Chlorine corrosion of carbon steel between 350 and 500°C

Ludmila KONRAD[1], Mathias GALETZ[2]

[1] *DECHEMA-Forschungsinstitut, Germany*
[2] *Dchema Forschungsinstitut, Germany*

Chlorine corrosion of carbon steel between 350 and 500°C

L. Konrad, M.C. Galetz, DFI, Frankfurt a.Main/Germany

For several decades chlorine corrosion at high temperatures has been known to induce high material degradation in boilers or combustion plants. The literature mentions, for example, "active oxidation" [1], low-melting eutectics of salt deposits [2], and reducing atmospheres [3] are mentioned as main causes for high corrosion rates.

This work will present the impact of different gas compositions on the corrosion rate of carbon steel 16Mo3 between 350°C and 500°C. In reducing atmospheres the corrosion rate shows a maximum between 410°C and 450°C, while the corrosion rate in oxidizing atmospheres increases with increasing temperature. An addition of SO_2 increases the corrosion rate (at low oxygen pressures as well as at high oxygen pressures) without changing the curve progression. An even higher material wastage occurred in reducing atmospheres on samples covered with an inert deposit of Al_2O_3 powder, proving the strong influence of gas exchange and gas diffusion. A model of the mechanisms will be presented in order to explain the behavior of the corrosion rate at reducing oxygen atmospheres. Also the behavior of the corrosion rate at oxidizing atmospheres will be discussed.

[1] H.J. Grabke et. al. Corr.Science 37 (1995) 1023

[2] M. Spiegel Mat. & Corr. 50 (1999) 373

[3] Y. Ihara et al. Corr.Science 21 (1981) 805