CORROSION AND CAVITATION IN TUBE FURNACES DURING THE HEATING OF WATER-CONTAMINATED OIL

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Tube furnaces in coking plants are vital for heating tar and oils but suffer severe corrosion when water-contaminated oil is used. This corrosion forms hemispherical cavities, with cavitation-induced damage. Water contamination increases the vapor phase, promoting cavitation and erosion, especially at low pressure and high temperature. Hydraulic calculations show that at 1 bar pressure, 20 % water content, and 160 °C, cavitation is inevitable, accelerating corrosion, particularly with ammonium chloride. Electrochemical and gravimetric analyses confirm high corrosion rates, emphasizing the need to control water contamination.

Keywords: tube furnace, coal tar oil, corrosion, cavitation.

INTRODUCTION: Tube furnaces are crucial in coking plants for distilling coal wash oil and heating tar. Corrosion due to aggressive compounds like metals and chlorides significantly impacts equipment life. High-grade alloys and soda treatment help mitigate these effects.

CORROSION MECHANISMS: Sulfide corrosion and cavitation are worsened by high temperature and pressure, especially when emulsified water is present. Understanding the effects of pressure and flow rate on tube durability is key to effective corrosion prevention.

EXPERIMENTAL RESEARCH: Experiments on a tubular furnace showed severe corrosion from water-contaminated oil. Electrochemical methods assessed the oils' corrosiveness.

RESULTS AND DISCUSSION: The furnace tubes showed oxide deposits, rough surfaces, and defects, with pitting corrosion observed. Cavitation-induced degradation was noted.

CAVITATION IN OIL FLOW: Heating oil forms a vapor phase, increasing during disturbances and oil watering, which enhances cavitation and erosion.

CONCLUSIONS: Heating water-contaminated oil causes severe corrosion and cavitation in tube furnaces. Water contamination promotes cavitation, accelerating corrosion. Controlling water content is crucial to prevent equipment damage.