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# Solutions to Boost Efficiency, Remote Work

*Going digital, streamlining processes and facilitating remote work are among the benefits offered by the most recently released or updated blasting solutions*

By Jesse Morton, Technical Writer

Lockdowns, travel restrictions and social distancing have inadvertently brought to the fore some powerful digital solutions for blasting. There has perhaps never been a better market for solutions that reduce the required number of people on site to plan and execute a blast.

The opportunity is not lost on the major suppliers. Even before news of a novel virus in Wuhan went global, their flagship offerings were being trumpeted as game changing at improving efficiency.

Recent headlines from the space reveal that, since then, case studies, miner testimony, record-shattering blasts and accolades all but prove they can help miners best conform to the emergent brave new world.

## Case Studies of Big Efficiency Gains

Dyno Nobel released a white paper showing how Dyno42 and SignaShot were used to generate big cost savings for a customer.

The customer, a U.S. coal operator, had previously determined it would deck casting blasts to prevent vibrations from exceeding the max allowed for nearby pipeline and risers. The miner used Dyno Nobel's Dyno42 and SignaShot to vet that decision and draw up a better plan.

Dyno42 analyzed data captured from seismographs on an exemplary single-hole blast, referred to as a signature hole blast. The software provided a range of possible timing schemes in Excel that could then be sorted and ranked. SignaShot analyzed the range and provided statistical confidence for each possible scheme.

The software solutions proved the miner's previous plans were too conservative. They helped the miner arrive at the optimal timing scheme to mitigate vibration. Blasting could then continue largely as normal, undecked.

Multiple direct cost savings were identified. The ability to blast normally gave



An Indiana mine uses Dyno42 and SignaShot to reverse a costly decision to deck blasts. The software systems mandate use of electronic detonators, which provide the required timing accuracy. (Photo: Dyno Nobel)

the miner a subtle advantage in subsequent negotiations with the pipeline owner over plans to move the pipeline and risers.

DynoConsult, a division of Dyno Nobel, said the case study revealed how the calculations typically used at mine sites to forecast vibrations tend to err on the side of conservatism, sometimes to the detriment of the miner. "The scale distance equations typically used to determine pounds per delay are usually conservative and their peak particle velocity predictions (PVP) may lack accuracy and precision when compared to a representative data set of actual vibration results," said Vincent Slone, senior consultant, DynoConsult.

"The equation is typically weighed down, resulting in a conservative limitation to the pounds of explosives fired per

8 milliseconds," he said. As a result, "in an abundance of caution, as a responsible operator, coal mines will begin decking shots at the first sign of elevated PPVs."

The case study also showed the importance of vetting timing schemes generated by signature hole analysis programs like Dyno42.

"Signature hole analysis traditionally relied on a signature hole wave and the principle of superposition to determine optimum timings for lowering PPV," Slone said. "The timings derived from this approach can lower PPV, but the predicted PPV may lack accuracy due to the variability in the signature hole wave driven by the inherent variability of all the factors affecting the wave form from each blast hole."

To eliminate some of the uncertainty caused by that variability, SignaShot can

tion, and 1 to 2 additional hours for each axis, per blast,” Slone said.

Training takes about a day for each program. “The learning curve for achieving ideal results depends on the quality of the data and the user’s understanding of the variables,” Slone said. If the data is bad, or the software is used incorrectly, the results will be less than ideal.

DynoConsult hosts seminars on both the signature hole analysis process and on the software.

Separately, a case study on field trials at a mine shows the new DigiShot Plus 4G System (DGPS) tags blast holes with an unprecedented level of accuracy. “The sub-1-m accuracy that was achieved ensures the correct hole position is identified and tagged with the right information, eliminating the possibility of human error,” Dyno Nobel reported.

The offered accuracy and “ease of use” prompted the customer to trial the system,

and attain the desired results, the report stated. “A 0% error/retag rate was obtained in the trials due to the accurate and automated hole-detection ability of the system.”

