Corrosion Fatigue in Heat Recovery Steam Generator Unit: A Case Study

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Heat recovery steam generator (HRSG) units remove the heat from exhaust gases that come from gas turbines and utilized this heat to generate steam. Typical HRSG unit consist of economizer, evaporator and superheaters.

This paper discusses a case study of corrosion fatigue as a damaged mechanism of evaporator tubes in a HRSG Unit. The tubes operating temperature is 507 °F and operating pressure is 705 psig. The tubes were subjected to visual, chemical and metallographic analysis. Visual examination of the internal part of tubes showed cracks that perpendicular to the flow direction. Positive Material Identification (PMI) was carried out on the tubes using X-ray fluorescence (XRF) and confirm the tubes chemistry is low alloy carbon steel. X-Ray diffraction (XRD) analysis was conducted for the deposits found inside HRSG evaporator tubes. The results indicated that the products are mostly Magnetite [Fe_3O_4] which support that the internal corrosion is due to oxygen attack. Moreover, the metallography micrographs suggest the type of damaged mechanism is corrosion fatigue.

It was recommended to maintain optimum feed water chemistry (pH, dissolve oxygen, conductivity, TDS) into the steam generating system as per the water treatment program in order to control the internal corrosion, reduce the fluctuations in pressure and temperature during operation to minimize the impact of fatigue and to clean the ID side of the tubes from the accumulated corrosion deposits and scales.

Keywords: corrosion fatigue, HRSG, evaporator