

State of the Art of Thermal Spray Technology in the International Waste To Energy Industry

Iain Hall, Kwang Han and Zheng-Rong Shui
IGS Technology Center, 2713 Oak Lake Blvd, Midlothian, VA, 23112

ABSTRACT

International Waste to Energy and Incineration markets are likely to continue to grow in capacity over the next 5 to 6 years. With this comes a greater need to burn more corrosive materials combust at higher temperatures and extract more energy. The reliability burden that this places on operators of plants will re-open opportunities for thermal spray solutions. Where maintenance costs, opportunity costs and access restrictions may preclude alternative in-situ technologies, thermal spray technology may fill a gap in providing new reliable and flexible process and materials technologies for at least the mid- term protection of water wall and superheater tubes. The state of the art of the technology is such that coating performance in WTE corrosive environments now approach the performance of corrosion resistant wrought materials. This is verified through accurate laboratory modeling and scale tests and trials conducted by OEM's and plants.

BACKGROUND

The need for incineration capacity for waste materials, whether from municipal solid waste or from industrial waste requirements is increasing internationally as a result of zero landfill and aggressive recycling policies. For many European and Japanese markets waste incineration is the only viable alternative to previous methods of waste disposal. The European Union Landfill Directive (1999/31/EC) specifically precludes certain materials such as hospital waste, tires, and certain reactive and flammable materials from land filling, [1]

Increased demand for combined heat and power (CHP) plants and the use of renewable resources for fuel is set to double. The electricity market share will increase from 9% to 18% by 2010 demanding an increase from 6% to 12% in the use of renewable fuel sources. As a consequence, new plants have to be built and existing plants need to be modified and made more efficient [2].

The presence of highly corrosive elements in these waste fuels such as Cl, S, Na, Zn, Pb, Al when taken in combination with free H₂O and oxidizing conditions can lead to rapid corrosion of boiler tube waterwalls and superheater tubes. In order to minimize the extent of this wastage, and in doing so increase plant reliability, plant operators will conservatively maintain maximum steam conditions at 400°C (752°F) and 40bar(580psi.). Increased demands for energy efficiency and emission regulations [3] requiring a 2 second maintained temperature of 850°C, or 1100°C in the case of halogenated organic substances, further exacerbate tube wastage conditions.

One of the primary methods of increasing reliability and the operational window of waste to energy (WTE) plants is application of corrosion resistant surface engineering technologies. Principle techniques employed are refractory lining, replacement of tubes with Ni alloys, weld overlay and thermal spray coatings.

WELD OVERLAY

The use of refractory lining reduces the effectiveness of heat transfer surfaces and as such, has limited scope. Weld overlay technologies have been applied extensively with Alloy 625