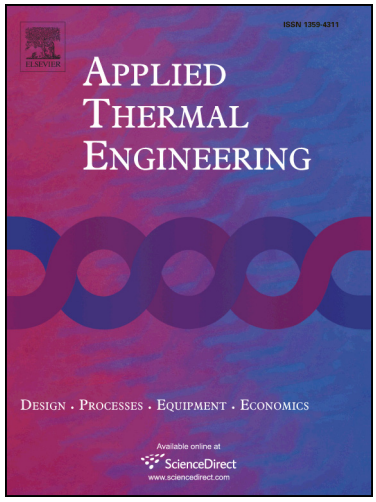

Research Paper

Experimental study on corrosion of steels for flue gas reheaters in a coal-fired power plant

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Experimental study on corrosion of steels for flue gas reheaters in a coal-fired power plant

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Abstract

The corrosion failures occurring in the back-end of coal-fired power plants are of great importance, and there are many decades of research experience of the corrosion issues before or in the flue gas desulfurization (FGD) unit, but the situation for flue gas reheaters (FGR) which are placed after FGD is rather different. In this paper, in-plant corrosion tests were performed and the corrosion mechanism was studied. The corrosion products were mainly iron oxides and the droplets entrained by the wet flue gas were the major cause. The wall temperature of the tubes in FGR should be kept at a high level to mitigate the corrosion.

Keywords:
Corrosion; Flue gas; Power plant; Heat exchanger; Stainless steel

Highlights:

In-plant corrosion tests of five kinds of steels may be used in FGR were conducted.
The results were analyzed by XRF, XRD, SEM and EDS.
The corrosion mechanism was studied, and the testing steels were evaluated.
The corrosive droplets entrained by the wet flue gas were the major cause of the corrosion in FGR.
The corrosion rate was negatively correlated with the surface temperature of the steel.

1. Introduction

The corrosion issues caused by low-temperature flue gas in the back-end of coal-fired power plants have long been a severe problem and gave rise to a lot of component failures. As the flue gas is cooled, condensation of H_2SO_4, HCl and water vapor in the flue gas will commence successively. In the flue gas desulfurization (FGD) unit, flue gas is usually cooled from 90°C to about 50°C, lower than the water dew point. The flue gas from outlet of FGD is saturated with water vapor and entrains a large number of droplets. Thus it could be called wet flue gas. The droplets entrained by this wet flue gas are mainly composed of condensate from the flue gas and absorber slurry which is used for desulfurization in FGD. These droplets are highly corrosive and make the wet flue gas extremely aggressive, threatening the safety and integrity of downstream

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