Conférence du Centre E4m - Centre de recherche sur la géologie et l'ingénierie des ressources minérales

“Smart mining complexes and value chains: A technological perspective on risk management and sustainability”

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Vendredi 22 avril 2016 – 12h

Pavillon Adrien-Pouliot PLT-2783

A mining complex may be seen as an integrated business starting from the extraction of materials from a group of mines, the processing and treatment of these materials through different processing facilities interconnected by various material handling and transportation methods, all leading to a set of sellable products delivered to various customers and/or the spot market. Underlying uncertainties (stochasticity) related to the materials produced from the mines and the metal’s spot market price are critical facets of this integrated business. Existing technologies do not explicitly manage these uncertainties, leading to the sub-optimal performance.

A new framework for the simultaneous optimization of mining complexes under uncertainty aims to maximize shareholder value, manage risk intelligently and address pertinent aspects of sustainability. It is a difficult problem to address due to its large scale, uncertainty in key parameters, intricacies of related data analytics and data-driven optimization, and absence of methods for simultaneous optimization of all components of a mineral value chain. Based on stochastic optimization, new methods tested in case studies for different mining complexes and commodities demonstrate that, when compared to past approaches: (i) reliability is improved in the operation’s meeting production forecasts; (ii) larger amounts of metal are produced from the same mineral resource due to improved ability to understand spatial connectivity of high-grade materials; and (iii) substantially higher economic value than with existing approaches due to the ability of new smart technologies to directly manage risk. These impact the company, along with indirect stakeholders, such as local communities that may benefit from increased investments in activities and job stability, and the environment, which can benefit from improved control of waste management and continuous rehabilitation.

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