

MINING & CONSTRUCTION

The
Atlas Copco
magazine for
rock excavation
professionals

No 1 | 2015

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Zinc sets its sights
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**Service is
key for new
European tunnels**

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ON THE COVER

Atlas Copco service engineer Dragoslav Kulja performs routine service on a Boomer drill rig at a tunnel site in Serbia.



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Atlas Copco

The road to prosperity

WE ARE ALL VERY MUCH AWARE of the economic situation in Europe and the effect it has had on the development of infrastructure projects. Some would argue that this is the time to kick off new projects thereby putting resources to work which will play a part in supporting the stimulation of economies and at the same time develop the infrastructure to a higher productive level.

AS WE KNOW, Western Europe has a fairly well developed overland system of connections, and therefore in this case it may be time to look towards Central and Eastern Europe where there is a need to renew or develop the overland connections between the Baltic, Adriatic and Black seas and Western Europe and so on, including many other opportunities for projects.

FURTHER TO THIS there is potential to develop the fairly abundant mineral resources which may not be the buzz business today, but will, however, certainly be required in the future. In our region of Central and Eastern Europe there are 140 million consumers on the doorstep of Western Europe which leaves food for thought.

IN REGARDS TO the overland connection projects in Slovakia and Serbia we have set out to meet Atlas Copco's vision of First in Mind First in Choice in a practical way by listening to each and every customer, and where possible, we have done our best to provide each of them a suitable solution, and in some cases with the support of our partners like BASF and others, provide a one stop shop.

HOWEVER IT DOES not stop there. We need to continue to walk the talk and work hand in hand with all stakeholders with the same objective to create a win-win position for all parties. This practical approach is part of our team's attitude to working with all our customers in our region.

TERRY BROWNE

Regional Manager
Atlas Copco Central and Eastern Europe



TUNNEL FEVE

in Central and Eastern Europe

AS INTERNATIONAL tunneling experts prepare to gather in Croatia this May for the 41st World Tunnel Congress, tunneling in Central and Southeast Europe is reaching fever pitch. In Slovakia, the Slovak National Motorway Company is pressing ahead with numerous investments and already four new tunnels are in use, eight are under construction and a further 22 are planned. In Serbia, now an EU candidate, several projects are also underway including three new tunnels along the strategically important highways Corridors 10 and 11. Throughout the region, Atlas Copco is playing a key role in helping contractors to find solutions to tough tunneling conditions. M&C reports on their progress.

When the Ovčiarsko Tunnel in northern Slovakia got underway in July 2014, no-one quite expected the scope of the task that lay ahead for the engineers.

The project, which forms part of a 427 million euro plan to build a new, 11 km section of the D1 highway as a southside bypass of Žilina, seemed a fairly straightforward assignment.

Consisting of two tubes (2 367 m

and 2 372 m long) and with first class contractors and equipment, the excavation got off to a good start to meet the January 2018 completion date.

At first, working from portals at the eastern and western ends simultaneously, things went relatively smoothly. Then, after about one month, the eastern portal came to an abrupt halt.

Igor Jurik, Project Geologist at Ovčiarsko, explains why. "This has

turned out to be one of the most difficult tunnel construction projects ever undertaken in Slovakia," he says. "In this part of the country it is extremely mountainous and there are large areas of weak, soft rock formations, in particular a type of clay called flysh.

"In the Ovčiarsko tunnel we have two types of rock formations to deal with, an older section which is relatively stable and not too bad to work with, and a younger,

R



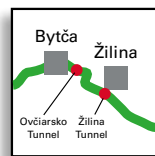
flysh-type formation which, frankly, is a nightmare.”

Jurik explains that the softer formations are not only weak but also highly porous causing them to disintegrate and swell in contact with water. According to the Austrian standard, it is classified as poor, between 4-XF and 5-XF. For the engineers on the ground, this translates into a major challenge, particularly as the geology varies substantially and frequently

throughout the tunnel alignment.

The entire construction project, which also includes 11 bridges and numerous access roads, is being handled by a consortium of top contractors made up of Doprastav, STRABAG, Váhostav, and Metrostav. Doprastav is responsible for the tunneling and has subcontracted the work to Uranpres with equipment supplied by sister company and construction management specialist EKOFIN.





The Ovčiarско tunnel is located in Northern Slovakia on the D1 highway near Žilina. The entire highway will continue from Bratislava through Žilina, Poprad and Kosiče to the Ukraine border.

When M&C visited the site in March, work at the eastern portal had just been restarted while the western end of the tunnel had been advanced more than 500 m.

The first 300 m consisted of the older, harder formation and was solid enough to excavate. But beyond that, the geology changed every few meters, forcing the engineers to repeatedly switch methods back and forth between drill and blast and rock breaking with a breaker and excavator.

Advance hard to estimate

In the more favorable formations, two Boomer E2 C drill rigs from Atlas Copco, equipped with COP 2238 rock drills, are used, while the poorer ground is tackled by two Atlas Copco MB1700 hydraulic breakers mounted on excavators. And with each changeover of equipment, there is naturally also a changeover of crews.

Because of this, the rate of advance is difficult to estimate and varies from 0.5 m to 2.5 m in a single production cycle.

Jozef Valko, Senior Construction Manager, says: "It's just not possible to use one method throughout the whole tunnel. The right technology has to be used according to the nature of the geology so we have to adapt to what we find. This not only involves difficult technical challenges but also places high financial demands on the project."

Naturally the company was prepared to tackle these demanding conditions. As

Valko explains: "Of course we were aware of the tough geological conditions as indicated by the pre-studies and we knew it would be a challenge. But the fact is, we are doing better than expected. From the beginning we thought we would only be able to use drill and blast for about 20 to 25 percent of the tunnel, but judging from our progress so far we think this figure will rise to about 50–60 percent."

The crews work two, 12-hour shifts, seven days a week, and in each shift they attempt to complete a full cycle of drilling and blasting the top and bottom of the face. This is not always possible due to the ground conditions, so utilization of the rigs is only around 30% or 8 hours per day. However, as the rigs are also used for rock reinforcement, they are not often idle.

Reinforcement and ventilation

A variety of bolt types are used including grouted, hydraulic, fibreglass and self-drilling anchors. The number of bolts installed per shift depends on the geology but in good conditions about 20 hydraulic bolts are installed in two shifts.

When installing self-drilling anchors – a classic solution for unstable ground conditions such as sand, gravel, silt, and clays – two Atlas Copco M400NT Mai pumps are used. In addition, two Potenza wet mix concrete spraying units from Atlas Copco Meyco are used for shotcreting.

Besides this, there are two Atlas Copco Liftec UV2 lifting trucks on hand for general service and support work such as the installation of wire mesh, ventilation ducting, lighting and other applications.

Ventilation is provided by two high pressure Atlas Copco Serpent fans (formerly Swedvent) together with 2.4 km of heavy duty, PVC-coated ducting. Serpent is a complete ventilation system that controls the flow of air with great efficiency, taking fresh air in and extracting the fumes from blasts and exhausts.

First rate service

All of the equipment at the site is supported by a service contract and supervised by Atlas Copco's local distributor, ISOP. Headed by Jozef Parobok, ISOP has represented Atlas Copco in Slovakia for 23 years. "We look after all of the Atlas Copco equipment here, 90 percent of which is new," he says.

In line with the contract, service and maintenance is provided with a reaction time of two hours. In addition, ISOP has a workshop at each portal and onsite containers stocked with rock drilling tools and parts. Another container serves as an office.

After more than 20 years of working in international tunnel construction projects, Valko is well acquainted with Atlas Copco equipment and its competitors. "The reason we use Atlas Copco is the high quality of the drill rigs and, of course, the service which is first rate," he says. "For underground work, I think Atlas Copco equipment is the best on the market."

Pavel Jindráček, Product Manager for Atlas Copco Central Europe, adds: "The Boomer E2 C, along with its sister machine Boomer L2 C, is a very popular choice in tunneling in the Central European region. They've been the rig of choice in civil engineering."

“We chose this equipment for quality reasons but also for the service which is first rate.”



Jozef Valko, Uranpres Senior Construction Manager at Ovčiarско



An Atlas Copco Potenza wet mix concrete spraying unit in action at the Ovčiarско tunnel.



