit.