

Safety and efficiency drives technical advances in drill and blast

by Stephen Timbrell, Laurie Pratt and William Codd, Blasting Specialists, Action Drill & Blast

Drill and blast has come a long way in recent years, driven by an industry-wide need to improve safety and efficiency.

With enhanced software, advanced drill equipment, innovative explosives and superior detonation techniques we are now able to achieve highly precise blasts, reducing dilution and delivering higher quality ore. The end result is a greater return on the orebody.

Enhanced software

Advanced blast fragmentation modelling software (such as 2D Bench and Surpac) has impacted the way blast patterns and parameters are planned as they allow the analysis and simulation of the detonation of the proposed design.

2D Bench provides a cost-effective solution for blast design, blast analysis and tie-in plans for shotfirers while Surpac provides additional benefits such as 3D modelling and allows blast designs to be created using topographic information and pit designs.

These predictive software programs allow further enhancement of blast outcomes by enabling changes to design parameters prior to implementation in the field. Improved software reporting functions allow for accurate information to be passed on to the shotfirer.

Advanced drill equipment

One of the most dramatic changes in drill and blast has been drill equipment. Recent advances to the state-of-the-art hydraulic drills used today include the use of Canbus control-systems which provide onboard monitoring and maintenance assessment. Modern drills have

global positioning system (GPS) hole location capabilities, rock recognition software, auto collaring and in some cases, auto drilling.

Rock recognition software enables drill hole information and rock recognition information from the software in the drills to be fed into the blast design program. The type and amount of explosive for each hole comes from the design program and can be sent directly to the GPS enabled mobile processing unit (MPU). As the MPU positions over each hole it is automatically loaded as per the design.

Another equipment innovation developed in recent years and now used around Australia is the ANFO Hopper. Developed by Action Drill & Blast during a drill and blast project at Rio Tinto's Western Turner Syncline project in Western Australia, it fits onto a front-end loader or interchangeable tool carrier. It safely carries 1.8 tonnes of ammonium nitrate fuel oil (ANFO) explosive onto sloping and uneven ground where blasting services previously required manual handling of bulk explosive products.

Direct delivery into the blast hole from the hopper enables more accurate record keeping of explosives consumed on a hole by hole basis. The use of the hopper also reduces the number of personnel required for contour blasting and provides a quicker turn around in the delivery of product to the blast holes.

Innovative explosives

Factors such as blast hole diameter and bench height, rock hardness, the presence of water, ground conditions, supply and storage cost, proximity to vibration sensitive receivers, fragmentation requirements for crushing, muck pile profile to suit excavation methods and equipment need to be considered when selecting the types of explosives to be used for mining operations.

The bulk explosives products available today allow better matching of rock type to the explosives to achieve a much more controlled and productive blast. The main bulk explosives available are ANFO, Heavy ANFO and

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An Action Drill & Blast mobile processing unit in operation at a West Australian iron pre-project.



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Emulsion. Another explosive, currently being trialed at Roy Hill, is a new generation hybrid explosive. It is demonstrating a host of benefits in harder rock and would be well suited to gold projects.

Superior detonation

Non-electric and electronic detonators are the main types of detonators available on the market today.

Non-electric detonators have the advantage of being more cost effective, readily available, and easier to use in

the field. The main disadvantages of non-electric detonators is the timing precision or scatter that occurs and the limited range of detonator timing delays available on the market, which reduces design flexibility.

Electronic detonators have high-precision timing which is ideal for vibration controlled blasting and achieving improved fragmentation on a site specific basis. When modifications are required to blast designs, electronic detonators eliminate concerns relating to detonator scatter. Electronic systems with two way communication can identify detonator misfires prior to initiation.

However, electronic detonators are typically higher cost and have additional training requirements given the potential for incorrect data entry and the lack of visual check other than the display on the programming unit.

Safety will continue to drive innovation

Improving safety will always be a key driver of innovation in drill and blast. A commitment to continuous improvement in this area by in-house teams and contractors alike will ensure we remain focused on reducing risks in the workplace. ■