Preliminary Content Structure for Small Autonomous Haul Trucks Whitepaper | 2022

This preliminary content structure was complied from Small Autonomous Haul Trucks workshops and discussions where industry participants created and discussed the project plan, the biggest challenges of small autonomous haul trucks, and potential use cases/opportunities.

As adoption of autonomous systems increase in mining, small vehicle automation is becoming more affordable and accessible.

The objective of this project is to publish a collaborative white paper that can help surface mines with the adoption of small size autonomous haul trucks (100 tonnes or less) by providing common considerations and increasing awareness of challenges and opportunities that are specific to them.

Small sized autonomous haul trucks can be an option for:

- Different types of operations that do not use large mining-scale haul trucks.
- For large operations that are looking to automate their smaller equipment.
- For operations that are not ready for large-scale automation and need an entry point.

Based on the discussions had on the topic, some of the potential core content to include in the white paper includes:

Suggested Heading	Content Discussed	Relevant Notes
Taxonomy	• Requirements and vocabulary on small truck automation • Vehicle size • Classes of trucks from light to heavy • Brownfield and greenfield differences • Underground and surface differences	• A participant commented on the taxonomy for clarity: "Taxonomy of vehicles sizes - why? size of market? clarity for new OEMs? like classes of trucks from light to heavy duty" • A participant commented asking if the scope is both construction and mining

Technology and Infrastructure	• Mine design considerations • Retrofitting or using on existing fleets • Dump site • Roads • Fragmentation • Fill factor • Communications infrastructure • Number of machines • Cybersecurity and data • Sensors and machine health • Automated grade control • Parameters and functional requirements • System integration • Supporting infrastructure	**Challenges noted:** • Difficulty of matching loading equipment with smaller trucks on many large open pit mines/Operational readiness i.e. pass matching • Meeting production targets • Dimensions of open-pit roads (smaller roads) • local climatic conditions • Operate in more hazardous conditions **Potential use cases discussed:** • Mine construction/road construction • Changes of mine layout • Interaction of different sizes of equipment especially at loading and tipping points • Interaction with other mine site equipment • Mixed Fleet Control (multiple vendors)
Processes	• Service and maintenance • Recovering from breakdowns • Traffic management • Logistics and productivity planning • Controlling large number of small machines • Start-up/shut down procedures • Continuous vs batch mine processes • Automated grade control is easier/more accurate	**Potential use cases noted:** • To right size the loading equipment and to increase the efficiency • Cost reduction/Commodity of parts/easier supply chain and access logistics
Staff training/workforce to maintain autonomous systems	• Dispatch team • Community and social impacts	• How does this differ with small autonomous haul trucks?
Safety	• Collision avoidance	**Potential use cases discussed:** • Safety: Safety reporting for Autonomous control • Safety benefits from reduced human error, potentially safer smaller tyres for example
Next steps/future section	• Future use on-road • Where to dump material	• This topic was originally noted as in-scope; however, later noted it should be included in future versions.


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