Systematic optimization of steelmaking process

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Electric arc furnace (EAF) is a process making liquid steel. Unlike blast furnace (BF)-basic oxygen furnace (BOF) process using iron ore as Fe containing material, EAF makes liquid steel using scrap. BF-BOF processes use carbon-based fuel but EAF process uses mainly much electrical energy to deal with scrap and uses some carbon-based fuel and emits some carbon dioxide. In order to respond for depletion of carbon-based fuel and greenhouse effect, various attempts are tried to reduce energy usage and carbon dioxide emission in steel industry. So mathematical model for energy intense EAF process was made and optimize it from a view of energy usage, emission of carbon dioxide and cost. Sensitivity analysis for cost of electricity, natural gas and raw materials is added to predict optimization results that change with external variables. And carbon tax concept is also added as cost variable. For a mathematical model, some processes are added and refer to actual plant data to enhance accuracy. Using this mathematical model, case studies are adapted and analyze optimization results.