

York Resource Recovery Center Metal Spray Success

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Abstract

Early US waste-to-energy plants were constructed using conventional boilers designed for fossil fuels, gas, and oil. Combusting MSW exposed those boilers to high levels of sulfides and chlorides that caused accelerated corrosion problems. MSW fuel required higher amounts of excess air that resulted in high furnace gas velocities and metal erosion. Depending upon the individual design of each boiler, effects of higher upper furnace temperature, flame impingement, and flyash carry over were reported. This paper describes a test conducted to extend the useful metal life of superheater tubes by employing recently developed high velocity continuous combustion (HVCC) metal spray materials.

Introduction

The three combustion units at the York Resource Recovery Center use the Westinghouse Electric design (1987) consisting of an O'Connor Rotary Combustor fitted to a single-pass waste heat boiler. Several design aspects of the boilers and conditions of the operation cause severe metal wastage in the superheater compartments. Tube design, furnace gas temperature, steam temperature, and superheater metal material led to superheater tube failures after only six months of operation in 1998.

The boiler's radiant cross-sectional dimensions are 22 feet x 20

feet (6m x 6.7m) with a vertical height of 56 feet (17m). The rotary combustors penetrate the boilers near the bottom of the chamber. Flame impingement and high velocity furnace gas problems in the radiant section caused the original plant operator to protect a large area of the lower radiant section with refractory.

Combustion gas leaves the rotary combustor flowing into a single pass boiler, spirals up through the firebox, and makes a ninety-degree turn to pass through screen tubes and into the superheater compartment. Furnace gas temperature near the entrance of the screen tubes averaged a temperature of 1375° F (746 Celsius) through most of the normal operation while the lower furnace walls were refractory coated. (See Figure 1 York Boiler Configuration)

The original boilers were fitted with two superheater sections with pendants fabricated of 2 in. OD x .135 in. wall thickness, SA-213 T11 designed for 900° F and 1100 PSIG, steam temperature and pressure respectively, corresponding to a gas temperature of 1332° Fahrenheit and steam temperature of 810° F. The higher than expected upper furnace temperature was related to the refractory protection installed on the lower radiant water wall tubes.

Within six months of the initial plant start-up and operation, the