

Regular Article

An Optimization for Ore Blending Schedules Using Mathematical Programming Methods

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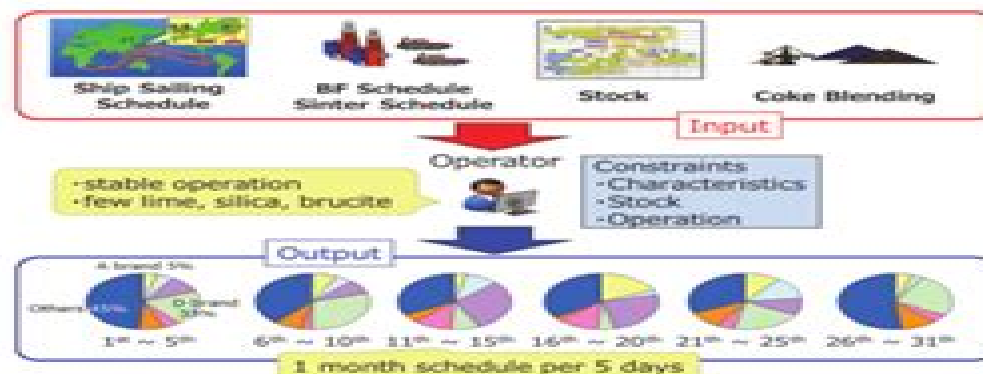
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Abstract: We have developed an optimal scheduling method for raw material operations aiming the raw materials cost reduction. In this paper, we report optimization approaches to minimize the cost of ore blending in steel works.

The ore blending problem is to make schedules for the purpose of cost minimization under several constraints such as the stock in yards, ingredients in sintered ore. When formulating as a mathematical model, nonlinearity exists in this problem and make it complicated. However, this problem has characteristic that becomes a linear problem by fixing several key variables as constants. To overcome the nonlinearity, we developed our original Hybrid model that was a combination of Particle Swarm Optimization (PSO) and Linear Programming method (LP). We applied PSO to search the best way of fixing key variables, and obtained blending schedules by solving LPs. Our Hybrid model searched wide area effectively, and derived the solution within 2 minutes. Numerical experiments indicated a cost reduction of secondary materials by 13%.

Keywords: ore blending; mathematical programming; optimization; linear programming; meta heuristics; particle swarm optimization; multi-point search method.



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