



Mining Equipment Technology Seminar
March 2018

Strategic Goals

- Support Codelco's development strategy through the provision of technological solutions. Its main focus is on adding value to Codelco operations on:
 - Sustainable use of critical resources – Water and Energy
 - Traceability of exploration, extraction, and mineral processing activities in a socially sustainable manner
 - Recovery of other metals, beyond copper and design of production strategies
 - Development of new uses and applications for copper which will generate additional demand in the global market
- Apply a diversified business model, open and collaborative with the innovation ecosystem
- Continuously explore the technological innovation market and identify potential players with capacity to solve their own challenges.
- Implement an Intellectual Property strategy that enables the open collaboration model with others, aimed at business competitiveness and fostering the participation of multiple players in the design, implementation, and/or commercialization of different solutions
- Implement models for technology transfer to other industries
- Incorporate the necessary methodologies to facilitate the change and adoption of solutions, within the context of safety and health for people.



- We are bridging the challenges from Codelco, Chile, and the global mining industry with new technologies and global capacity to provide solutions and add value to the industry
- Our role is to push Chile´s development within the mining industry, through innovation
- We explore state of the art technological solutions for the treatment, processing, and production of minerals, changing the industry into a sustainable mining industry
- We innovate in the usage of metals, other than copper and moly, caring for the environment, and improving the rational use of critical natural resources, such as water and energy
- We promote new demand for copper through the development of new applications and uses for the metal
- We provide a suitable environment for our people and the innovation ecosystem, so they can spread their full potential

VISION

CodelcoTech is the Chilean technology development company, with Global reach in the mining business, that integrates innovation with operational experience, working on solutions that will allow us to reinvent the mining industry, transforming it into a more sustainable business.



Our values

- **Sustainability:** In CodelcoTech the solutions we develop integrate technical, economic, social and environmental aspects, because we understand that our Client's and Communities progress are interrelated.
- **Innovation & creativity:** We are building the future now, prospecting technologies, identifying and integrating knowledge networks, listening to our Client's needs and their challenges, so we can create solutions that no one has even imagined.
- **Excellence:** Each member of CodelcoTech is responsible of listening, solving, and delivering solutions to our Clients. We guarantee compliance with legal requirements, safety principles, and quality that confirm our integral behaviour in doing business.
- **Collaboration:** In CodelcoTech value creation is done through an open collaboration model. This means that we generate and promote interaction with companies, research centers, suppliers, entrepreneurs, among others, within a framework of trust, mutual benefit, and shared growth.
- **Safety:** People are our main and most significant asset, and as part of Codelco life is not negotiable. All our solutions are designed to ensure that life will never be harmed.



Challenges for the future and today



Communities demand a better understanding and responsibility for large-scale projects

- Water and surface have become scarcer.
- The environmental requirements impose greater restrictions.
- Safety is of the highest priority



- Deeper mines
- Lower grades and predominance of primary sulphides.
- More impurities in the ore



Challenges

Energy Transition

Electromobility

Water Efficiency

Minimum Water consumption

Sea water

Water recovery

Sulphide Ores

Low grade treatment

Sustainability

Tailings and waste management

Remediation and Mine Closure

Enablers

Data Science

Automation/ Robotics

Technological breakthroughs

Open Innovation



Specific areas in which we are working

- **Community relations and sharing information**
 - Potential use of microsateletes to obtain land information and monitor mining operations
 - Web based access to public information
- **Water and Energy usage**
 - Water recirculation from tailings thickeners
 - Filtered or paste tailings to maximize water recovery
 - Dry grinding
 - Use of electric vehicles, both in mining operations and to replace regular vehicles
 - Incorporation of renewable power into mining operations
- **Safety**
 - Remote operations of moving mining equipment
 - Incorporation of robots and Process Automation
- **Mineral Processing**
 - In situ mining, how do we resolve recovery of minerals without removing them from the ground
 - Use of bacteria to recover minerals, not only copper
 - Increase in contaminants and other metals such as As, Zn, Sb, Bi
 - Recovery of other valuables from the ore, such as Ge, In, Co, Rare Earths



How we plan to face these challenges?

- Implementing open innovation, we do not know all the answers, working collaboratively may help us find them
- We have the mandate to bridge what the market could offer with the challenges the industry is facing
- We do not validate suppliers or technologies
- We are open to receive ideas and jointly develop solutions to specific challenges
- Establish collaboration agreements with a specific purpose, a defined scope and a timeframe to explore potential solutions





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