

Materials Selection in Air Pollution Control Equipment
for Refuse Fired Systems

by

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As air pollution emission code requirements have become more and more stringent over the past several years, it has become increasingly important to design new refuse incineration facilities, or retrofit existing facilities, with sophisticated, pre-engineering gas cleaning equipment. Three basic types of equipment have been used on incinerators to meet present-day air pollution emission requirements: bag filters, electrostatic precipitators; and wet scrubbers. Problems and excessive maintenance costs at many of these plants point up the need for better information related to selection of materials of construction in this type of facility.

To the best of my knowledge, only four municipal incinerator sized installations have used bag filters - Pasadena, Calif.; Orchard Park, N.Y. (the Torrax unit); E. Bridgewater, Mass. (at plant owned and operated by CEA); and Nashville, Tenn. (a pilot scale unit). None of these installations operated long enough to generate meaningful information on selection of materials of construction. The bags in the Orchard Park Installation burned out shortly after plant startup due to a high temperature excursion. This serves to highlight what is potentially the most serious problem with this type of installation.

Over thirty electrostatic precipitator units have been installed on U.S. incinerator facilities to date. Many more than this are operating on plants in Europe and other parts of the world. Most of these facilities are presently operating with minimum corrosion problems and generally acceptable levels of maintenance. I am aware of two specific corrosion problems in this type of air pollution control facility. One problem reported on in some detail at the 1974 ASME Winter Annual Meeting [1], involved two New York City installations originally placed in operation in 1969. The author, Mr. P. Franconeri, concluded that the corrosion attack on these units was primarily due to low temperature corrosion caused by long down-time, low temperatures, the presence of moisture, and deposits on the precipitator surfaces that were acidic in nature. Discussors of this paper at the time of presentation suggested several additional possible reasons for the attack including the proximity of these installations to salt water, and the reported flow of some of the gases from the operating furnaces through these units when they were not in operation.

The second instance of corrosion of electrostatic precipitators was reported to us during our 1972 tour of West German facilities. Zinc chloride was reported as the agent in this corrosion attack. Corrosion was reported to begin at a temperature of 561 to 789°K (550°F to 600°F). Above temperatures of 603°K to 616°K (625°F to 650°F), the attack proceeded very rapidly. Location of the attack varied widely. The temperature range at which the attack was most severe seemed to be rather narrow.

The zinc chloride deposits were reported to be very hard, black and shone like they were polished. The melting point of the deposits was 518°K (472°F). No similar experience has been reported as yet in the United States, to my knowledge.

Over 75 units, broadly classified in the general literature as wet scrubbers, have been utilized in incinerator facilities over the past 15 years. These units range from wetted baffle walls, largely constructed of refractory materials, to tray-type and venturi scrubbers, usually fabricated from metals. Over thirty of the tray-type and/or venturi pre-engineered and fabricated scrubbers have been installed and/or are operating on municipal sized refuse incinerator plants. It is generally conceded that this type of facility is capable of meeting present air pollution emission requirements, and will be required to meet future emission limitations.

There have been many instances of material failures in wet scrubber installations. The hot acidic environment will attack most metals, while the chlorides in the flue gases render many stainless steels unsuitable for this service. Failure of non-metallic materials has occurred when they have been improperly applied or they have been subjected to operating conditions, either over short periods or continuously, for which they were unsuited.

Much information on the performance of different materials of construction at a number of installations was presented in a paper [2] by this author at a meeting in January of 1976. While this paper is useful in developing empirical information on proper materials to use in wet scrubber installations, much work can and should be done to identify the exact mechanism of failure in this type of installation so that an intelligent engineering analysis can be made as to whether other suitable but less expensive materials of construction can be utilized in this service.

Much work can and should be done in this field of application to improve the technology and the economics of this important pollution control technique.

BIBLIOGRAPHY

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2. C.O. Velzy, "Materials of Construction for Wet Scrubbers for Incinerator Applications", from Resolving Corrosion Problems in Air Pollution Control Equipment, by National Association of Corrosion Engineers, 1976.