A Simulation Study of Basic Oxygen Furnace Operations

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The study was conducted in the Basic Oxygen Furnace shop of a reputed steel company. Data were collected over extended periods to establish the statistical characteristics of daily liquid iron (hot metal) production from the blast furnaces, the life of refractory-lined vessels of the Basic Oxygen Furnace, and the heat-cycle time. This simulation generates total daily hot metal production from the specified distribution and determines the optimum combination of hot-metal-only charge (regular heat) and mixed charge (scrap and hot-metal or pre-heat) that will maximize ingot steel production within a fixed time period. The simulation takes into account the heat-cycle-time, the charge-mix, the number of heating-vessels available on the oxygen furnace, and the time required for relining of vessels. An iterative process using a modified form of the simplex algorithm with two constraints have been utilized in the simulation study for maximizing output. The output includes, on a daily basis, the hot-metal produced in tons. the number of vessels available, the number of regular-heats and pre-heats required for maximum steel production, steel production in tons, the amount to be pigged, and the amount available for the next day. The simulation provides the decision-maker in charge of the BOF operation with an operational discipline to maximize productivity and a reliable indicator to justify installation of scrap pre-heating facilities.

The entire simulation is written in Fortran IV, level G, and executed on an IBM 360 Model 65 computer.