Lonely Trucks in a Lonely Place: Autonomous Trucks Debut in Chile's Desert

Komatu's autonomus trucks have no driver and follow a determined route based on GPS technology

By Cecilia Jamasmie

A 30-tonne truck the size of a house speeds down a desert track in northern Chile and suddenly halts within 60 meters of another vehicle.

There is no heated argument . . . because there are no drivers.

The so-called autonomous, 330 tonne-capacity, Komatsu mining truck is one of 11 being put to use at the Gabriela Mistral copper mine owned by the world's biggest copper miner, Codelco.

Run by a computer program, without any human intervention, the trucks are on the cutting edge of modern mine technology and Codelco is claiming a world first in rolling them out to haul mineral at its new mine.

"This is the world's most modern copper mine in terms of the technology being put to use here," Codelco Chief Executive, Jose Pablo Arellano, said at the inauguration of the mine in early December 2008 in the heart of Chile's Atacama, the world's driest desert.

Gabriela harvested its first batch of copper cathodes in May 2008, building the large open-pit operation in about two years and becoming one of the world's very few brand new copper mines last year.

According to Jeffrey J. Dawes, President Mining Business Unit and Vice-President of the Autonomous Haulage Division at Komatsu, the main advantage of surface automation is a very obvious one: safety.

"Not having truck drivers automatically reduces the risk of accidents and other hazards. There is also a utilization advantage as the trucks can work almost around the clock, stopping only for refueling or maintenance," Dawes said.

"For mines that are developed on the basis of autonomous operations, there are also significant mine-development cost savings and operational cost savings, such as tire costs, fuel consumption and maintenance costs, among others.

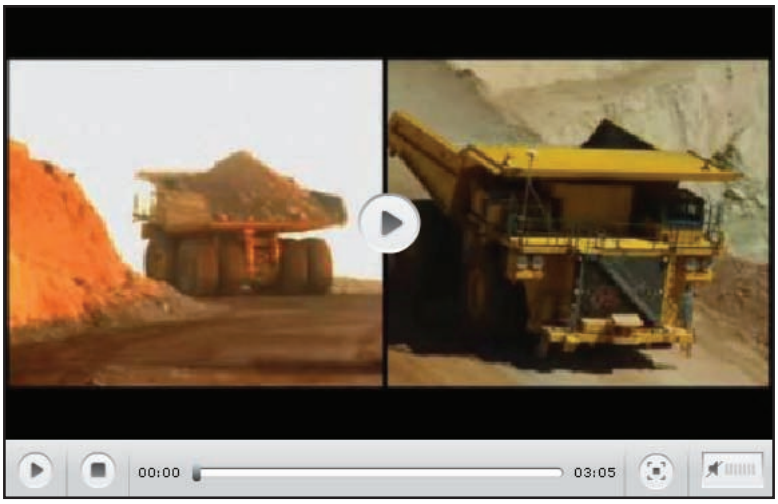
Aside from safety and cost advantages, the new technology allows Codelco to be a pioneer in mining methods and technologies.

"Codelco has the policy of actively looking for cutting-edge technology and testing it to have a competitive edge. Being able to have the first mine with autonomous trucks shows market leadership relative to peers," said Dawes.

How it Works

The trucks have no driver and follow a determined route based on Global Positioning System (GPS) technology, while being constantly monitored from a central control room.

When the truck gets close to the shovel, an operator takes control of the truck and he can instruct the machine as to what side of the shovel it should approach for loading.



Komatsu autonomous trucks - corporate video

The capabilities of the system were proven during the Radomiro Tomic project, when five trucks [930E3] were successfully operated in an isolated part of the mine development area. However, that was a pilot project and the trucks were not interacting with the rest of the production fleet, unlike at Gabriela Mistral, where the new automated trucks are the main production haulage tools.

The Radomiro Tomic project gave Codelco the chance to assess the productivity and extra safety measures needed.

"One of these is the so-called 'electronic bubble,' where all machines that are meant to be in the automated area are known and, if something enters the production area that is not recognized, an alarm sounds and the whole system shuts down. We had examples of this, such as where a motor grader encroached on the area and was not recognized by the automated 930E, which shut down successfully," explained Dawes.

Komatsu claims that several mining companies have already approached them to inquire about possible applications of the autonomous technology at their operations. However, Dawes says that the company has chosen to be cautious, proceeding slowly to avoid mistakes.

The next step for Komatsu is to open an autonomous operation in the Pilbara region of Western Australia in Rio Tinto's Pilbara mine and, in 2010, Komatsu expects to be migrating the technology to smaller sized trucks (from 930 to 830), which will allow it to expand its market.

Mostly Women

Named after Chilean poet Gabriela Mistral, the mine is a site for sore eyes for international markets hungry for every pound of the 150,000 tonnes of copper it promises to add.

Appropriately enough, given its name, the mine employs more women than any other in Chile, accounting for 25 percent of its engineers, geologists and mining technicians.

Gabriela, the only greenfield expansion project at Codelco, is in the middle of an ambitious expansion across its five divisions aimed at boosting output to 2.0 million tonnes per year by 2010, from about 1.7 million tonnes at present.

The company has other properties it could develop, each with significant challenges to overcome, ranging from low ore grade to high arsenic content of mineral.

At Gabriela Mistral, Codelco's main challenge was overcoming low ore grades. The mine will have an average ore grade of about 0.4 percent over 14 years, falling gradually from 0.7 or 0.8 percent copper per tonne in the first three years in operation.

"This is a deposit of relatively low ore grades, one of the lowest there is these days and, as such, the demands on efficiency are very high," Arellano said.

Gabriela Mistral Mine produced around 80,000 tonnes of copper in 2008. Operations will ramp up to full capacity of about 150,000 tonnes per year of copper early this year.

A second-phase expansion in coming years will boost output to about 165,000 tonnes per year. ■

Links and References

- Atacama Desert, the Driest Place on Earth
- Automated Mining Becomes a Reality
- Codelco
- Evaluation of Systems to Monitor Blind Areas behind Trucks
- Gabriela Mistral Mine
- GPS Technology
- Mine Technology
- Radomiro Tomic
- Rio Tinto's Pilbara Mine

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