KAWASAKI STEEL TECHNICAL REPORT
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Ironmaking Technology
and Tubular Products Technology

Development of a Blast Furnace Operation Simulator and its Application for Reduction of Si Content of Pig Iron

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Synopsis :
A total blast furnace simulator has been developed for the planning of maintaining the best stable operation performance with inferior burden materials. The simulator has the following features: (1) Layer profile of burden materials is predicted with high accuracy. (2) Gas flow and heat transfer in the cohesive zone are modeled by focusing, with a special attention paid, on layer structure. (3) Size degradation of burden materials is modeled. The simulator has been used to precisely predict the results of operational changes for various purposes such as, [Si] reduction operation and stable operation with small size sinter. In this paper, the [Si] reduction at No. 3 blast furnace at Mizushima Works is described as a typical application of the simulator to deal with the changes of charging sequence at the bell-less top.

The body can be viewed from the next page.

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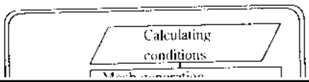
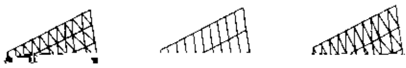
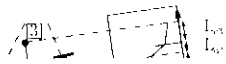
Synopsis:

A total blast furnace simulator has been developed for

Material	Charging condition	Operation condition
Particle diameter	Bell less pattern	Blast volume
	Charging cycle	Top pressure







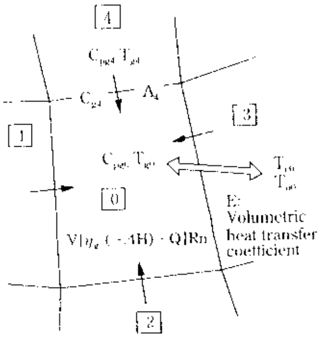


Fig. 6 Heat balance of gas phase in square mesh

$$\Sigma[A_i\,\mathrm{Max}\,(G_{gi},0)C_{pgi}T_{gi}]$$
$$-\,\Sigma[A_i\,\mathrm{Max}\,(-G_g,0)C_{pg0}T_{gi0}]$$
$$+\,E_{gc}(T_{c0}-T_{g0})+E_{go}(T_{o0}-T_{g0})$$

[redacted]

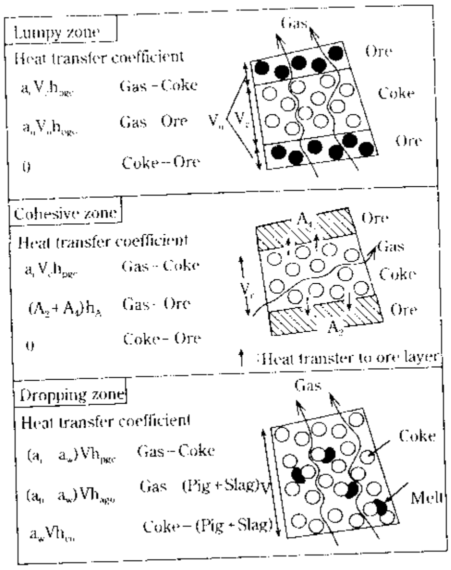
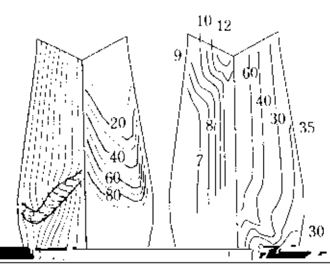


Fig. 7 Gas flow and heat exchange in each zone of

[redacted]

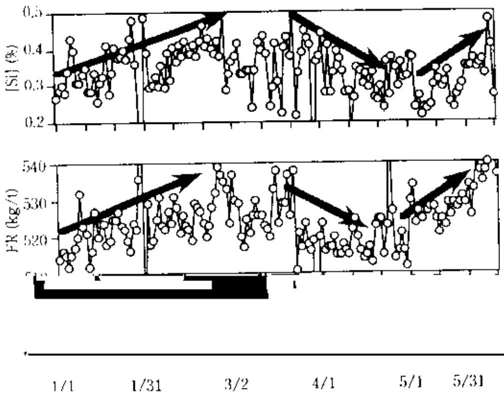
$= b\ (a < b)$

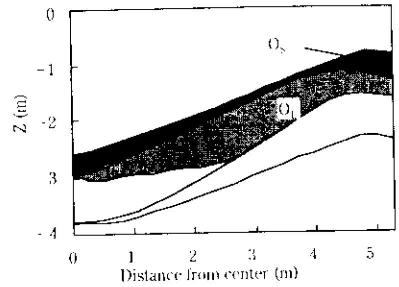
A: Area of mesh interface (m^2)
C_p: Average specific heat (J/kg)
T: Temperature (K)
E: Heat exchange coefficient (W/K)
V: Volume of mesh (m^3)
$-\Delta H$: Reaction heat (W/m^3)
Q: Amount of sensible heat transfer from nonuniform reactions (W/m^3)



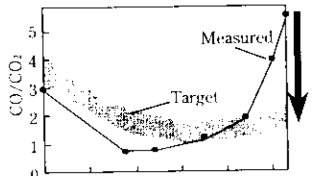
[redacted]

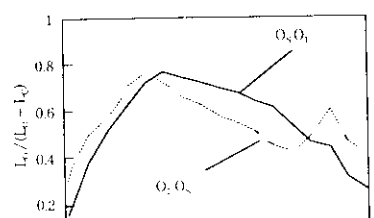

Generation reaction

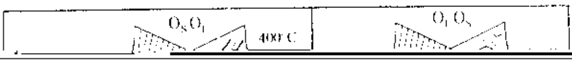




of Mizushima Wor■ks



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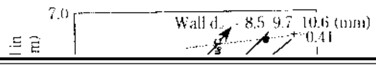
7.0
Wall d
8.5 9.7 10.6 (mm)
0.41


STEP 1
STEP 2