

# Codelco's Chuquicamata

THE "SUPER CAVE" MINE PROJECT



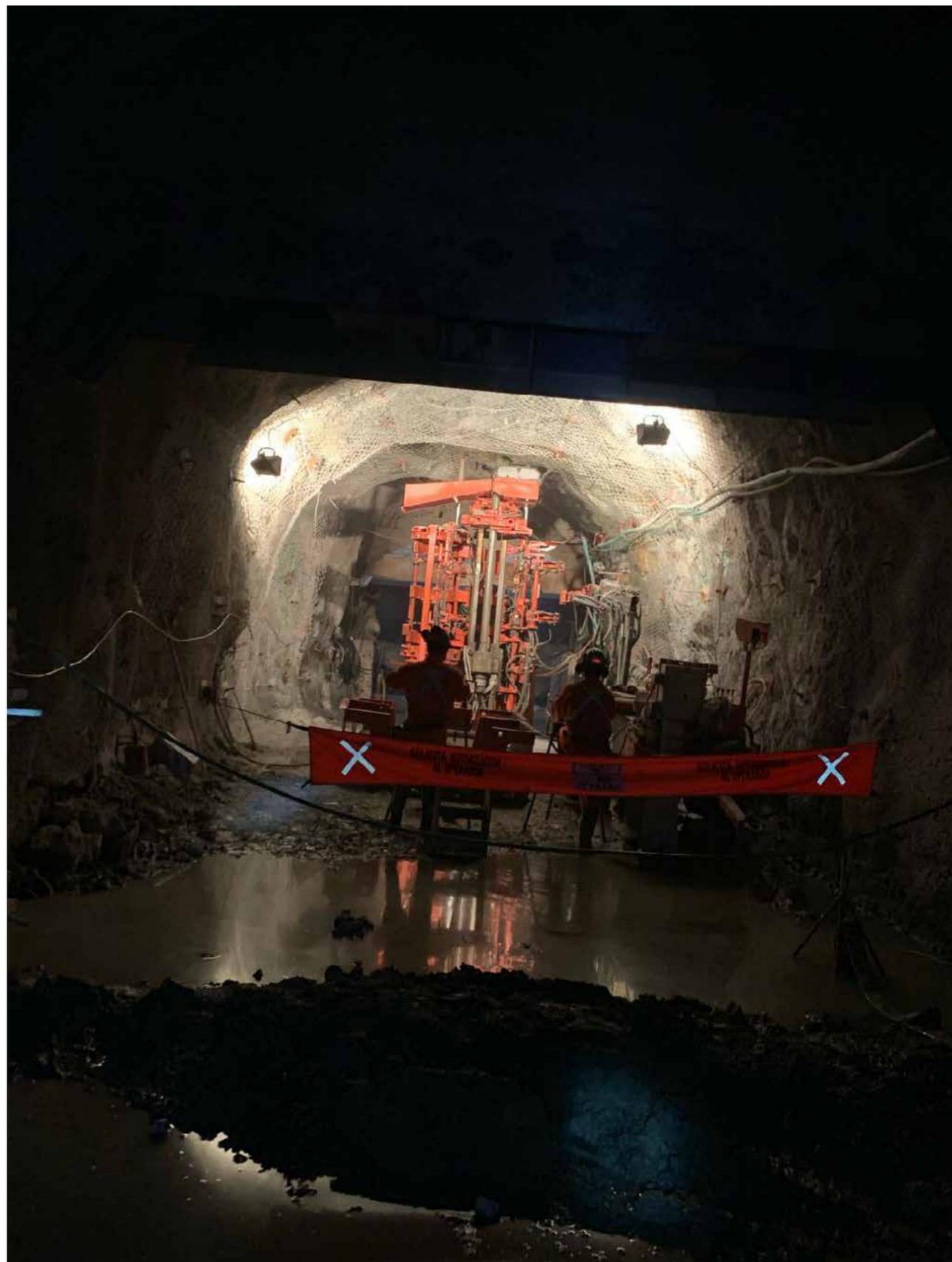


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# THE “SUPER CAVE” MINE PROJECT

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RESEARCH BY *Eurides lopes*



**W**hen Business Excellence first visited Codelco's Chuquicamata mine all the way back in 2013, what stuck out most was the sheer scale of the operations. As the biggest copper mine in the world, the vital statistics of Chuquicamata are quite staggering; at the time, before a modernization of the mine had begun, it was already producing 366,000 tons of fine copper per year and proven mineral resources totaling 4,200 million tons.

As the most important asset of mining firm of its parent company Codelco, not to mention arguably the most important in Chile, Chuquicamata is constantly being updated, modernized and improved to cement its standing as world number one. A relatively recent example of this came in 2012, when Codelco announced that it was to convert

measures at Chuquicamata. After almost six years since our last visit, we decided to return to Codelco's most important mine and see what its next phase of development has in store.

### **A complete overhaul**

After over 100 years in its current guise as an open pit mine, located 2,870 metres above sea-level, the development work which began in 2016 to change the mine to an underground facility, was nothing short of revolutionary. The major shift at Chuquicamata is the highlight of a major overhaul at Codelco's operations around Chile, which for which investment funds of nearly US\$40 billion have been earmarked over the next decade.

The shift to underground mining will not just offset the risk of dwindling profitable

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*“As the most important asset of mining firm of its parent company Codelco, not to mention arguably the most important in Chile”*

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Chuquicamata from an open cast mine into an underground facility.

