Comparison of Measured and Calculated Pressure Profiles in Iron Ore Sintering Using Different Theoretical Models

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ABSTRACT

In the iron ore sintering process, the resistance to air flow is a major factor determining the flame front speed which in turn influences the sinter quality and productivity. A high pressure drop indicates a high resistance to flow in sintering. From previous work it is believed that the flame front is the major contributor to the overall pressure drop during sintering. In the present work, the pressure profile was predicted using a number of different theoretical models. The Ergun equation (with and without modified porosity), orifice model equation and a combination of both were used to calculate the pressure profile in the bed, using temperature profiles predicted from a one dimensional transient sinter model. To validate the results, detailed experiments were conducted to measure the pressure profile during sintering at different bed heights in a sinter pot, for a range of fuel rates and basicities. In these sinter pot tests a sleeve of fine material was introduced between the granules and the wall to minimise the airflow wall effect. To calculate the pressure drop across the bed, the sintering bed is divided into three zones i.e., sintered zone (SZ), high temperature zone (HTZ) and green zone (GZ). The relative proportions of the zones are changed dynamically as sintering proceeds. Factsage 7.2 is used to generate the melt formation data for each experiment. This melt formation data is used to modify the porosity of the HTZ. The pressure profiles predicted by the models are compared with the experimental results.