

## **Assessment of energy efficiency of belt conveyors working in open pit mine**

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The mining industry consumes a significant amount of energy, accounting for around 6% of global energy production. Within the industry, transport alone consumes over 20% of this energy. Belt conveyors are widely used for bulk material handling in mining due to their efficiency and cost-effectiveness. However, they still consume substantial amounts of energy. Improving the energy performance of belt conveyors is crucial to address this issue.

Assessing their energy efficiency has been challenging due to their diverse designs. Standardized approaches are necessary to evaluate efficiency for optimization at the technological and management levels. Previous methods relied on comparing conveyors operating under similar conditions, which led to simplified and potentially inaccurate assessments. To overcome these limitations, a Monte Carlo simulation approach was employed to generate energy efficiency classes for belt conveyors based on their operating states. This method provided statistically representative data that would be difficult to obtain in real-world conditions. The specific energy consumption (SEC) indicator was used to assess efficiency by considering the electrical energy consumed to transport materials over a given distance. The results include a classification of real belt conveyors into energy efficiency classes and insights into their operating times within specific energy ranges.

The study focused on belt conveyors used in overburden transportation in an open-pit brown coal mine, where energy consumption is particularly relevant. This classification framework allows differentiation between less and more efficient conveyors, facilitating the identification of factors contributing to lower efficiency in specific cases.