

Use of Electronic Detonators to Reduce Boulders and Fines



Background

BOULDERS AND FINES BECOMING AN ISSUE

This recently opened limestone quarry in Ontario, Canada is in the process of opening up a pit for a future operation. A number of blasts were done using NONEL® detonators. All blasts were considered pioneering as a thick layer of overburden was stripped, exposing fractured rock, an uneven surface, and bedding planes of various thicknesses.

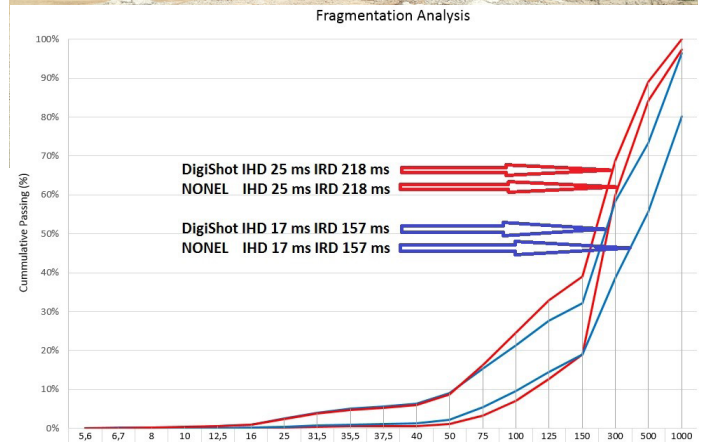
The customer raised concerns that the large amount of boulders generated by the blasts were becoming an issue. At the same time, fines recuperated throughout the crushing process keep piling up and cannot be recycled or sold. Dyno Nobel was invited to investigate and propose solutions at a competitive cost.

Technology Applied

IN-DEPTH ANALYSIS OF QUARRY OPERATIONS AND INTRODUCTION OF ELECTRONIC DETONATORS

The DynoConsult® team was asked to review quarry operations as well as their main blasting techniques. As a newly open pit, crushing techniques were adequate for the volumes of blasted rock. They were also well calibrated for the type of crushed stone that was the most desirable for the area it serviced. Blasting techniques were closely studied to see if some areas can be optimized. Boulders and fines were the main subject. Following an in-depth analysis, it was proposed to test electronic detonators that were not considered previously because of their cost, and to change firing timing in order to minimize the fines and boulders.

A series of 6 trial blasts were performed. After each blast, fragmentation of each muck pile was analyzed using the WipFrag photo analysis tool. Information was also gathered from the crushers to see if the changes made improvements in the crushing process. It was challenging to deal with boulders as the bedding planes and fractures of the top layer were uneven and did not follow any specific pattern.



Results

BOULDERS AND FINES WITHIN THE MUCK PILE WERE REDUCED

The use of electronic detonators helped to reduce boulders in the range of 5% to 17% and reduced the fines by close to 5% compared. Speeding up the timing helped to reduce the blocks generated by the top layer.

Overall, reduction of the percentage of the boulders in the muck pile from 11% to 25% could not justify the use of electronic detonators and the testing period was put on hold. Moreover, hoe ram time to fracture boulders added to the operation cost. Further investigation and optimization of blasts will have to take place to reduce the sizing of rock to client's specifications.