University of Exeter, Camborne School of Mines

Misfires Identification in Tunnel Blasts

Submitted by Solomon Ewusi, to the University of Exeter
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Abstract

Due to economic gain the use of explosives for rock breaking has been the preferred choice in the mining industry for extracting minerals and the construction industries for driving tunnels and underground excavations. Although misfires are not an expected outcome in any form of blasting operations, however, due to the confined nature of underground blast the likelihood of blasthole misfires occurring is increased compared to that of a surface blast. Past research on the use of explosives for rock breaking have been concerned with issues about improving the effective use of explosive energy neglecting such effect as safety hazards and increased operational cost resulting from blasthole misfires.

This research project investigate misfires in tunnel blasts with the aim of developing method(s) of minimising it occurrence during the blast design and identify blasthole misfires should they occur. Through a series of test blasts carried out at the Holman’s Test Mine operated by the Camborne School of Mines, three identification techniques based on blast emission data were developed namely; Electro-Magnetic Pulse (EMP Signature), Light (Optical Signature) and seismic (Vibration Signature).

The study therefore concluded that whilst no one single method developed could effectively identify blasthole misfires in tunnel blasts, the vibration signature approach is the most pragmatic method for misfire identification in tunnel blasts as measurements are remotely undertaken. Moreover, blast vibration is well understood and part of almost all tunnel blasting operation. The blast vibration measurements and analyses undertaken during the course of this research resulted in the identification of potential blasthole misfires and aided in the safe retrieval of unexploded detonators and explosives cartridges. As a result of the research project several misfires were identified immediately after full face tunnel blasts at the Holmans’ Test Mine and appropriate measures taken to handle the misfires.
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