An Atlas Copco Boomer E 2 C drill rig at Ovčiarско's eastern portal.

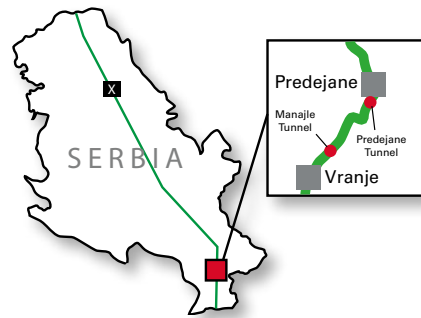


One of two Atlas Copco breakers being checked in the service workshop.



Formidable team: (from left) Jozef Parobok of ISOP, Pavel Jindráček, Atlas Copco, and Jozef Valko, Senior Construction Manager, Uranpres.





Corridor 10 is a major transport route running through the heart of Serbia, north to south. The Manajle and Predejane tunnels are located in the south between the city of Nish and the Macedonian border.

In Serbia, which has its sights set on becoming a full member of the European Union, infrastructure development is also in full swing with construction of the Manajle and Predejane tunnels on Corridor 10 as key projects.

The new tunnels, located between the southern city of Nish and the Macedonian border, will play a major role in improving the flow of traffic in this area. At present, this section of Corridor 10 only has two lanes and is often overloaded with trucks heading south to Macedonia and Greece. Accidents are frequent, and especially in summer when the road is jammed with European holidaymakers. The tunnels will not only ease the congestion, they will also bring environmental and safety standards into line with those in the EU.

Costing more than 50 million euros, the tunnels are being built by two Bulgarian companies, Euro Alliance Tunnels and Roads & Bridges Ltd., for the state-owned company Koridori Srbije.

“We have a long history in Serbia, mainly in the mining industry which is traditionally stronger here, but more and more construction projects are now being commissioned,” says Boris Loncar, Atlas Copco Product Manager, Central Europe, adding that Atlas Copco has been active in the country for more than 50 years.

Longest in Serbia

At 1.8 km, the Manajle tunnel will be the longest road tunnel in Serbia. It will have two tubes, one for each direction, with two

lanes in each. Just 10 km further north is the Predejane tunnel with the same design but different lengths, 870 m and 1 050 m.

The work at both sites is being carried out continuously with a combined workforce of 170, working two 12-hour shifts per day.

According to Stojan Petrovski, General Project Manager for both tunnels, most of the engineers are from Bulgaria and about 90% of them are skilled. “It’s difficult to find skilled workers here so we brought our own,” he says. “They have a lot of experience of working on other similar projects.”

Preparation work started in September 2013 and the tunnels are scheduled for completion in March 2016. “So far we have developed about 40 percent of the tunnels but the geological conditions at



At the face: (from left) tunnelers Ruman Kamburov, Yulian Cholakov and Plamen Baldjiev (rig operator). Drilling is carried out by both Boomer E2 C and Boomer L2 C rigs.



Manajle are more complex than we first anticipated,” explains Petrovski.

Good and bad

As in Slovakia, the tunnelers encounter competent rock as well as clay-like material. And again, the conditions demand frequent changes of technology; drill and blast in the good rock, hydraulic hammers and excavators in the poor ground.

According to the original project study, the company was expecting to mostly employ drill and blast using the New Austrian Tunnelling Method (NATM).

“This would be much faster of course, but because of the conditions, we are forced to work this way, making progress slower,” Petrovski says. “The advance depends completely on the geology. In good rock, advance can be about 3 m in one shift. We

don’t necessarily see this as a huge problem, but this is the situation we face and we have to deal with it.”

To help them do just that, Atlas Copco has provided two drill rigs, a Boomer E2 C and a Boomer L2 C, that are used in both tunnels. One of the rigs is a new unit featuring Atlas Copco’s latest Rig Control System RCS 5 for computerized positioning and high precision drilling. And »

More and more road construction projects such as this one in the south of the country are underway in Serbia.



Atlas Copco's Serpent ventilation system is used to maintain optimum air conditions inside the tunnel.



Service is crucial: Dragoslav Kuljaca of the Atlas Copco Service Team, performs routine service on a drill rig at Predejane.



