

WTER Corrosion Research

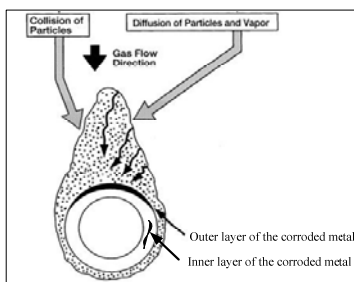
The Waste-to-Energy Research and Technology Council is conducting research on the corrosion phenomena in boilers of waste-to-energy facilities. The objective is to explore ways for reducing corrosion in WTE boilers.

Student: Shang-Hsiu Lee Advisors: Profs. N. J. Themelis, M.J. Castaldi, and P.F. Duby
Earth and Environmental Engineering, Columbia University

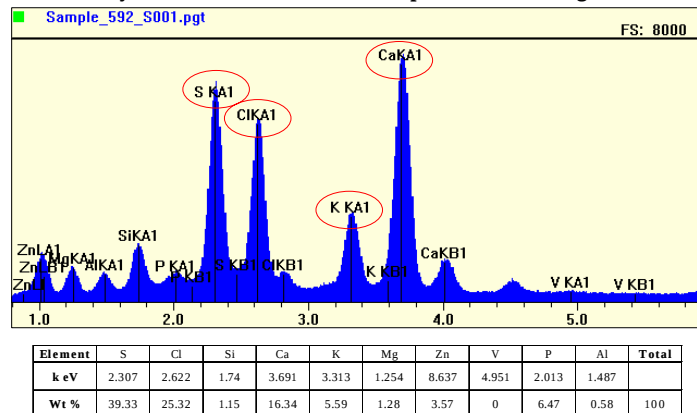
Corrosion in WTE units

- Corrosion is the cause of shutdowns in WTE plants and a major operating cost.
- Corrosion sensitive areas are: waterwall above refractory lining in the combustion chamber, evaporator screen, and superheaters.
- Corrosion is mostly associated with chlorine, and consists of active oxidation and salt-mixture induced corrosion.

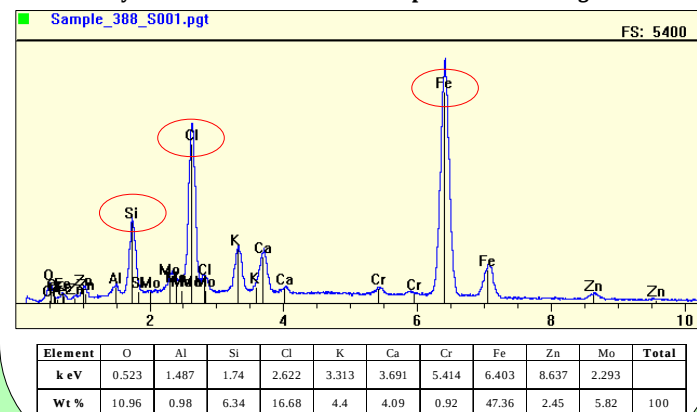
Element Analysis of Corrosion Products on Metal Tubes from WTE Plants



Outer layer of the metal tube corresponded to the figure above



Inner layer of the metal tube corresponded to the figure above

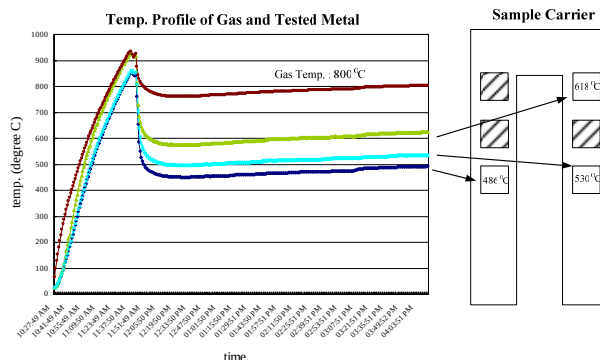


Corrosion Resistance Test

- Objective:
 - Determine corrosion rate of various metals under controlled conditions.
 - Characterization of corrosion products



- Selected alloys: SA178A, SA213-T12, SA213-T22, Comenoy 88, NSSER-4 (from Japan), and Inconel 625.
- Control variables:
 - Waterwall
 - Gas temp.: 1600-2000F (870- 1090°C)
 - Metal temp.: 540-550F (280- 290°C)
 - Superheater
 - Gas temp.: 1200-1600F (650- 870°C)
 - Metal temp.: 750-850F (400- 450°C)



- Atmosphere
 - HCl, SO₂, O₂, CO₂, CO, N₂, and Water vapor
- Salt deposit

- Analyses:
 - Mass loss corrosion rate measurements
 - Corrosion product analyses
 - Scanning Electron Microscope (SEM) / Energy Dispersive X-ray (EDX)
 - X-ray Diffraction (XRD)