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Experimental Study on Bag Filtration Enhanced by Magnetic Aggregation of Fine Particles from Hot Metal Casting Process

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Abstract

Bag filtration experiments enhanced by pre-aggregation of fine particles from hot metal casting process with size range of 0.3 - 10 μm in magnetic field were conducted in this work. There is a distinct difference in magnetization process between particles from cast house and coal-fired power plant. The influences of magnetic flux density and gas velocity on particle aggregation and total particle removal efficiency were investigated. The experimental results showed that bigger particles are easily affected by magnetic field and the smaller particles are easily affected by flow field. Although higher magnetic flux density can improve the aggregation of bigger sized particles at a constant gas velocity, combined with the effect of particle size distribution, the total particle number concentration increases as the average gas velocity increases, which would result in the decrease of the total particle removal efficiency. When the total particle mass concentration is 1000 mg/m^3 , the magnetic flux density is 0.08 T and the gas velocity is 3.0 m/s, the highest total particle removal efficiency reaches 99.77 %. When particle magnetization reached saturation, the magnetic flux density will reduce the total particle removal efficiency.

Keywords: particulate control; magnetic aggregation; bag filter; iron making plant.

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