Construction Manager Velin Mahov and General Project Manager Stojan Petrovski of Euro Alliance (left and center) with Boris Loncar (Atlas Copco Product Manager).



View of the western portal of the Predejane tunnel.

» when this rig arrived, Atlas Copco trained the operators to use it.

The blastholes are drilled to depths of 4 m at the rate of 2.5 m/minute. When working in the softer formations, three Atlas Copco HB1700 hydraulic breakers (mounted on excavators) are used to break the rock.

Pipe roofing required

Pipe roofing is also used to support the tunnel crown in the weaker zones, leading to less overbreak and ensuring safety for the operators. Here, the Boomer rigs are used to install 3 m pipes in an umbrella pattern to a hole depth of 15 m. About seven pipes are installed per shift and it takes 50–70 minutes to install one 15 m section.

“It’s fine, this is normal, we just know that we need two days to finish a whole pipe umbrella,” says Velin Mahov, Euro Alliance Construction Manager. Once the pipes are installed, four Atlas Copco MAI 400NT grout pumps are used for injection of self-drilling anchors. The grout is provided by two Atlas Copco Unigrout grouting platforms, one for each tunnel.

Ventilation is by five different fans, one of which is a new Atlas Copco Serpent

AVH 125 with a flow rate of 14–42 m³/sec.

All of this equipment is covered by a service agreement which includes the presence of an Atlas Copco service technician Monday to Friday. According to the agreement, Atlas Copco has to respond to any problems within 24 hours and there is also a container for parts and rock drilling tools.

Long relationship

“We have been working with Atlas Copco equipment for a long time,” says Project Manager Petrovski. “We have a good relationship and our operators are used to working with this equipment. I think they are good quality machines, but the most important factor for us when choosing

equipment is the service support. This is especially important here in Serbia as the country is not yet in the EU and some processes, such as moving equipment and parts through Customs, can take a long time.”

“Other manufacturers whose equipment we are using in Serbia, do not have that kind of support, so if a problem arises, we have to call the sales office in the nearest country or even the manufacturer’s country of origin. Even then, it takes a long time for the parts to arrive and it is another long, complicated process through Customs.

“If we have a problem with a machine, I just call up Boris at the Atlas Copco office in Belgrade and I know it will be sorted out. That peace of mind is priceless.”

“The drill rigs are good but the most important factor for us is the service support.”



Stojan Petrovski Euro Alliance General Project Manager

A BIG WIN for China's tin

Datun Mine sets new productivity records with Diamec rigs

Ever since the French built a railway from the Yunnan plateau into Vietnam in the late 18th century, tin has been an important export to the countries of South East Asia.


Today, a wave of modernization is sweeping through the Yunnan Province mines, not least the Datun Mine which has the largest tin reserves in China and an annual production of two million tonnes of tin ore and 12 000 tonnes of tin.

Located in the city of Geiju and operated by the Yunnan Tin Group, the mine is striving to introduce new technology and equipment in order to boost efficiency levels. As part of this project, the mine commissioned two new exploration drill rigs from Atlas Copco – a Diamec U4 and the larger Diamec U6 – both of which have achieved productivity records.

Drilling 15 hours per day in a 5 x 6 m diameter drift, the Diamec U4 achieved

an average productivity rate of 900 m per month, 150% better than previous equipment.

Productivity then soared once more when the Diamec U6 went into operation. Working at a 6 x 8 m mining face and drilling at a depth of 618 m, the rig scored a maximum productivity rate of 1 390 m per month with an average of 1 030 m/month.

Says Guang Gu, Datun Mine's Director of Equipment & Energy Department: "Although the Diamec U4 and Diamec U6 models vary in size and power, they share a common characteristic which is high production efficiency. They only require two operators rather than three in one shift, and this plays a very important role in our downsizing for efficiency strategy." 

