

# **Progressive Development of Bulk Emulsion Explosives, Blast Application Improvements, and Blast Crew Training at the Ok Tedi Mine, Papua New Guinea**

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## **ABSTRACT**

The Ok Tedi Mine is a large open pit copper and gold mine located in a remote section of the Western Province, Papua New Guinea, with an annual rainfall of over 10 metres. Ok Tedi mines an average of 205,000 tonnes per day. A strong working co-operation between the mine operator (Ok Tedi Mining Limited) and the explosives contractor (ICI Explosives Asia / Pacific) has led to progressive development of bulk emulsion formulations to meet site-specific needs, continued improvement to blasting applications, and competency based training programs for the national blast crew.

There has been a progression of bulk emulsion formulations pumped at Ok Tedi. Chemically sensitized ("gassed") bulk emulsions have been employed at the mine from start-up in 1988. Several incidents in Australia, and elsewhere world-wide, which were attributed to reactions between sulphide bearing ground and ammonium nitrate explosives, led to laboratory tests being conducted in late 1993 to evaluate the reactivity of rock samples from Ok Tedi with the bulk emulsion being used on-site. When these tests showed the potential for reactivity, a sulphide reaction inhibited emulsion was put into mine-wide use in 1994. Post blast fume was also being generated in some parts of the pit; this led to the on-site development and adoption of a fume and sulphide reaction inhibited bulk emulsion in 1995.

High-speed film analyses performed in 1994 resulted in changes being made to improve initiation firing sequences and prevent blasthole crowding. Further, based on determined explosive gas confinement times, stemming was changed from drill cuttings to partial or full columns of crushed limestone. As a consequence, there has been observable improvement to gas confinement times and surface breakage uniformity. Additional studies have been performed during 1996 to confirm changes and observations.

Education and development of the national blast crew has been formalised. A four day 'Shotfirer Training' course is used to identify and prepare blast crew members for examination by the PNG Mines Department for a site-specific shotfirer's licence. This is in conjunction with a minimum of one year field experience, and further classroom work.

The program of bulk emulsion developments, improvement to blasting applications, and formalisation of competency based training programs for the national blast crews, have contributed greatly to higher levels of productivity and safety at the Ok Tedi Mine.