THE IRON BLAST FURNACE

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Theory and Practice

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by

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Contents

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An up to date and comprehensive treatment of blast furnaces from fundamental principles through to modern operation procedures. Fundamental equations for the iron blast furnace are developed on the basis of experimental, operational and theoretical data. These equations are used to indicate the relationships between operating variables (raw materials, fuels, fluxes, tuyere injectants, temperatures) and demonstrate how processes should be operated to achieve a specified optimisation goal. Worked examples are provided throughout the text. Each chapter contains a selection of problems and answers are given at the end of the book. Uses SI/Metric units.

CONTENTS: A brief description of the blast furnace process. A look inside the furnace. Thermodynamics of the blast furnace process enthalpies and equilibria. Blast furnace stoichiometry. Development of a model framework:- simplified blast furnace enthalpy balance. The model framework: combination of stoichiometric and enthalpy equations. Completion of the stoichiometric part of the model: conceptual division of the blast furnace through the chemical reserve zone. Enthalpy balance for the bottom segment of the furnace. Combining bottom segment stoichiometry and enthalpy equations:- a priori calculation of operating parameters. Testing of the mathematical model and a discussion of its premises. The effects of tuyere injectants on blast furnace operations. Addition of details into the operating equations:- heat losses, reduction of Si and Mn; dissolution of carbon; formation of slag; decomposition of carbonates. Summary of blast furnace operating equations: comparison between predictions and practices. Blast furnace optimisation by linear programming. Appendices.

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