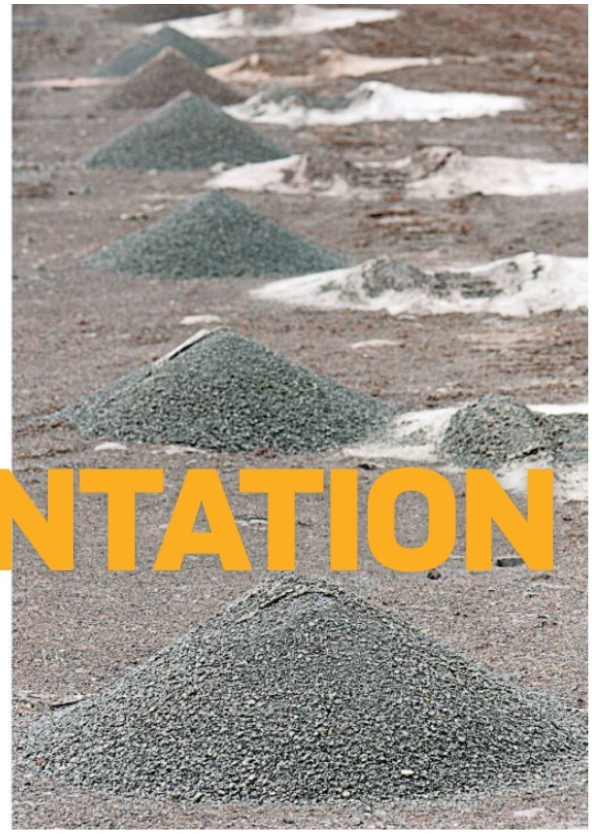
SAFETY
DRILLING & BLASTING



IMPROVING FRAGMENTATION

A special blasting technology takes a Canadian producer's fragmentation to new heights

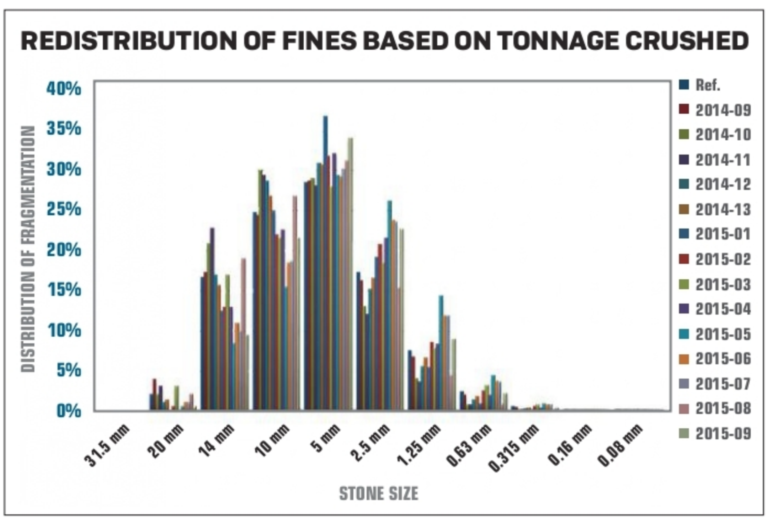
EDITED BY **KEVIN YANIK**

Groupe-Piercon, a producer in the aggregate, concrete, crushing and blasting markets within Quebec, Canada, is made up of six companies.

Groupe-Piercon carried out a study in collaboration with Dynapier, the company's drilling and blasting division, which produces more than 4 million metric tpy to meet Groupe-Piercon's needs.

Using an optimization study that covered a 20-month period, Groupe-Piercon found a high percentage of fines in its blasted stone. The company called in DynoConsult, a division of Dyno Nobel, to help study the reasons and come to a cost-effective solution.

Before the study began, an audit was conducted to validate sound loading practices and the precision of drilling. A standard blast was also conducted to determine the baseline data on particle size and speed of the primary crusher. The approach was to make one change at a time in the blasting parameters to measure the impacts on variation in particle size and crushing.



Through the project, **Groupe-Piercon** sought to improve and reduce fine particles smaller than 31.5 mm. *Source: Dyno Nobel*

IMPROVING & REDUCING FINE PARTICLES

According to Dyno Nobel, the project's aim was to improve and reduce fine particles smaller than 31.5 mm. The 0.08-mm passing size was not to exceed 11 percent of the range from 0.08 mm to 31.5 mm.

A secondary goal was to improve overall fragmentation of blasting, improving the optimal range of 31.5 mm to 1 meter.

The sampling methodology consisted of taking a portion of stones after the primary crusher at every 7,000 tons crushed from the blast under the study. After that, the sample was sent for analysis to an outside lab.

