

Proposal of belt conveyors energy efficiency classification

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Nowadays, the issue of energy efficiency in the mining industry is crucial for reducing operational costs, minimizing environmental impact, and improving sustainability. The key consideration should be put in material handling operation that was recognised as one of the most energy intensive one in the mine site. Many scientific researches indicate that transportation process optimization can lead to significant energy savings. Best practices that enable energy consumption reduction are implemented at equipment, operational and technology level. Nevertheless, there is still a need to develop a new approach to measure and assess the energy efficiency of conveyors.

The study introduces a new approach to belt conveyors' energy performance evaluation that is based on energy consumption labels. Since belt conveyors are considered as mechanical conveying systems, it is barely possible to normalize energy class thresholds directly from measurement data. Therefore, the unique methodology for energy class thresholds with the use of Monte Carlo simulation was established. Moreover, quartile-based classification was used in data analysis and statistical research to understand the distribution of a variable and to group data into meaningful categories named as energy efficiency labels.

The case study of an underground copper ore mine was used to demonstrate the effectiveness and benefits of the proposed method. Its definite advantage is the elimination of the unreliability of directly comparing energy consumption between two conveyors. The proposal for belt conveyors' energy efficiency classification based on Monte Carlo simulations and specific energy consumption indicator has a great potential application in the entire mine and beyond.