Improved Blasting Through Precise Initiation

CIVIL • ENVIRONMENTAL • MANUFACTURING • **MINING** • OIL & GAS • POWER GENERATION

PROJECT DESCRIPTION

Luleå University of Technology

Luleå, Sweden

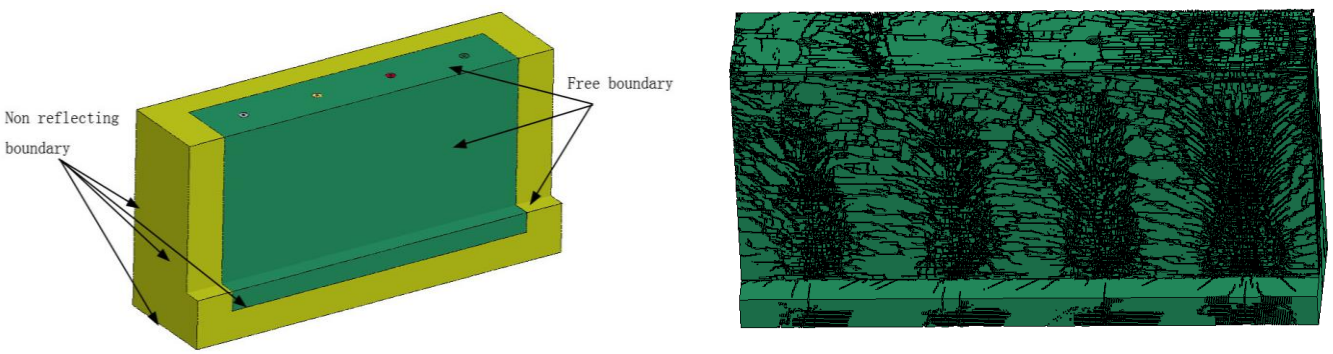
Using blasting caps with electronic delay units, and programmable delay times down to 1 ms, it has become possible to employ wave superposition in rock blasting. It has been hypothesized that fragmentation is improved in areas between blastholes where the tensile waves meet, overlap and interact. An improved fragmentation can, in turn, result in reduced costs for both blasting and transportation of the blasted rock, improved environmental aspects, and reductions in energy consumption during crushing and grinding of the blasted rock, as well as improved metal recovery. In this project, the above hypothesis was further studied in conjunction with developing computational tools for simulation of blasting with electronic programmable delay caps.

ITASCA'S ROLE

In this project, Itasca Consultants AB acted as project manager for the government-funded research project awarded to the Luleå University of Technology. The project was a mix of laboratory model tests, full-scale field tests and numerical modeling, carried out by researchers at the university and within mining companies (Boliden Mineral AB and LKAB) in Sweden.

PROJECT RESULTS

The results showed that there is a measurable, although relatively small, effect on fragmentation from stress wave interaction due to short inter-hole delay times. However, the effect of shock wave interaction may be "overshadowed" by other factors, which have a larger influence on the fragmentation. This implies that the use of electronic blasting caps cannot be motivated by possible improvements in fragmentation alone; rather, they should be chosen for their other benefits, and with a possibly improved fragmentation as a side-effect. The project result show also that the fragmentation is not worse for the cases with short delay times, compared to current blast designs for the cases studied. The developed numerical scheme can be used for future research of blasting effects.



Model geometry (left) and overall crack pattern for 3 ms delay time (right)

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