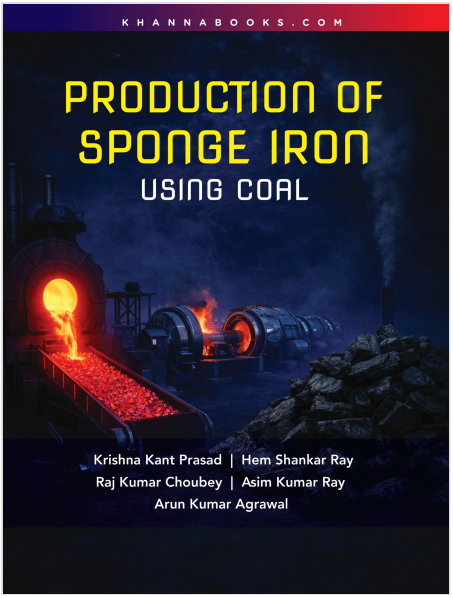

Production of Sponge Iron Using COAL

by Krishna Kant Prasad, Hem Shankar Ray, Raj Kumar Choubey, Asim Kumar Ray, Arun Kumar Agarwal

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Description

Production of Sponge Iron Using COAL Production of Sponge Iron using Coal: Rotary Kiln, Tunnel Kiln and using Gas from Coal is a definitive technical guide that explores India's global leadership in the coal-based direct reduction of iron ore. While international markets often rely on gas-based shaft processes, this book highlights how India has pioneered and perfected the use of rotary kilns to utilize abundant, high-ash non-coking coal-resources often dismissed by foreign experts as "muck". The text provides an exhaustive analysis of the thermodynamic, kinetic, and aerodynamic principles that govern the solid-state reduction of iron oxides. The book serves as a vital bridge between theoretical research and industrial application, documenting decades of expertise from leading metallurgists. It broadens the traditional focus on rotary kilns to include emerging commercial successes in tunnel kiln technology and coal gasification-based shaft furnaces. Beyond technical specifications, the authors connect modern engineering with India's ancient metallurgical heritage, such as the storied Iron Pillar of Delhi. This work is an essential resource for metallurgical students, researchers, industry professionals, and entrepreneurs seeking to understand the economic and technical nuances of sustainable ironmaking in coal-rich regions. **Salient Features**

- Rotary Kiln Dominance: Detailed analysis of the rotary kiln's primary role in India, covering its versatility in processing lump hematite and its unique operational strengths and weaknesses.

- Scientific Process Modeling: Comprehensive chapters on mathematical modeling, CFD analysis, and reaction kinetics that allow for precise control over heat transfer and solid movement.
- Alternative Reduction Technologies: In-depth exploration of tunnel kilns as a viable solution for reducing magnetite and iron ore fines, filling a critical gap in traditional kiln operations.
- Coal Gasification Insights: Evaluation of the economic and technical feasibility of converting coal into reducing gas (CO and H) to supplement production in shaft furnaces.
- Resource Optimization: Strategies for utilizing high-ash Indian coal and recirculating char to enhance energy efficiency and reduce the environmental footprint of ironmaking.
- Practical Engineering Focus: Guidance on plant design, refractory management, and overcoming common industrial hurdles like accretion or "ring formation" inside kilns.
- Historical Contextualization: A unique addendum on India's ancient ironmaking legacy, offering a perspective on the longevity and evolution of sponge iron technology.
- Future-Ready Strategies: Critical projections on hydrogen-based ironmaking and the integration of sponge iron into blast furnaces to reduce costly metallurgical coke consumption.

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