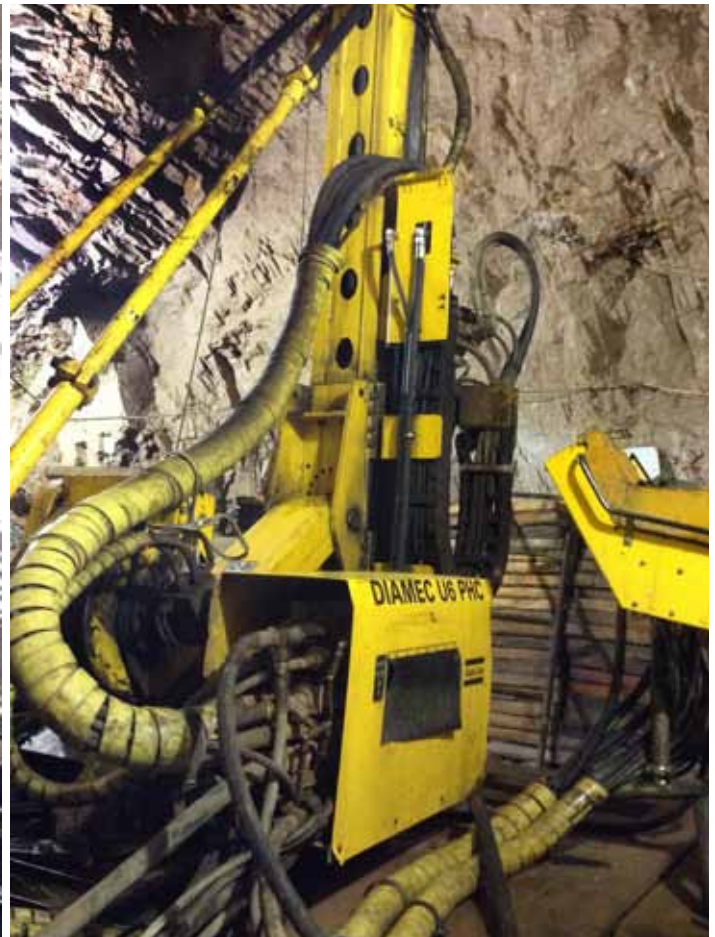
“These two machines play a very important role in our efficiency strategy.”



Guang Gu Director of Equipment & Energy, Datun Mine



Record-breaker number one: The Diamec U4 in its 5 x 6 m drift.



Record-breaker number two: The Diamec U6 in its 6 x 8 m drift.

Savage River Mine increases safety with

Bench**REMOTE**

The Savage River mine has taken its focus on safety another step forward with the installation of a mobile, remote control station for drill rigs.



● Savage River Iron Ore Mine

“It’s the ultimate in hazard reduction – and the way of the future.”



John Crockett Mine Superintendent, Grange Resources

After four straight years with no lost time injuries, the Savage River iron ore mine on the west coast of Tasmania is justly proud of its safety record. This open pit operation, owned by Grange Resources, has consistently put safety first in bench drilling and blasting.

Now this operation has been made even safer with the introduction of a mobile, remote control station allowing an operator of an Atlas Copco SmartROC D65 drill rig to control the entire drilling process from a distance.

This Atlas Copco innovation, called BenchREMOTE, replicates the controls in the cabin of the rig. It can be mounted in any mine vehicle or dedicated mobile cabin and can be operated at distances of up to 100 m.

Testing the “virtual cabin”

Grange Resources decided to put the station to the test at Savage River and installed it inside a vehicle similar to a camper. From this “virtual cabin”, the operator was able to perform all drilling operations successfully at the full 100 m distance range from the drill site.

This capability is of particular importance at the Savage River pit as it is located in a region frequently subjected to heavy rainfall that from time to time can threaten the stability of the benches.

As a result, the mine’s BenchREMOTE station is an added safety measure on the site and is mainly used when the SmartROC D65 needs to drill near the high wall of the pit, removing the operator from the area and the potential danger of falling rock.

“We are using the BenchREMOTE station up to 50 percent of the time in both the south and north pits,” says John Crockett, Grange Resources’ Mine Superintendent,



SmartROC D65 operator Ben Whish-Wilson puts the BenchREMOTE system to the test.



When bench stability is in doubt: The Atlas Copco SmartROC D65, seen here together with the BenchREMOTE unit mounted inside a vehicle (right) at the Savage River Mine in Tasmania.



