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From a CFB reactor to a CFB boiler – the review of R&D progress of CFB coal combustion technology in China

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Abstract

Circulating fluidized bed (CFB) technology was applied for coal combustion after CFB chemical reactors have been widely used and studied in chemical engineering. However, there were still many special phenomena found in the CFB boiler. In this paper, the main differences between a conventional CFB reactor and a CFB boiler are summarized. A CFB boiler is a special CFB reactor. It is an open circulating system with a wide size distribution feedstock and a low circulating solid flow rate. The CFB boiler behaves as particle selection machine, retaining particles within a certain size range in the furnace. Its fluidization regime is distinguished from a conventional CFB reactor, composing of a bubble or turbulent dense bed in the lower furnace and a fast dilute bed in the upper furnace. A large portion of heat is released in the dilute bed, and there is an oxygen-deficient combustion zone in the center of the upper furnace of a CFB boiler. Based on the theoretical studies and engineering practice, the principles and a guidance map of fluidization state specification for CFB boiler design are presented. In addition, the paper reviews the research and development (R&D) history and important achievements of the Chinese CFB combustion technology.

Keywords: CFB; boiler; design theory, development history; coal combustion

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