

Modeling of porous media in a reciprocating grate furnace of a 3MW boiler burning eucalyptus chips

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ABSTRACT: This study investigates the degradation of reciprocating grates in wood chip-fired boiler furnaces using computational fluid dynamics (CFD). The objective is to identify critical operating points and understand processes such as temperature gradients, oxide formation, erosion, and corrosion on the grate. Based on the results, corrective and alternative geometric solutions are proposed, with a focus on recycling combustion gases to reduce temperatures on the grate. The CFD simulation enables a detailed analysis, identifying critical degradation areas and supporting maintenance and optimization strategies. These approaches prevent unplanned shutdowns and reduce operational costs, contributing to the efficient design and operation of biomass-fired boilers. The study is relevant to energy transition and environmental sustainability, considering the increasing importance of renewable energy sources. By understanding and mitigating the challenges faced by reciprocating grates, the aim is to improve performance, lifespan, and energy efficiency of these systems. In summary, this study utilizes fuel bed modeling and analysis of degradation processes to address the challenges of grates in wood chip-fired boilers. The proposed solutions and focus on recycling combustion gases aim to enhance the performance and sustainability of these systems.

Keywords: Biomass combustion; Moving bed furnace; Reciprocating grates, CFD simulation.