View of the Savage River mine: Heavy rainfall in the area can sometimes affect the stability of the benches. Atlas Copco's BenchREMOTE system enables the SmartROC D65 drill rig to be operated from a safe distance.

“This is awesome!
You can see everything
in real time and it's responsive.”



Ben Whish-Wilson SmartROC D65 operator, Savage River Mine.

» adding that the rig's HNS (Hole Navigation System) eliminates the need to mark up the holes manually.

“We also have a remote charge unit so people can be further away from the high wall,” he continues. “BenchREMOTE is the ultimate in hazard reduction and completely removes the risk. It's the way of the future.”

From his virtual cabin, the SmartROC D65 operator monitors and controls the rig via a closed circuit WiFi network which is independent of the mine's communications infrastructure.

In addition, the SmartROC D65 rig's functions of auto-collaring, auto-positioning, auto-drilling and rod changing ensure accurate and productive drilling while following the drill pattern which is loaded via USB.


“It's awesome!” says Ben Whish-Wilson, the rig's operator. “It's got a good camera so you can see everything that's going on and it's real-time and responsive. Basically, I have the same level of control (as in the rig). I especially like the auto-pos button which straightens the feed and the auto-drill's good, too.”

With today's lower iron ore prices,

maintaining access to high grade ore, mine development and focusing on costs are top priorities at Savage River. Against this background, the addition of a BenchREMOTE station is more than just a way to increase safety. It allows the mine to access ore which otherwise would have required the gradient of the high wall to be reduced and a lot more waste rock to be blasted.

Further development

The remote station is currently being used together with one drill rig, but can be set up to allow one operator to control several rigs in parallel, potentially boosting productivity.

John Stanton, Tasmanian Branch Manager for Atlas Copco, says his team in Burnie provides the mine with the necessary backup in terms of rig maintenance, parts, service exchange and training support. He also adds that the mine's SmartROC D65 will soon be equipped with Rig Remote Access, enabling data to be transmitted and received via Grange Resources' own local area network (LAN). 

THE SMART MOVE

Whenever bench stability in open pit mines is in doubt, the smart move is to get drill rig operators out of the danger zone.

Atlas Copco's SmartROC remote control station BenchREMOTE allows them to do just that. This mobile replica of the rig's cabin enables operators to carry out all drilling tasks at distances of up to 100 m from the hole.

The control console is identical to the one in the rig and the display screen provides the same overview of the hole position. In addition, as this “virtual cabin” can be mounted on a trailer it can be easily towed and set up in the best position.

BenchREMOTE operates via a closed circuit WiFi network that is independent of the mine's LAN network and in the future it will also be possible to control up to three rigs from one single station.

BenchREMOTE™ is a registered Atlas Copco trademark.



PEAK PERFOR

A perfect solution to a loading challenge in Peru

A hydroelectric project high in the Andes mountains in Peru is well under way with an Atlas Copco solution to an unusual environmental challenge.

The Quitaraca hydroelectric power plant now being built in the province of Huaylas, central Peru will add a further 112 MW of installed capacity to the country's national grid.

Located 500 km northeast of Lima at a height of 1 800 m above sea level, this project is a major feat of engineering involving a 5.7 hectare reservoir and a 5 800 m long headrace tunnel installed inside the mountain at a steep incline of 16 percent.

The headrace tunnel reaches the underground powerhouse at the lowest point

and connects a network of various tunnels including the tailrace tunnel, cable tunnel and access tunnel.

JME SAC, the consortium consisting of Peruvian contractor JJC and Mas Errazuriz of Chile, is responsible for the work. Adan Nanquen, Construction Equipment Manager at JME, explains that the challenges are considerable. "Hydropower projects usually have a slope of about one percent that reaches a penstock of about 500 meters long. This project is extreme because the slope of the tunnel is 16 percent and does not have a penstock tunnel."

An Atlas Copco Boomer 282 drill rig is used to drill the blastholes but the extreme slope of the tunnel makes it difficult to ventilate and to evacuate the dust and fumes after each blast.

Water spray solution

Santiago Arenas, Underground Excavation Manager at Atlas Copco Peruana, says the project planners needed to create an efficient, clean and safe construction environment inside the tunnel and found the answer in the Häggloader 7HR-B. This continuous, front end loading system from Atlas Copco employs a special water spray system to keep the working area clear at the face.

