

# Small versus large autonomous trucks in surface mining

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## ABSTRACT

This research paper addresses a critical and timely issue in the mining industry. The historical focus on larger equipment has been a common trend, but recent technological developments and shifts in mindset toward sustainability and efficiency are opening opportunities for exploring the advantages of smaller autonomous trucks. The aim of this paper is to compare small autonomous mining trucks to large ones, covering key aspects of performance, technology, economy, maintenance, sustainability, and overall impact on mine design.

The key highlighted points include:

- **Truck performance metrics:** Availability, Utilization, and Overall Equipment Efficiency (OEE): Comparing the performance metrics of small autonomous trucks with larger trucks is essential. It will help in understanding how the adoption of smaller trucks impacts their availability, utilization, and overall efficiency.
- **Automation development impact in mining:** Investigating how automation affects mining operations is fundamental. Smaller autonomous trucks may provide advantages in terms of adaptability to automation technologies, potentially leading to increased efficiency, reduced downtime, and improved safety.
- **Effect of truck size on mine planning and haul road design:** Analysing how the size of trucks influences mine planning and haul road design are important keys, too. This includes considerations for the layout of the mine, extraction strategies, and the design of haul roads. Smaller autonomous trucks might offer more flexibility in mine planning and narrower haul roads which has an impact on overall stripping ratio and the economics of the mine.

- **Differences in maintenance timeframe and life cycle cost:** Comparing the maintenance requirements and timeframes between different truck sizes is critical. Smaller autonomous trucks may have lower maintenance costs and shorter downtime, contributing to improved overall efficiency and reduced life cycle costs.
- **Environmental and safety considerations:** Assessing the environmental and safety implications of adopting smaller autonomous trucks is essential. It's important to understand how the change in truck size may influence factors such as electrification, emissions, waste generation, and overall safety within the mining environment.

Ultimately, this paper concentrates on the benefits and challenges associated with the integration of small autonomous trucks in mining operations. The outcomes of the research have the potential to guide future industry practices toward more sustainable, efficient, and safe mining operations.