QUARRY CASE STUDY

Reducing Regulatory Community Liability Exposure with DigiShot® and Waveform Analysis

PROJECT SUMMARY

DIGISHOT® AND WAVEFORM ANALYSIS KEY TO RISK MANAGEMENT

Blasting in an urban environment has its own unique set of obstacles.

Strict regulatory compliance with both federal and local laws can leave a mine or quarry owner with few blasting options.

Taking advantage of the flexibility and precision of the DigiShot® electronic initiation system paired with alternative timing sequences designed through signature waveform analysis, one northeast U.S.A. quarry operator was able to reduce peak particle velocity (PPV) values by over 50%.

This reduction in PPV resulted in fewer neighbour complaints and a decreased need for oversight by local regulatory authorities.

Reductions in ground vibration were realised without the loss of productivity, blast size, or fragmentation.

Digishot tagger.

PROJECT GOALS

REDUCED VIBRATION WITHOUT IMPACTING PRODUCTION COSTS

Blasting in an urban environment involves significant liability exposure.

Concerns over the effects of vibration on existing homes in this north-eastern city resulted in increased scrutiny by the local township and state regulatory agencies.

With mounting concerns over the potential cost of litigation and the tightening of regulatory limits, Dyno Nobel initiated a program to utilise the capabilities of the DigiShot system.

The goal of this system is to employ alternative timing sequences, developed using waveform analysis, to reduce the impact of off-site effects.

Drawing on over 20 years of waveform analysis experience, Dyno Nobel targeted:

- reducing vibration,
- providing a positive impact on productivity through improved fragmentation,
- reducing mucking cycle times and;
- increased blast size.

All of this, while reducing off-site effects such as ground vibration and air overpressure.

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TECHNOLOGY APPLIED

PRECISION INITIATION AND OPTIMISED FIRING SEQUENCES PROVIDES THE SOLUTION

To determine optimum firing times for vibration control, a series of single-hole test blasts were designed by a team consisting of DynoConsult and quarry staff.

For each test location, arrays of seismic monitoring units were deployed to record the test data.

Using state-of-the-art waveform analysis software, DynoConsult derived site-specific blast design sequencing aimed both at a reduction in peak particle velocity at critical structures and at enhancing the high frequency spectra to minimise structure response.

Timing sequences were reviewed by Dyno Nobel blasters to ensure results would not only provide the desired off-site effects but would also provide the mechanism for improved fragmentation and the ability to increase blast size.

Using the alternative timing designs, Dyno Nobel blasters began initiation of production blasts using DigiShot electronic detonators.

VALUE ADDED

REDUCED VIBRATION, FEWER COMPLAINTS AND BETTER REGULATORY COMPLIANCE WITHOUT NEGATIVE IMPACT TO PRODUCTION

The use of electronic initiation on its own may have provided some reduction in vibration.

However, by introducing timing sequences derived from site specific waveform analysis, the level of success in reducing peak particle velocity and increasing the high-frequency spectra generated by production blasts was greatly enhanced.

Because of the history of damage complaints from blasting in this state, regulatory penalties are assessed on an ever-increasing scale, making compliance a financial necessity.

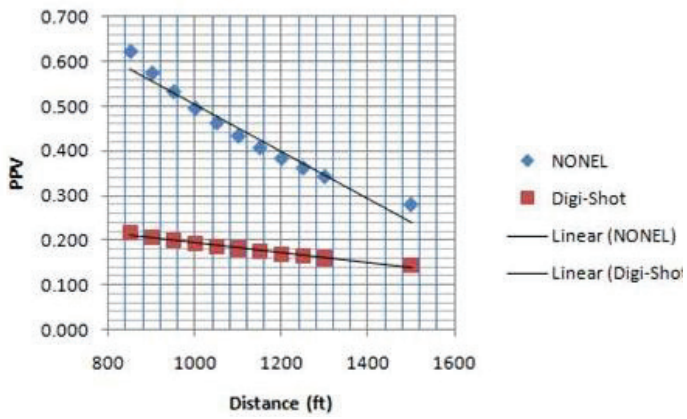
The use of electronic initiation allowed the blaster to increase productivity through greater crusher throughput, faster cycle times for mucking and increased size of the blast event.

The modelling capabilities of the Signature Waveform Analysis (SWA) program ensured that timing sequences used for each blast would not result in unacceptable vibration.

This enabled the blaster to take a more aggressive approach which maximised production without increasing community complaints or incurring regulatory penalties.

A comparison of electronic initiated blasts with previous blasts utilising traditional pyrotechnic delay detonators showed a significant reduction in peak particle velocity for blasts using the DigiShot system, with timing sequences developed using SWA modelling.

This quarry customer also realised a virtual elimination of complaints from the surrounding community. All these results were achieved while maintaining productivity targets set by the quarry.



PPV NONEL vs Digishot

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