

Case Study: Unlocking the Secrets of Boiler Materials for Pulp and Paper Industry

Navigating the Complex World of Boiler Materials for Pulp and Paper Industry

Within the realm of pulp and paper manufacturing, the selection of appropriate boiler materials plays a pivotal role in ensuring the efficient and reliable operation of these critical industrial assets. This comprehensive case study aims to shed light on the intricacies of boiler material selection, empowering decision-makers with the knowledge and strategies to optimize their operations. Through a combination of expert insights, best practices, and real-world examples, this study unravels the secrets of selecting the ideal boiler materials for the unique demands of the pulp and paper industry.



Industrial Materials for the Future R&D Strategies: A Case Study of Boiler Materials for the Pulp and Paper Industry by David R. Howell

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Unveiling the Challenges: Corrosion and Degradation in Pulp and Paper Boilers

The harsh environment within pulp and paper boilers poses significant challenges to boiler materials. The presence of corrosive chemicals, high temperatures, and fluctuating operating conditions can lead to rapid degradation and premature failure of boiler components. This section explores the primary factors contributing to corrosion and degradation in pulp and paper boilers, providing a deep understanding of the underlying mechanisms and their detrimental effects.

Acidic Environment and Corrosion

The combustion of fossil fuels in pulp and paper boilers releases acidic gases, such as sulfur dioxide (SO₂) and nitrogen oxides (NO_x). These gases dissolve in water vapor present in the boiler, forming corrosive acids that attack boiler materials, particularly those made of carbon steel. This acidic environment significantly contributes to the degradation of boiler tubes, headers, and other components.

Erosion and Corrosion-Erosion

In addition to corrosion, erosion and corrosion-erosion can also pose problems in pulp and paper boilers. Erosion occurs when high-velocity gases or liquids impinge on boiler surfaces, causing mechanical wear. Corrosion-erosion, a combination of corrosion and erosion, is particularly damaging as it accelerates the degradation of boiler materials. Fly ash and other particles carried by flue gases contribute to erosion and corrosion-erosion, especially in areas with high gas velocities, such as the economizer and superheater sections.

Stress Corrosion Cracking

Stress corrosion cracking (SCC) is a type of localized corrosion that can occur in certain boiler materials, such as stainless steels and nickel alloys, under the simultaneous presence of tensile stress and a corrosive environment. In pulp and paper boilers, SCC can be induced by the presence of chlorides, which can come from the combustion of biomass or the use of deicing salts in the boiler water. SCC can lead to sudden and catastrophic failure of boiler components, posing a significant safety hazard.

Material Selection: Finding the Optimal Balance for Pulp and Paper Boilers

Given the challenging environment in pulp and paper boilers, selecting the appropriate boiler materials is paramount to ensuring longevity, reliability, and cost-effectiveness of these critical assets. This section presents



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