The cross section of the tunnel is 3.6 m x 3.8 m and the Häggloader is specially designed for small-to-medium sized tunnels of this type. It uses a front digging bucket to backhoe the blasted rock fragments onto its built-in conveyor which



Thumbs up! From left, Oscar Parra (Key Account Manager, Atlas Copco Peruana), Nisan Martinez, Häggloader operator (JME), Adan Nanguen, Construction Equipment Manager (JME).

THE HÄGGLOADER SOLUTION

Häggloader is an electro-hydraulic loader providing continuous loading while maintaining good air quality. It is also equipped with a diesel-hydraulic system which is used for transportation and for smaller digging work.

The machine's front arms or backhoe bucket loads material onto a conveyor belt which continuously fills a dump truck at the rear. The conveyor can also be raised and lowered to suit the loading height of different vehicles. Suitable for galleries and tunnels with a cross section of 7 m² and upwards, the loader's front and rear axle also gives excellent agility and the ability to move sideways in confined spaces. In addition, the operator works in a compartment with a protective roof, door and comfortable backrest.

MANANCE



Outside the tunnel at the Quitaracsa hydro: Adan Nanquen and Oscar Parra with the Häggloader.

Below: The Häggloader's water spray system makes the environment at the face cleaner and healthier.




continuously feeds a dump truck at the rear.

Julio Salazar, Development Manager at JME, emphasizes the environmental and health benefits and says the Boomer and Häggloader are “ideal partners”. “It is in the most adverse of situations such as these that the Häggloader really shines,” he says “The Häggloader also works perfectly together with the

42-tonne capacity dump truck and the water spray system gives very effective dust control.”

Nisan Martinez Cuenca, who operates the Häggloader 7HR-B, comments: “The water spray system enables the smoke and dust to be removed faster and this means that the working environment at the face is much better.

“Inside the tunnel the Häggloader 7HR is working in front of us in a temperature of 30– 40°C without any problems.”

Victor Mercado, specialist at Atlas Copco, says the performance of the Boomer–Häggloader combination has exceeded all expectations. In addition, maintenance of the Häggloader is easy, requiring just periodical replacement of certain parts. 

The logistics of loading and haulage is arguably the most tricky aspect of rock excavation planning. With a great many parameters to consider, obtaining a complete overview is problematic – until now.



OPTIMIZING LOADING

By Johannes Hansson, Global Projects Manager, Application Specialist Team, Atlas Copco Underground Rock Excavation

Choosing the right method and equipment to match specific conditions for material handling has never been an easy task. Today, the challenge is bigger than ever as mines go deeper and tunnel designs become increasingly complex.

Fortunately, there is plenty of room for increased efficiency and reduced costs. And we do know this: Accurate planning at the earliest possible stage increases your chances of meeting ambitious productivity targets, tight budgets and demands for safety at every step.

Data is being put to use in new ways in the development of engineering solutions, and this certainly applies to mining and tunneling. We now provide an easy way of finding the best options for a wide variety of mucking out operations. The tool we use is called Loading Optimizer. It enables key factors in material handling – loading methods, equipment and ventilation – to be finely adjusted. Not only that, they can be simulated to achieve an ideal setup.

Based on our many years of knowledge and accumulated data, Loading Optimizer has been developed to help planners find the most well-matched solution. It eliminates all guesswork from the task of getting blasted material out of excavation areas as quickly and efficiently as possible.

Optimal choices: three methods

By entering key parameters relevant to a specific mining or tunneling project into the tool: length of tunnels, cross-sections, ore production, volumes, densities, swell factors, the size of ventilation ducts and more, we obtain a comprehensive picture of what is needed for any desired rate of loading and haulage.

Equipment specifications can be imported automatically or manually from the updated Atlas Copco portfolio, or using data from other sources. In the next step, Loading Optimizer gives three suggestions for loading methods that are both feasible and provide high capacity.

When this is done, the tool can be used in a variety of ways to simulate and recalculate

different scenarios. The user can make adjustments and comparisons between the proposed methods, and between variations within these methods.

