Best-for-project practices in drill and blast

BY MICHAEL WISEMAN
Technical Services, Action Drill & Blast
AND STEPHEN TIMBRELL
Blasting Specialist, Action Drill & Blast

As the mining industry becomes increasingly lean, a 'one size fits all' approach is becoming increasingly obsolete. A commitment to continuous improvement – finding ways to do things better, faster and more cost effectively – is how asset owners and contractors are ensuring their ongoing success.

In drill and blast, innovative detonation technology is providing forward-thinkers with an opportunity to dramatically enhance their blast capability.

Unlike conventional pyrotechnic and electric detonators, these electronic initiation systems are capable of facilitating highly-tailored blasting solutions, with the potential for significant cost and productivity benefits. Many teams and contractors willing to invest in increasing their knowledge base, trialling new products and upskilling in order to deliver maximum value to their project or clients are now implementing the technology.

Benefits of electronic initiation systems

Typically, electronic initiation systems are best suited to complex blasts. Blasts requiring precision, such as those close to infrastructure, large tonnage blasts and blasts where creating the muckpile profile to suit the digging fleet is the primary objective.

When used in these situations, the benefits can be significant:

1. Reduced bulk product use – This is electronic systems' key advantage. The overarching goal for drill and blast is to use the raw energy from the bulk explosives product to do the most useful work on the rock.

In most mines, the bulk product cost is more than all other drill and blast costs combined. Electronic initiating systems, when used to their potential by skilled operators, will achieve more with the rock using the same energy. Depending on the mine's situation, this can result in increased productivity, or it can assist to reduce costs by improving fragmentation so that the rock digs faster and the mine produces more for the same cost.

Alternatively, if the mine is operating at full capacity, the capacity can be maintained but at reduced cost by delivering the same level of productivity with less bulk product.

A typical coal overburden blast.

A shotfirer tying in a blast hole.

2. Cheaper at longer lengths – The head of a pyrotechnic detonator is relatively inexpensive and the tailwire is relatively costly. In electronic systems, the head is very expensive due to its computer chips, but the tailwire is cheap. This means at short lengths pyrotechnics are cheaper per detonator, but at long lengths – usually greater than 50m – electronics are cheaper.

3. Improved fragmentation – Most of the gains achieved with electronics are not made through the detonator itself but through the use of its advanced software. A blast team has the ability to plan in just a matter of hours timing sequences that would otherwise take days using conventional equipment and be impossible to practically implement.

However, the big benefit of the accuracy and flexibility of electronics' timing capability is to be able to devise a plan that best suits the shot in question; very fast, very slow and/or very complex sequences can be used to get the most useful work out of the explosives to achieve optimal fragmentation. Trying these sequences without electronics would be unsafe, impractical or impossible.

4. Reduced ground vibration – The best electronic initiating systems come with a vibration prediction tool so that the vibration can be predicted at various points, particularly sensitive ones. The blast timing can then be modified to protect those points and the vibrations can be aimed in a direction where nothing of value needs protecting.

Further, because of the accuracy of the timing, the explosive energy is released at the exact time it was set to; there are no unplanned spikes in energy (and therefore vibrations).

5. Improved control of blast movement – A general rule is that a hole that detonates a long time after the hole next to it will tend to move into the gap where the last hole was. With electronic systems' advanced timing, it's possible to change the height of the muckpile and where it sits by changing the timing between the holes.

6. Integrated safety and security features –In an electronic system, generally speaking, the firing box communicates with each detonator in the circuit via the internal microchip to check for continuity by using just enough power to test the circuit but at no stage enough power to initiate the detonator. Any faults in the circuit are reported to the firing box.

7. Reduced detonator stock requirements – Pyrotechnic detonators have a fuse, so the timing delay on the box is based on a very small fuse in the detonator. This means for each timing, a different detonator is needed. If different lengths of detonator are needed for each timing, a dozen or more different detonator piles might be needed but only a couple of types will be used for each blast. With electronics, the timing is programmed in, so only different lengths are required. With less than half the combinations needed, double the quantity of each length can be used in the same magazine.

Best-for-project is key

Selecting technology and employing techniques based on what is best-for-project must be front-of-mind for any drill and blast team in today's market.

This means an ongoing investment in technology, training and trialling is more important than ever to ensure optimal project delivery. **NMC**