systematic optimization of EAF steelmaking using mathematical model

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Steel plant is a complex system that is combined to each other variously. Because of the characteristics of the process, steel plant uses a lot of energy and a reducing agent that contains carbon. So various attempts to save the energy and reduce carbon dioxide are in progress. However, to build a strategy of carbon reducing and energy saving, there is a need to observe the total effects of technology on plants. To do this, a mathematical model of plants can be used.

Electric arc furnace (EAF) is a furnace that can produce liquid steel from Fe containing materials like scrap, hot metal, direct reduced iron and so on. EAF steelmaking is an energy-intense process which has a lot of potential to save energy. A mathematical model based on a material flow and energy flow is developed to simulate the EAF steelmaking that contains pre-treatment, EAF, and post-treatment and optimize the carbon emission, energy usage and total cost. This optimization is a mixed integer linear program and solved by a commercial optimization tool, GAMS. The results of this study give an optimized strategy of steelmaking process with maintained steel grade and can be used efficiently in the optimization of total steelmaking process.