

Use and cost optimization for underground mines electrical energy: A case of a mine in Zvishavane

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Abstract

Mines profit margins are being lowered by high energy tariffs, demand costs, energy costs due to high energy consuming equipment and energy losses. To mitigate the problem of higher energy cost, mines should optimize energy use centred on productive mining equipment and peak demand shift since meaningful reduction of energy cost is on productive energy consumption. A model of the mining electrical energy use and costing was produced to provide a detailed mining industry research study since other studies were mainly centred on energy optimization reviews and single parameter analysis. The mine energy use and cost optimization were based on rescheduling of shifts and equipment, the proposed mine operation model, load crippling, the power factor correction and the implementation of the renewable energy supply coupled with noted parameters. The research established that a non-renewable energy supply combination of the rescheduling methods, load crippling, power factor correction and recommended mine operation mode is the best way of reducing energy cost of 21.81% considering the Net Present Value (NPV). The recommended mine operation mode guarantee reduced energy costs by 8.07%, enable continuous production during maintenance time, increased mine asserts and increased mine production capacity when higher production is needed.