Mine Waste Rock Management Using Mixed Integer Programming (MIP)

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Abstract

Waste rock from open pit mining operation is hauled to and stacked in areas referred to as waste rock dumps. They are the largest remnant structures of open pit mining and can absorb a large proportion (up to 60%) of the mine’s operating costs, and be costly to rehabilitate. Proper design and scheduling of waste rock dumps and haul routes can significantly reduce costs, minimise the possibility of failures and avoid harming the environment. Since the early 1960s, there has been extensive optimisation research carried out into production scheduling of ore from open pit mines, and several tools are available to achieve the task. However, there is no tool or methodology available for providing optimum waste rock movements and dump design. A mixed integer programming (MIP) model is developed to optimize mine waste rock placement to minimise haulage costs and to minimise the potential for environmental harm through the selective placement and encapsulation of reactive waste rock. The paper also employs the proposed model to schedule mine site data. The findings and applicability of the methods are discussed.

Keywords
Mine Waste Dump Management, Mixed Integer Programming, Mine Optimization