

TECHNICALLY speaking

The new drill plan generator and map navigation systems developed for the Atlas Copco Boomer L2 C series are providing drillers with better accuracy and precision than ever before.

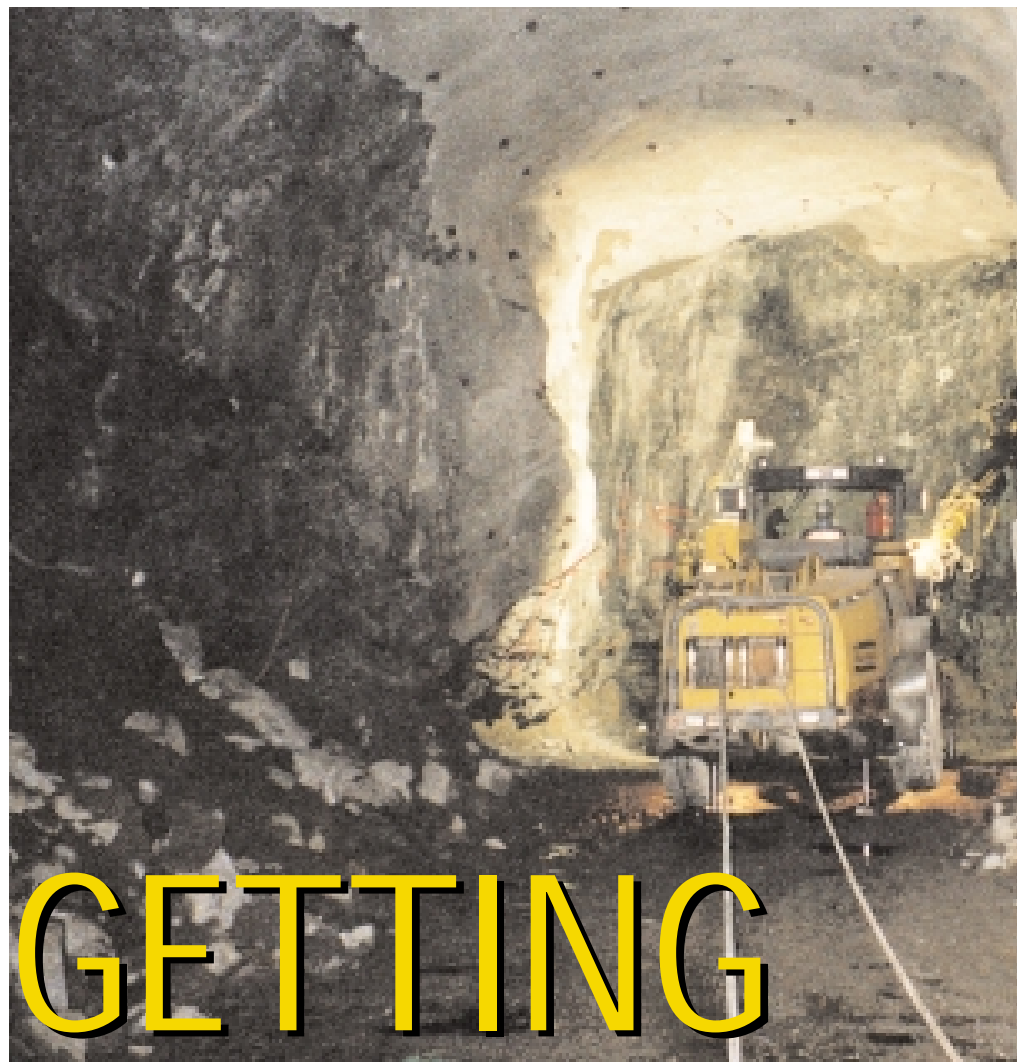


*By Rolf Elsrud,
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When Atlas Copco released its newest family of drill rigs – The Rocket Boomer L2 C, in 1998 – the series was designed with a technological platform that would allow for further development and improvements.

The drill rigs are equipped with the latest in computer sensory technology – the Rig Control System (RCS), modularly built around a CAN-bus structure, which has made it possible to quickly develop other new and unique functions that add to the system.

An important element in the development of new features has been co-operation



GETTING CLOSER

*How new technology helps drillers
to track the orebody*

tion between Atlas Copco and the Swedish mining and metal company Boliden AB.

Customer co-operation

A joint project between the two companies began in 2000 to further develop the Boomer L2 C rigs in order to adapt them to the conditions at Boliden's Garpenberg Norra Mine, where the primary mining method is cut-and-fill.

The Garpenberg Norra ore bodies consist of several narrow, near-vertical lenses that are heavily folded. The complex geology results in winding cross-sections of varying width and ore bound-

aries, which are difficult to predict by core drilling. To be able to follow the paths of the ore bodies with the drifts, information such as accurate production maps from the mine and precise drill rig navigation are essential.

The mine uses a computerised planning system, which is distributed within the offices and also in the mine.

As part of a new large-scale production system, Boliden purchased two Atlas Copco Rocket Boomer L2 C drill rigs equipped with Rig Control System and the ABC Regular option. The rigs were also equipped with an early version of the Mine Map Navigation and Drill



Plan Generator systems for further development.

