Iron Ore Sintering Process Model to Study Local Permeability Control

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Abstract

The iron ore sintering process prepares fine iron ore for the blast furnace process. A mixture consisting of iron ore, coke (fuel) and additives is ignited at the top and air is sucked from below to move a combustion front down through the bed. Most of the sintering plants use permeability bars to raise the productivity. The permeability bars locally aerate the bed of raw materials after charging. This affects the local flow rates, the local course of the combustion, the temperature field in the bed and thus the overall sintering process characteristic.

A transient 2D sintering process model was developed to estimate the influence of various bar configurations on the process by using COMSOL Multiphysics®. This model solves reactions and flow through the porous bed with the Chemical Reaction Engineering Module.

The model has been calibrated with in situ measurements and laboratory experiments. The local changes of the permeability are measured via flow velocity measurements in the lab and in an industrial plant. Operational trials were complemented by IR thermography to investigate the influences of the different permeability bar configurations on the temperature profiles at the plant discharge. The model results were proven to be consistent to the laboratory and industrial measurements.

Figures used in the abstract

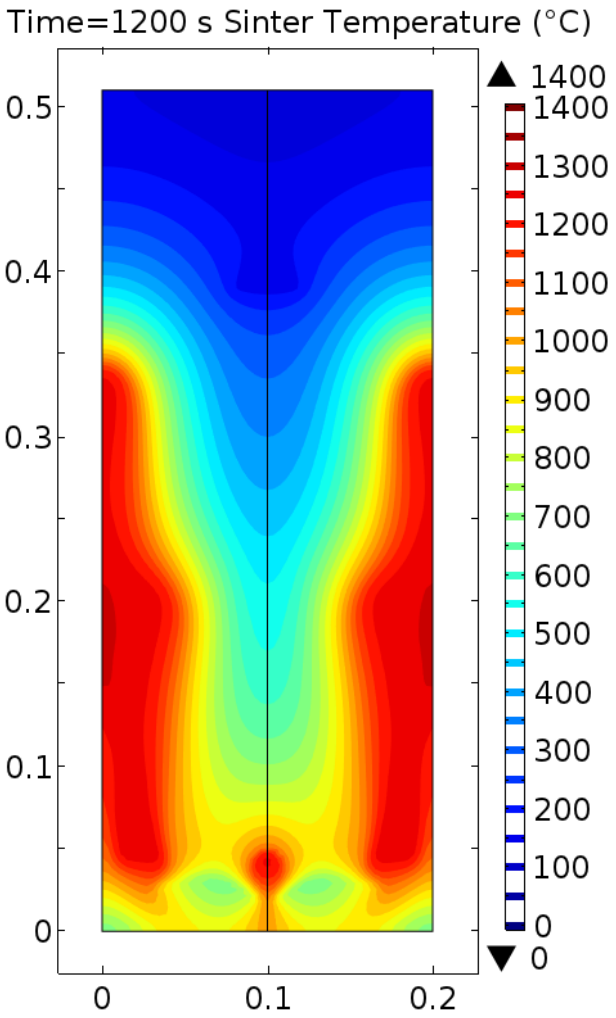

Figure 1: Estimated sinter bed temperature.