## The value of high-speed drifting

Mine development is a major issue for the preparation of new mines and existing workings alike, and while advances in modern technology are making the job easier, faster and safer, at the end of the day, it's all about time.

With continuing pressure on mining companies to meet their obligations to their customers and their owners, as well as meet demands for increased safety and sustainability, it is vitally important that mine development work is carried out in the most efficient way possible.

Here, the name of the game is speed. Miners need to get access to ore as fast as possible at a reasonable cost and without compromising on safety or sustainability. In essence, it is about time, and time is money in all aspects of the underground mine development process, including ramps, raises and shafts, as well as drifts. It is drifting, however, that is the most difficult process to optimize as it encompasses crosscuts, ramps, and entrances. The faster a drift can be completed to allow production to begin, the better.

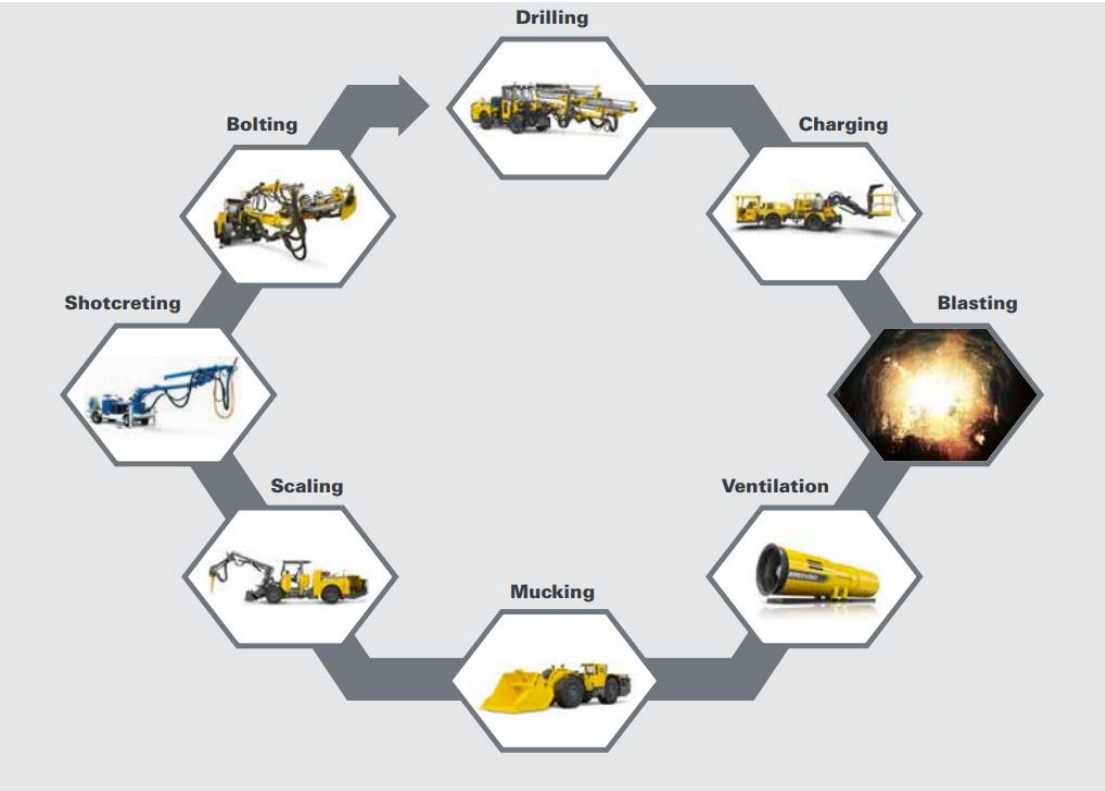


*Figure 1: The sequential operations performed at the face in mine drifting.*

There is no doubt that the developments of the last few years in tunnelling technology have contributed greatly to meeting Figure 1: The sequential operations performed at the face in mine drifting. Charging, Blasting, Scaling, Ventilation, Mucking, Shotcreting, Bolting, Drilling. Modern, computerized drill rigs that are specially designed for drifting, equipped with increasingly powerful rock drills and long-life drill bits along with various devices for monitoring performance and progress, are now commonplace in many parts of the world.

Similar advances have been made in loading and mucking out equipment, which play equally important roles in the drifting process. If operated as a dedicated equipment fleet, fit for purpose, mines can maximize their chances of meeting their productivity objectives. At the same time, mining engineers are changing the way that development work is carried out by, for example, focusing on proactive planning for rock reinforcement and the improvement of routines, a crucial task in the development process as illustrated in Figure 1.