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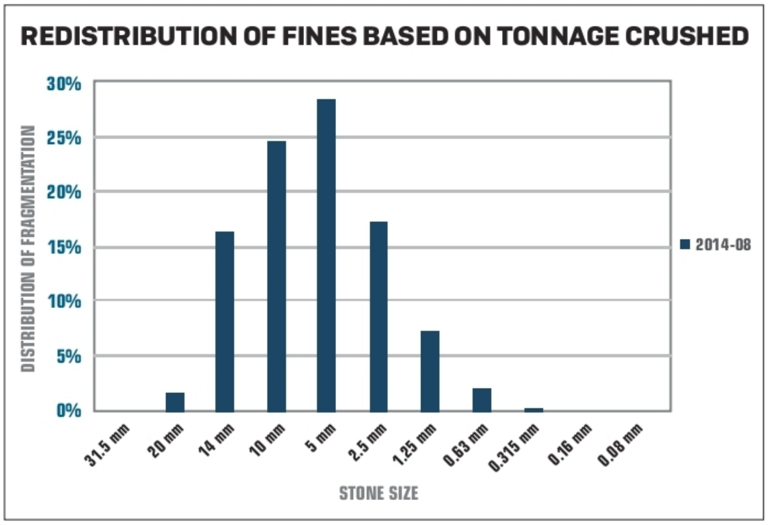

In its benchmark blast (No. 2014-08), nearly 30 percent of **Groupe-Piercon**'s fines were of the 5-mm variety. Significant percentages of 10-mm and 2.5-mm fines were also yielded. *Source: Dyno Nobel*

A POSSIBLE SOLUTION

The technology involved in the study was Differential Energy, which allows alteration of the segment gasification rate (with a maximum of four segments) in a single hole and in a single loading phase.

For this study, more than 15 blasts were required to determine the parameters best suited to meet the project's goals. The benchmark blast was done based on the quarry's conventional parameters (blast No. 2014-08). In examining this blast, it was possible to determine the distribution curve of the fines. It was found that the 0.08-mm passing size came to 10.8 percent – close to the 11 percent limit.

In another blast (blast No. 2014-12), the drilling parameter was retained, and the loading level was much the same: 0.90 kg/m3 for blast No. 2014-08 and

IMPROVING SAFETY

Differential Energy offers a number of safety enhancements to quarry blasting, according to Dyno Nobel.

For example, the product is not sensitized until it is delivered to the blasthole. The potential for flyrock is also reduced, the company says, by placing low density gassed emulsion near the collar and areas of low burden.

Highwall stability is also improved, Dyno Nobel adds, as a result of accurate control of energy at the crest. Additionally, a thickened emulsion resists flowing into cracks and voids, and emulsion densities can be tailored to the hardness of the rock.

Source: Dyno Nobel

0.92kg/m3 for blast No. 2014-12. The use of two-segment Differential Energy allowed the average load density of 1.2g/cc to be maintained in the hole.

After blasting, an improvement in the 0.08-mm passing level was observed, from 10.8 percent to 6.5 percent.

After several trials, one particular blast (No. 2015-08) demonstrated the best overall result. The drilling diameter was lower, at 114 mm to 121 mm; the drilling pattern was reduced by 7.8 percent, from 3.35 m x 3.65 m to 3.35 m x 3.96 m; and the loading level was higher, at 0.97 kg/m3 instead of 0.90 kg/m3.

Also, the average density in the hole was altered, from 1.20 g/cc to 1.13 g/cc. This lower average density in the hole was achieved by using three-segment Differential Energy (bottom segment 1.26 g/cc, middle segment 1.15 g/cc and upper segment 1.10g/cc).

A decrease in 0.08-mm passing fines from 10.8 percent to 5.7 percent was observed in comparison to the benchmark blast and from 6.5 percent to 5.7 percent in comparison to blast No. 2014-12.

TECH HELPS IMPROVE FRAGMENTATION

Differential Energy played a major role in improving fragmentation, and several other positive improvements were obtained in fragmentation during the blasting trials:

1. A lower proportion between 0 mm and 31.5 mm, from 21.02 percent to 15.56 percent – a 26 percent improvement.

2. The optimal fragmentation range, between 31.5 mm and 1 m, is maintained, marking an increase from 76.97 percent to 81.31 percent – a 5.33 percent improvement.

According to Dyno Nobel, it was shown Differential Energy helps improve fragmentation to obtain a desired particle size, due to energy being distributed in the right places. **P&Q**

Information for this article courtesy of Dyno Nobel.