Long-term maintenance optimization for integrated mining operations

Journal Article

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Maintenance activities are inevitable and costly in integrated mining operations. Conducting maintenance may require the whole system, or sub-units of the system, to be shut down temporarily. These maintenance activities not only disrupt the unit being shut down, but they also have consequences for inventory levels and product flow downstream. In this paper, we consider an interconnected mining system in which there are complicated maintenance relationships and stock accumulation at intermediate nodes. We propose a time-indexed mixed-integer linear programming formulation to optimize the long-term integrated maintenance plan and maximize the total throughput. We also devise an algorithm, which combines Benders decomposition and Lagrangian relaxation, to accelerate the computational speed. To validate our mathematical model, we perform simulations for a real-world case study in the iron ore industry. The results show that our method can yield better solutions than CPLEX optimization solver alone in faster time.

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