The system is comprised of the handheld CE4 Tagger, the compact Commander beacon, ViewShot 3D software, and ideally the new 4G Detonators.

With a built-in long-range antennae, the Commander is sited on the ground at a known surveyed location within 3,000 m of the planned blast. The Commander can be used as a remote unit, a repeater or a base commander, Dyno Nobel reported.

The electronic Detonators are wired to the Commander. The Commander tests the connection and monitors the energy stored in the last Detonator, detecting and adjusting to leakage.

ViewShot 3D and the Tagger programs the timing. The timing sequence is planned and simulated in ViewShot 3D, which uses GPS coordinates of holes

obtained from drill rigs, drones or survey systems. The timing sequence is loaded into the Tagger by WiFi or USB.

The Commander and the Tagger triangulate with GPS to tag blast holes. Multiple Taggers can be used with a single Commander.

Upon approach, the Tagger automatically detects the hole. It “automatically identifies the hole position as the user walks toward the hole so that very little or no interaction is required, which was particularly helpful to the customer,” Dyno Nobel reported.

The Tagger writes the delay time and unique ID of the hole directly into the Detonator. The Detonator’s memory can also store the downwire wire length and GPS coordinates.

The Tagger can tag and test up to 400 Detonators per line, Dyno Nobel reported.

The Tagger and Commander execute the blasts. Scanning a yellow card arms the Commander. Scanning a Red Card initiates the blast.

A button on the Tagger wirelessly signals the Commander to fire the blast.

The system “is cable of supporting standard and custom coordinate system projections,” the company reported.

The benefits offered by the system include efficiency and safety gains.

“The elimination of tag/log errors that the system provides will assist the customer with improved on-bench efficiency and associated downstream cost benefits,” Dyno Nobel reported. “The prevention of incorrect timing will also mitigate against the safety concerns of a poor blast result due to tag/log errors.”

The representation of the hole layout generated by the system assists in the reconciliation process.

“This semiautonomous system of tagging/logging offers tremendous value to the customer,” the report concluded.

Dyno Nobel said some of the intangible benefits include reduced stress for the blaster, fast deployment and minimal infrastructure requirements. “We always wanted to build a system that was not dependent on the backbone of the mine,” Mark Dorman, product manager, electronics, Dyno Nobel, said. “So, the system is fully independent of a backbone and can run anywhere in any mine.”

Dorman said the case study shows the hole-tagging process supported by the System as almost foolproof. “With the DGPS Tagger, a 0% error/retag rate was

## Emulsion System for UG Offers Better Safety, Productivity

Getman Corp. announced the ProCharge Emulsion MAXX configuration for its 3000 and 4000 explosive charger units. “Our integrated emulsion system includes the emulsion, water, and gasser tanks, along with water and gasser pumps, hydraulic valves, and a hose handling system,” Mario Tremblay, principal product line engineer, Getman Corp., said.

The optional hose handling system includes hose pushers, a hose reel, and hose guides for up or down holes. Space is also allocated for explosives supplier emulsion pumps and their process control system. “The system can accommodate all known explosives companies’ components,” Tremblay said. “Once the explosives supplier is identified, we are

involved up front to ensure successful integration.”

The system offers the maximum emulsion capacity available for each vehicle model, he said. It will reduce trips to the magazine, clutter on the ramps, and wear and tear on equipment.

Fully operational vehicles can be put into service in weeks instead of months after delivery, he said.

In the field, the system has yielded promising results, the company reported. “Using the largest of our designs for a face-charging application, our mine customer was able to sustain operations for three days without returning to the magazine for tank refills,” Tremblay said. Since then, a second truck and a retrofit kit was sold.



The ProCharge Emulsion MAXX Integrated Emulsion system for the ExC 4000 explosive charger includes the emulsion, water, gasser tanks and a hose handling system. (Photo: Getman Corp.)