Corporación Instituto de Tecnologías Limpias (ITL)
Antofagasta
Carrera #1615

CHALLENGE TITLE

Mass Movement of Minerals on Surface.

CHALLENGE DESCRIPTION

Surface material transport represents one of the highest logistical costs and sources of energy consumption and emissions in mining. Current hauling systems, mainly based on large-tonnage trucks, face limitations in efficiency, safety, and sustainability. This challenge seeks to promote technological solutions that transform surface material movement, reducing costs, energy consumption, and emissions, and enabling cleaner, safer, and more competitive alternatives for mining.

GENERAL OBJECTIVE

Contribute to the transformation of surface material transport through the scaling and validation of new technologies that reduce logistical costs, energy consumption, and emissions, strengthening the sustainability and competitiveness of mining.

SPECIFIC OBJECTIVES

1. Co-develop and validate alternative technologies to conventional hauling (electric, hybrid, autonomous, modular rail systems, advanced conveyor belts, among others).
2. Design comparative models of technical, economic, and environmental performance against traditional systems.
3. Execute pilots in semi-industrial and operational environments to measure efficiency, safety, and emission reductions.
4. Generate technical guidelines and integration protocols with mining operations and environmental management systems.

EXPECTED RESULTS

- Technical reports with validation results of new surface transport technologies.
- Comparative indicators of logistical costs, energy consumption, and emissions versus conventional systems.
- Platform for modeling, monitoring, and control of surface transport systems.
- Demonstration pilots of technologies in semi-industrial and operational environments.
- Document with technical guidelines for industrial adoption.

SCOPE

Includes:

- Surface material transport technologies with TRL ≥ 4.
- Demonstrations in controlled relevant environments, semi-industrial and operational pilot testing and validation.
- Evaluation of technical, economic, energy, and environmental performance.
- Studies on integration with environmental management and mining operation systems.

Does not include:

- Proof-of-concept and/or laboratory-scale tests with TRL < 4.
- Design, construction, or operation of a full-scale industrial manufacturing plant.
- Solutions that pose additional risks to worker, equipment, or environmental safety.
- Technologies that increase consumption of strategic resources such as water or energy.
- Interventions that negatively interfere with the continuity of the production process.

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KEY PERFORMANCE INDICATORS (KPIs)

1. Reduction in logistical cost (%) per ton transported.
2. Reduction in energy consumption (%) per ton transported.
3. Reduction in GHG and particulate matter emissions (%) compared to conventional baseline.
4. Average recovery time after a failure.
5. Percentage of time the technology is operational versus total planned time.

DESIRABLE CONTRIBUTION TO ITL CAPACITY BUILDING

- Development of validation and technological certification protocols for material transport.
- Installation of pilot infrastructure for testing alternative hauling systems.
- Training and protocols for operation and maintenance associated with the transport system.