The Benefits of End-To-End Integrated Planning from the Mine to Client Supply for Minimizing Penalties

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Abstract : The control over delivered iron ore blend characteristics is one of the most important aspects of the mining business. The iron ore price is a function of its composition, which is the outcome of the beneficiation process. So, end-to-end integrated planning of mine operations can reduce risks of penalties on the iron ore price. In a standard iron mining company, the production chain is composed of mining, ore beneficiation, and client supply. When mine planning and client supply decisions are made uncoordinated, the beneficiation plant struggles to deliver the best blend possible. Technological improvements in several fields allowed bridging the gap between departments and boosting integrated decision-making processes. Clusterization and classification algorithms over historical production data generate reasonable previsions for quality and volume of iron ore produced for each pile of run-of-mine (ROM) processed. Mathematical modeling can use those deterministic relations to propose iron ore blends that better-fit specifications within a delivery schedule. Additionally, a model capable of representing the whole production chain can clearly compare the overall impact of different decisions in the process. This study shows how flexibilization combined with a planning optimization model between the mine and the ore beneficiation processes can reduce risks of out of specification deliveries. The model capabilities are illustrated on a hypothetical iron ore mine with magnetic separation process. Finally, this study shows ways of cost reduction or profit increase by optimizing process indicators across the production chain and integrating the different plannings with the sales decisions.

Keywords : clusterization and classification algorithms, integrated planning, mathematical modeling, optimization, penalty minimization