## Adjusting the profile

The key factors when establishing the most effective tunnel profile are the mining method and the rock mechanics. If the latter is permits, the profile can be suitably designed to accommodate larger equipment in the drift. Increasing the advance rate by using an alternative tunnel profile should be easier to implement for mines than for civil engineering contractors. This is because mines have more freedom to decide the shape of their drifts once the mining method and surrounding rock have been taken into consideration.

## Extending the rounds

Excavating drifts by drill and blast requires sequential operations at the face, each characterized by the mobilization and demobilization of equipment. The time required for this is practically the same, irrespective of the length of the round. By extending the round from 4 m to 5 m, some 90 minutes is saved over 20 m of drift. The drifting crew needs to determine what rock classes are likely to be encountered in each round to plan the process in the most efficient way. This is usually evaluated at the planning stage to design the appropriate rock support system. Other considerations include rock bursts or seismic conditions which may require that permanent rock support be installed directly, and it is common for mines to have a strategy in place for such situations. The aim is to install just the right amount of rock support needed at the face. The remaining support will then be installed well behind the face. This reduces the amount of time needed for rock support at the face and enables the drift to advance as quickly as possible under safe conditions.

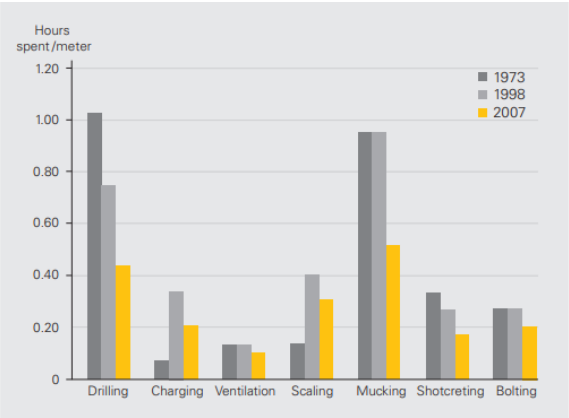


*Figure 2: Typical development of the sequential operations at a tunnel face seen over a 35-year period.*

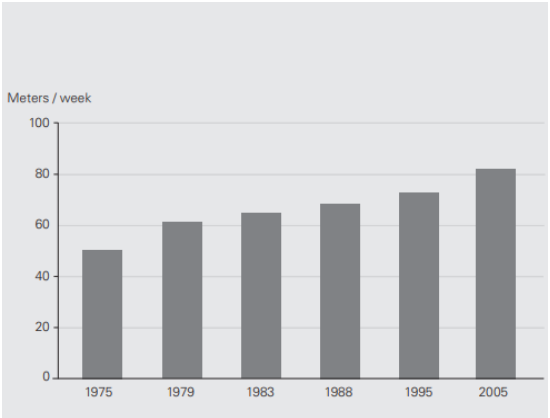


*Figure 3: Typical improvement of tunneling speed over a 30-year period.*

## Supporting the Round

Drifting is mainly carried out in connection with mine preparation. Drifts run in parallel at many faces and the objective is not to advance a single face as fast as possible, but to excavate each tonne of rock as economically as possible and to finalize each mining area at the right time to allow bulk mining to commence. This is particularly important when it comes to the Sublevel Open Stoping, Sublevel Caving and Block Caving methods, where development is just a small percentage of the entire mining process.

In this situation, characterized by the availability of multiple headings to work at, it is more cost effective to install all the bolts and the shotcrete needed for final support right at the face. This will mean savings in terms of mobilization time and simplicity. Applying final rock reinforcement at the development phase will also result in fewer rock mechanic disturbances, which is an advantage for subsequent mass mining.

## Better scaling

Scaling of the face, roof and walls is the only process in the drifting sequence that might be somewhat difficult to optimize in advance. This depends on the rock conditions.

In good rock conditions, the roof and walls will not yield any falling rock, and the need for scaling will be minimal. In poor conditions, all surfaces will require scaling, which is much more time-consuming. However, even here, advanced technology in mechanized scaling equipment has enabled the scaling process to be carried out much more efficiently and safely.

This also allows any necessary shotcreting to be carried out well behind the tunnel face. In many cases, shotcrete is applied some 50 m behind the face, even in large tunnels, provided the rock mechanics are favourable.

If, however, mining is conducted at deep levels, 800 m or more, rock bursts or seismic conditions will often dictate when and how rock reinforcement is applied. In addition to rock quality, the mass mining activities surrounding the drift may also determine how to plan and proceed with rock support.

In recent years, mine development has become significantly more efficient as more reliable and advanced machines have become available. Modern technology in all its forms, and particularly in communications, has contributed to making it safe and fast. Although all these factors have paved the way for easier and faster drifting, miners are confronted by a whole new range of issues as drifts are constructed at deeper levels than ever before. Judging by the pace of technological innovation and evolving expertise, however, the industry is well equipped to meet the challenges.