ANALYSIS OF THE INFLUENCE OF WATER-FUEL EMULSION DURING ITS COMBUSTION ON THE CORROSION OF LOW-TEMPERATURE HEATING SURFACES

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Modern Ukrainian energy sector is increasingly focused on the use of alternative fuels in order to reduce the consumption of traditional resources and increase the energy efficiency of power plants. One of the promising areas is the use of water-oil emulsion (WME) [1], which is formed by mixing fuel oil with water and surfactants. This type of fuel allows not only to reduce the consumption of traditional fuel, but also to reduce emissions of harmful substances into the atmosphere. However, an important aspect is the study of the influence of WME on the processes of low-temperature corrosion (LTC) of the heating surfaces of boiler plants.

The problem of corrosion of low-temperature heating surfaces (LTHS) is extremely urgent, since it is these elements of equipment that are prone to intensive formation of deposits and acid condensate when burning sulfurous fuels. Corrosion significantly reduces the equipment's service life, reduces thermal efficiency, and leads to increased repair costs [2].

The analysis showed that when burning BME, important factors that affect the intensity of corrosion are the temperature of the wall of the heating surface, the sulfur content in the fuel, the excess air ratio and the water content in the emulsion. Increasing the water content in BME to 30% helps to reduce the flame temperature, improve the combustion process and reduce the formation of sulfuric acid compounds that participate in the processes of NTC. At the same time, the corrosion rate of the heating surfaces decreases from 0.5 mm/year when using traditional fuel oil to 0.2 mm/year when using BME with Wr = 30 %.

Studies have shown that the greatest risk of corrosion is observed at a temperature of the heating surface wall below 100-110°C - in the acid peak zone, where the formation of sulfuric acid condensate is possible. However, when using BME, this effect is significantly weakened due to a decrease in the mass flow of SO_3 in the combustion products. It is also important to introduce technologies for acoustic cleaning of heating surfaces when using BME, which allows for effective removal of solid particle deposits and improve heat transfer.

Conclusion: The use of water-oil emulsion with a water content of up to 30% is a promising direction for increasing the reliability and durability of power plants. This allows not only to reduce the intensity of corrosion of low-temperature heating surfaces, but also to ensure a reduction in the costs of operation and repair of equipment while simultaneously increasing its thermal efficiency.

References:

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