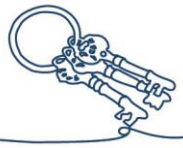
Federal Ministry
for Economic Cooperation
and Development

GHH FAHRZEUGE

Making mining safer in Chile

Remote operation of mining machinery



The challenge

Mining is one of Chile's most important economic sectors, accounting for around 15% of the country's GDP and more than 50% of its exports over the last 10 years. The sector's dynamism has contributed to the growing prosperity of the Chilean people. However, the efficiency of the country's mining sector is now threatened by rising labour and energy costs as well as the declining price of the commodities being produced.

At the same time, mining safety remains a serious concern, despite the fact that the widely publicised disaster in San José in 2010 moved the issue firmly into the spotlight. Larger enterprises, such as the state-owned CODELCO, set great store in their safety measures, but smaller companies just meet the minimum requirements. As such, many miners still face great risks.

Automated technologies can improve not only the safety but also the efficiency of mining, with subterranean work being carried out by remotely operated machines. Such tele-operation reduces the need to deploy miners below ground. This, in turn, reduces extraction costs and raises productivity. While the larger players have already begun to automate their production in this way, the smaller enterprises are unable to do so because the available technologies in Chile are too complex and expensive.

'We're testing and adapting automated technologies that will do a lot to improve safety and productivity below ground. Many potential users, from service staff to academics, are learning about the advantages of automation.'

Christian Riedel, GGH Fahrzeuge GmbH

The solution

GHH Fahrzeuge GmbH, a producer of utility vehicles for the mining industry, has entered into a development partnership with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, as part of the develoPPP.de programme of BMZ. Their primary aim is to assist Chilean mining companies, especially small and medium-sized enterprises, to obtain access to technologies for automated and tele-operated machinery.

Working together with the local partner, the *Advanced Mining Technology Center* (AMTC) of the University of Chile, they are developing new systems for the remote control of l*oad haul dump* (LHD) vehicles, which move material around underground inside the mines. GHH and GIZ are supporting AMTC in adapting existing tele-operation approaches to meet the needs of the Chilean mines and make them more relevant for smaller enterprises. Above all, this means ensuring their ease of use.

Through its involvement in all aspects of the project, AMTC will acquire the capacity to develop its own automated mining systems in the future. The relevant technical competences for this are also being integrated into the Center's existing courses. Meanwhile, GHH is also working with a vocational training institution, *Centro de Entrenamiento Industrial y Minero* (CEIM), to train trainers in theoretical and practical aspects of automation and tele-operation, in particular for the maintenance and remote operation of LHDs.

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Our services

The project comprises a series of academic and practical steps to design a suitable tele-operation system suited to the target group of small and medium-sized mining enterprises. Following research into the current state of technology in Chile and the related needs for innovation, GHH began working with an AMTC expert to design a new system architecture, all the time striving to ensure its relative simplicity. GHH then procured the necessary communication, navigation and video hardware for use in the automated machinery.

The technology had to be adapted to ensure the planned system would work effectively in the context of a medium-sized Chilean mine. This process involved numerous workshop tests and field tests at the pilot site. As well as designing a system for the automation of the vehicles, GHH has overseen the setting up of a control room and the installation of hardware, while AMTC programmed the necessary software.

Alongside the development of the system itself, the project also includes support for vocational training for the operators. To this end, GHH and GIZ are collaborating with Centro de Entrenamiento Industrial y Minero, identifying areas in which to improve and expand its curriculum, and supplying it with appropriate learning materials. The centre has since established a series of operator training courses, imparting skills at different levels, including to employees of the pilot mine. Furthermore, GIZ is working to promote contacts with universities and other institutions, and it is also responsible for monitoring the project activities.

In the later stages of the project, the partners have begun sharing the results of their activities with other stakeholders and SMEs in the mining sector. Using the project documentation and a range of publications and events, GHH and GIZ are now also transferring the new approach and know-how to other countries of South America.

Impacts and results

- AMTC has benefited from its better understanding of automated mining equipment. A new course on the automation and tele-operation of mining equipment has been made mandatory for students of mining engineering. A curriculum with appropriate new content is used at the Faculty for Physical and Mathematical Sciences of the University of Chile.
- Following the project, trainers at the vocational training institution, Centro de Entrenamiento Industrial y Minero, are expected to train at least 40 technicians for the tele-operation and maintenance of the LHD vehicles.
- Working with the local partner AMTC increases the potential for GHH to tap into the Chilean market to sell its haulage vehicles. These vehicles are ideally suited to the use of tele-operation systems, and the local partner is well placed to effect the necessary adaptations to for their automation.
- Awareness is growing among SMEs in Chile and other South American countries regarding the applications and potentials of automated LHDs and dumper trucks.

At a glance

Duration	15 December 2014 – 15 October 2017
Country	Chile
Objective	Improve local capacities in the Chilean mining sector, especially of SMEs, and provide better access to automated technologies for safer and more efficient production processes.
Partners	GHH Fahrzeuge GmbH and GIZ
Results	• A new course on automation and tele-operation is taken by students of mining engineering. • At least 40 experts trained for the tele-operation of LHD vehicles. • Increased awareness of the uses of automated LHDs and other vehicles.

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