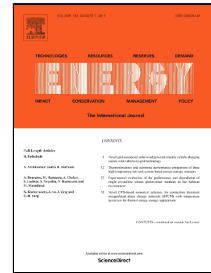


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Exergy assessment of a rotary kiln-electric furnace smelting of ferronickel alloy

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Abstract

The main objective of this paper is to assess the thermal performance of the RKEF process based on the actual operational data by using exergy analysis method. To identify the factors affecting exergy efficiency loss, exergy destruction caused by the main chemical reactions (fuel combustion, reduction reaction, decomposition reaction and slagging reaction) is investigated in detail. The results show that the energy efficiency of the RKEF process is 53.3% whereas the exergy efficiency is 15.7%, indicating a great potential for energy-saving. The overall exergy destruction accounts for 46.4% of the total exergy input, in which 24.8% is caused by chemical reactions. Moreover, the exergy destruction due to chemical reactions of rotary dryer, rotary kiln and electric furnace is 20.4%, 27.1% and 5.1%, respectively. It is also found that combustion is the dominant factor for the efficiency loss of rotary dryer and rotary kiln and slag with high temperature contributes most for the efficiency loss of electric furnace. Several suggestions for improving the thermal performance of RKEF system are proposed. The present work should do helpful effort for further improvement of the RKEF process.

Keywords: rotary kiln-electric furnace; ferronickel smelting; exergy analysis; exergy destruction.

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