An Assessment of Battery Trolley systems' Performance in Surface Mines

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ABSTRACT

Mining production, being one of the most energy-intensive industries globally, consumes substantial amounts of fossil fuels and contributes to extensive carbon emissions worldwide. The trend of electrification and advanced developments in battery technology have shifted attention from diesel power to battery alternatives. These alternatives are appealing, as they contribute to decarbonisation efforts when compared to conventional diesel trucks. This paper presents a mining scenario to assess the performance of various current and potential applications based on mining system-level considerations. The evaluated configurations include Diesel-Electric Truck (DET), Trolley Assist Truck (TAT), Battery-only Truck (BOT), Battery Trolley with Dynamic charging truck (BT-D), and Battery Trolley with Stationary charging truck (BT-S). Due to pit dynamic changing as the mine site deepens, various powertrains, and battery degradation characters, a further simulation will be managed to evaluate mining metrics like OEE, corrected truck payload, mining productivity, NPV, CAPEX, and OPEX. The final aim is to take a techno-economic assessment of the mining performance when battery electric trucks are broadly deployed in large surface mines. All of this assessment based on mining metrics provides a well-rounded perspective that empowers businesses to navigate through uncertainties and make data-driven decisions, ensuring a more successful implementation of the Battery Trolley technical solution.