On September 9, 2018, the last blast at the bottom of the open pit operation occurred, after 103 years of the mine. However, “Chuqui,” as the locals call it, wasn't closing up. Rather, it was just closing the page at the end of the first incredible chapter. Codelco also announced that it had awarded a \$50m contract to Rockwell Automation to take charge of the transformation of the mine into, what industry onlookers are calling ‘a super-cave’ mine.

The estimated cost of this transformation is estimated at around US\$5.5 billion, putting it among the top twenty largest capital investments announced by any company in the world in 2012. Nothing is done in half

ore, but also open up new untapped resources for the mine. Codelco's geology experts forecast that the change will give the mine at least a further 50 years of operations, bringing operations to at least 2058. Once the mine is fully converted to an underground operation, it is expected to have an annual production of 320,000 tons of fine copper and a further 15,000 tons of molybdenum.

This first phase involved the construction of four tunnels, two for ventilation, one for access and one for transport totalling about 20 km in length whilst the second and main phase of the project, involved the construction of no less than 100 km of tunnels and drifts. These will be used for production, material transport,

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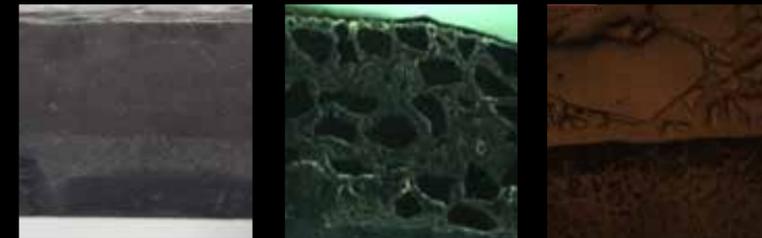
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► Since 2001, Derk Ingeniería y Geología Ltda. has been linked to the development of the Chuquicamata Division. During these 18 years, our Company has participated in various Projects related mainly to the geotechnical, geology and topographic survey areas; developing geological - geotechnical characterizations of the rock mass, stability analysis for slopes and underground excavations, surface and underground ground control, geotechnical reconciliation, orientation and geophysics of drilling wells, operational technical control of drilling campaigns, short term geology, geological and geotechnical modelling, geotechnical instrumentation; control, operation and maintenance of geotechnical instrumentation systems, management and development of databases, mining topography, among others.

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*“As a 100% government-owned entity, Codelco gives all of its profits back to the government, which then distributes it to the public budget”*

ventilation levels and auxiliary facilities such as crusher stations.

Importantly, the project has the full backing of the Chilean government, whose Finance Minister, Felipe Larrain, recently told gathered press on the announcement of the mine's transformation: "This is a show of the confidence we have in the company and in the importance of these resources for Codelco to be able to complete its structural reform programme." Copper has played a crucial role

in the development of Chile and it appears that role will continue.

Furthermore, as a 100% government-owned entity, Codelco gives all of its profits back to the government, which then distributes it to the public budget. Contributing around 40% of these profits, Chuquicamata is clearly important on a social level, contributing jobs directly and indirectly, but also paying for schools, education, infrastructure, health and other social projects by driving money into the public coffers.

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Over 1,200 Codelco employees have been deployed on this project. These include around 150 new staff employed specifically to work on the expansion project. The company has already established a training and induction program for 150 people, out of which 102 were selected for high-skilled roles at the mine. The training received by the selected individuals will ensure that they possess the technical aspects of the roles required in the mine.

**Partners and Suppliers**

Since we last spoke with Codelco, not only have its operations grown, so too has its network of partners and suppliers. Rockwell Automation has been awarded a \$50 million contract to supply a “number of important” systems for the Chuquicamata underground mine including will implement a block-caving extraction process for the asset life time expansion and improvement of the

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asset’s utilization. In Chile, the switchover to underground mining involved the assistance of Derk, Ingeniería y Geología Ltda. specialist mining consultants, based in Santiago de Chile. Redco Mining Consultants will also be involved in the extremely extensive block cave engineering and construction effort, to get the operation up and running.

In terms of the infrastructure and capital equipment involved inside the mines, Sandvik Mining supplied eight Loaders LH621 (21 ton) that will operate throughout an integrated

automation system in the new Chuquicamata Underground Mine, Sandvik will also automate and digitalise the underground operations supplying digital technologies such as AutoMine and OptiMine solutions as well and Howden, a Scottish firm with a 165-year pedigree in mining, was awarded the installation of the main fans of the Chuquicamata underground project in Chile.

Other key contributors include Sika Chile has been awarded with 70% of the total concrete admixture business technologies



*“Few mines in the world have experienced such a dramatic transformation, let alone at this scale. Who’s to say how many more chapters this incredible mine will write”*

for the underground infrastructure. S-INTEC an established provider of Industrial Technical Inspections.

#### **Beginning Chiqui’s 2nd century**

The story of Chuquicamata is an incredible one. It’s not just a prolonging of the mine’s life – and by extension, continuing to generate employment in the region – it’s also a case of going deeper into the mine for a level of efficiency which hasn’t existed till now. A good metric of this can be seen in the estimation that the exploited minerals will account for around 60% of the total mined over the last 90 years.

In our first article on Chuquicamata back in 2013, we noted that ‘bigger is better,’ in reference to the enormous scale of the mine in Chile’s abundant northern territory. To that list, we now add ‘brave’ as the mine makes a brave new beginning. Few mines in the world have experienced such a dramatic transformation, let alone at this scale. Who’s to say how many more chapters this incredible mine will write. **BE**

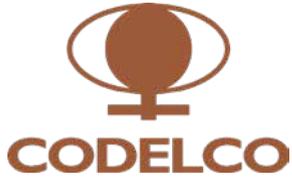
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