

ANATOMY OF A WTE RETROFIT: START TO FINISH

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ABSTRACT

This paper describes the retrofit of scrubber/baghouse air pollution control systems at an existing coal and refuse-derived fuel fired power plant located in Portsmouth, Virginia. The paper will describe the reason for the retrofit, the initial planning process, financing of the project, engineering and procurement decisions and their rationale, key construction issues, initial performance test results, and lessons learned. The initially projected and actual costs for project implementation will also be described.

INTRODUCTION

Southeastern Public Service Authority of Virginia (SPSA) is an integrated solid waste management authority serving the residential and commercial sectors for eight communities in southeastern Virginia's Tidewater area. A key element of the integrated solid waste management strategy is the preparation of Refuse-Derived Fuel (RDF), which is burned to produce steam and electricity for the US Navy's Norfolk Naval Shipyard. SPSA owns and operates the RDF production facility, and operates the coal and RDF-fired power plant for the US Navy.

Refuse-Derived Fuel Production

The RDF production facility consists of three parallel lines of production capacity, with total processing capability of 2,000 tons (1814.3 Mg) per day on a two-shift basis. Municipal solid waste (MSW) is delivered to the facility by transfer trailers from SPSA's eight transfer stations, and by packer trucks from the local communities and commercial haulers.

Mixed MSW is converted to RDF in a two-stage trommelling process, which includes several stages of magnetic separation of ferrous materials, as well as handpicking of

aluminum beverage cans. The oversized materials are shredded in a vertical hammer mill, and the undersized materials are diverted to the landfill. The process produces minus 4-inch (10.2 mm) size fuel with an average heat content of 5,400 Btu/lb. (12,552J/g).

RDF is transported to the Norfolk Naval Shipyard Steam Plant by a belt conveyor consisting of underground and overhead sections. At the power plant, the fuel is either fed directly to the boilers or stored in a pit for later recovery with a grapple crane.

Power Plant Description

The power plant consists of four stoker-fired boilers, each rated for 550 tons per day of RDF (498.9 MG per day) or 133 tons per day of low sulfur stoker coal (120.7 MG/day). The boilers produce superheated steam at 700 psig (48.3 bar) and 750F (398.9 C). Steam is used to drive condensing steam turbine generators, and turbine extraction steam is transported to the shipyard for use in process and heating systems. The primary fuel at the power plant is RDF, supplemented by coal during periods of RDF feed interruption or shortage.

The original power plant air pollution control equipment consisted of a cyclone separator located upstream of a hot precipitator (ESP), followed by a regenerative air heater, induced fan, and stack discharge. The cyclone was used to remove large particles and "sparklers" from the flue gas stream before entering the ESP. The ESP was configured in eight electrical fields and equipped with eight hoppers for ash discharge. The extensive modifications to the original air pollution control system are described below.