Completed at the face

Getting drill plans that are adapted to the actual ore boundaries is a challenge for all mining companies. It's easy to create a drill plan in the office and transfer it to the drill rig. But the problem arises when it is applied to the rock face. Often the plan doesn't match, and the operator is obliged to improvise and make adjustments while drilling or drill using their own judgement, which often leads to poor blasting results.

The Mine Map Navigation and Drill Plan Generator systems help address these problems by allowing the final drill plan to be completed in the drill rig. The drill plans can be revised on site, right at the face, based on the parameters from the planning department.

Mine Map Navigation

With the fully elaborated system, drill plans can be generated based on actual interpreted ore boundaries, combined with the mine's planned production design.

With the Map Navigation system, mine map information is transferred directly to the drill rig. When the drill rig is navigated according to the mine map, the ore boundary information from the map is used for the proposed volume to be drilled.

Providing the planning information is correct, generating a drill plan can be as easy as pressing one button.

Drill Plan Generator

In its basic form (which is also available as a stand-alone option), the Drill Plan Generator assists the operator in creating a suitable drill plan at the face of the drift.

A calculated volume for the planned round together with a symbol for the rig and the positions of the feeds are shown on the display. By aligning the feed to the laser beam, the operator can define the position of the rig. If the generated drill plan matches the ore boundaries, the operator presses the "OK" button and begins drilling.

If the drill plan deviates from the ore-body, the operator defines new co-ordinates by positioning the feeds at the four corners of the face, in line with the geologists markings. When all adjustments have been made, the Rig Control System produces a drill plan that is now adapted according to the new parameters.

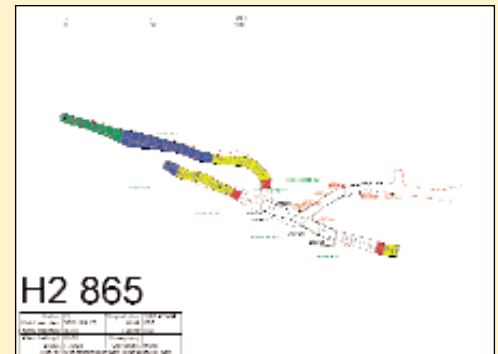
The generated drill plan is automatically entered into the Boomer L2 C ABC Regular standard drilling system and the operator can start drilling.

While drilling, each completed hole is logged and, if the Measure While Drilling (MWD) option is activated, parameters along the hole are also recorded. All of the data is stored on a PC-card for off-line processing in the Tunnel Manager Lite support program and then transferred to the mine database.

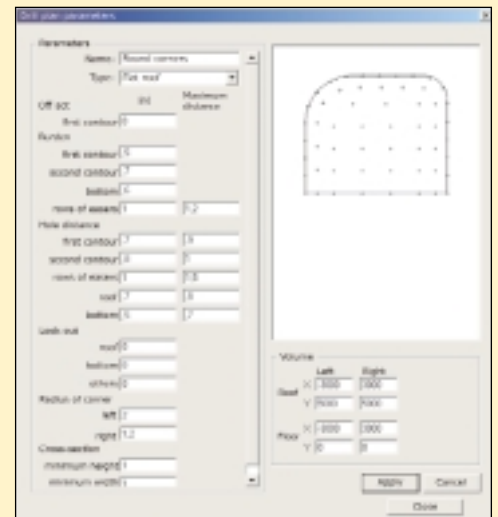
The system used at Garpenberg has three basic components:

- The Boliden Mine Database, where all production map and reference points are processed and exported. ▶

How it works: A five-step process



1. Mine Database: The mine's planned design, with production map and reference points is processed and exported to the drill rig using a PC-card.

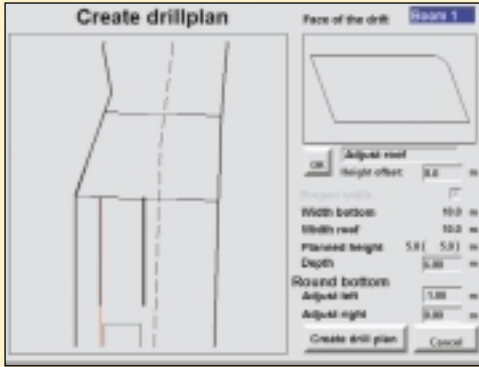


2. Tunnel Manager Lite: The map data from the central database is converted and sorted for easy access by the Rig Control System. Drill plan parameters for the shape of the face are added and the information is transferred to the drill rig.

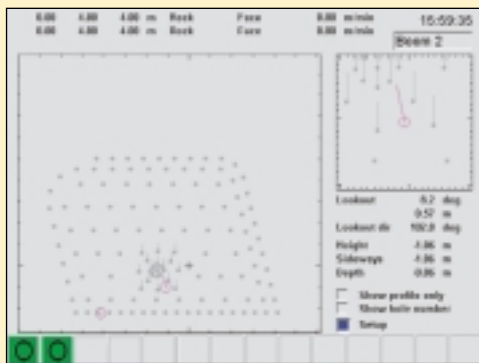


3. Mine Map Navigation: In the drill rig the operator chooses the overview map of the correct mine level. Then the correct area and front are chosen. The exact position of the rig is defined by aligning the feed to the laser theodolite.

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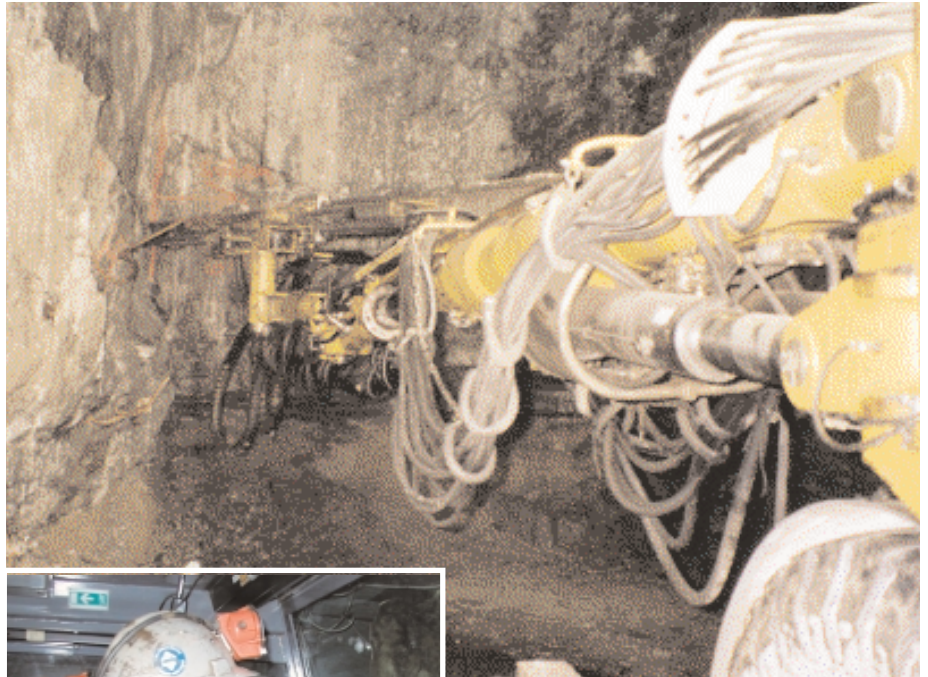
4. Drill Plan Generator: The proposed drill plan is now based on interpreted ore boundaries and adjustments made by the planning department. The operator doesn't have to wait for a drill plan designer to come down to the rig with a new drill plan. The operator can make adjustments according to information from the geologist, sometimes as marks on the face in the drift, or using his own judgement.



5. Rocket Boomer L2 C ABC Regular: The generated drill plan is fed into the ABC Regular standard drilling system and the operator can begin drilling. The drilled round is logged on the PC-card.

- ▶ ● The Tunnel Manager Lite support software for pre-processing production maps and defining drill plan parameters. In Tunnel Manager Lite, the map data from the central database is converted and sorted for easy access by the Rig Control System.
- The Rig Control System, which processes production maps and presents them on the operator's standard display. After navigation, a drill plan is generated. Standard ABC Regular is used for drilling guidance and the drill hole positions are reported back to the Boliden Mine Database.

At present, two of these components are linked in a computer network. The drill rig is off-line, so data is transferred to and from the drill rig by using a PC-



Garpenberg operator Knut Lund at the controls of the Rocket Boomer L2 C, with Mikael Andersson of Boliden.

card. The next step will be linking the drill rig into the LAN by using a radio modem for access to the planning database.

Better blasting

With only a short training period required, the system has been positively received by the Garpenberg operators. An experienced operator trains newcomers to drill using the system in a short period of time.

Although the ore deposits at Garpenberg are complicated, the Map Navigation and Drill Plan Generator systems enable the drifts to be correctly aligned with the ore boundaries. The blasting quality has been improved resulting in less damage to the walls of the drift.

Not only have the two new Rocket Boomer L2 C rigs replaced three previously used rigs, drilling capacity has also increased. In addition, the number of rounds has been reduced, but production has increased thanks to the possibility of being able to achieve longer holes and larger rounds on a more regular basis.

Hole length has been raised from 14

to 20 ft, and rounds have been increased by up to 60 percent.

Based on effective co-operation between Boliden and Atlas Copco, development of this technology is ongoing.

At present, this co-operation has led to the development of drill plans for a number of different applications, such as mine development for drifts and cuts, and dealing with such difficult situations as vaulted and non-horizontal roofs.

Atlas Copco also provides for communication between the drill rig and the planning department, which allows for current updates of navigation and planning information, as well as providing an easy method of obtaining feedback of production results.

Technology of the future

This technology represents the future of the industry and being able to co-operate directly with the mines has been an extremely valuable experience.

Although primarily developed for mining applications, this system will also be adapted for tunnelling, allowing for easy transfer of tunnel co-ordinates and planned profiles from the tunnel design into the drill rig. This will eliminate manual data transfer and reduce the risk of error.

Drill plans for difficult situations such as junctions and crossings can be generated with greater ease than ever before – by simply pressing a button. **M&C 2-02**