What is the potential impact of choosing continuous loading instead of LHDs? How will productivity levels differ if loaders with side-dumping buckets are used instead of conventional front-end loaders? What are the costs of using rail-bound haulage instead of wheel-bound trucks?

The answers to these and other important questions are given almost instantaneously and illustrated in detail. By importing every conceivable parameter into Loading Optimizer, including local safety regulations, the tool provides tailored options in an easy way. It demonstrates that a simple change in the choice of equipment can have a profound effect on loading capacity and total costs.

Spacing of loading bays

Loading bays, or turning niches, for wheel-bound LHDs is a typical aspect of planning where considerable savings can be made. The ideal spacing is also a frequently raised

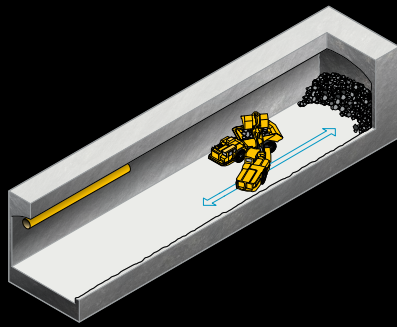


Fig 1: Front-end loading close to the muckpile.

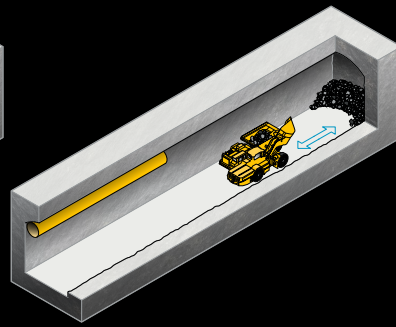


Fig 2: LHD with side-dumping bucket.

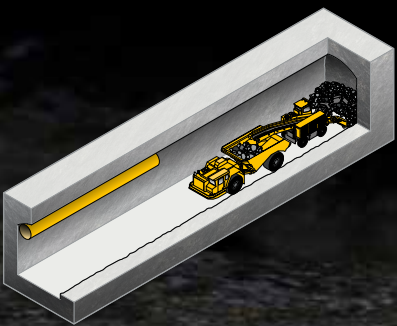


Fig 3: Continuous loading using trucks.

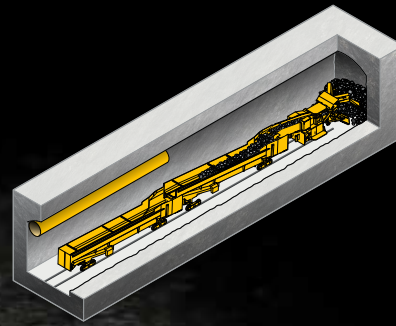


Fig 4: Continuous loading using rail-bound haulage.



From the program: By customizing the setup a complete overview of costs can also be viewed on screen.

question as there is no hard and fast rule for how niches should be excavated.

This is about to change as Loading Optimizer can calculate the achieved productivity level for a given distance between loading bays. In simulating the setup, it is possible to increase the distance between the niches from, say, 100 m to 150 m, but still maintain the same loading capacity by switching from one method to another.

Reducing the number of loading bays in a tunnel or drift means that less excess rock will need to be excavated in a tunnel or drift. And less rock means reduced total volumes and lower costs.

Ventilation systems: Serpent integration

For small and long tunnels ventilation becomes a difficult issue and this is where Loading Optimizer will play a crucial role. The required size of ventilation ducts for fresh air determines how much space is available for equipment, and vice versa.

These parameters, and the off-set between equipment choice, tunnel size and ventilation ducts, can be finely tuned and adjusted to get the right balance. Small and long

tunnels are often the most energy-intensive meaning that there is large potential for cost savings.

For example, if a long tunnel requires 25 m³ of air at the inlet, the power consumption will triple as the tube diameter goes from 1.4 m to 1 m as the air pressure increases. This presents planners with a difficult equation.

Loading Optimizer makes it easy to make the right choices based on comparisons. If all machinery has been selected, leaving no more than 1.2 m of free space for ventilation ducts at the tunnel roof, the tool interface will automatically adapt, displaying only the ducts that actually fit. This is done thanks to synchronization with the software for Atlas Copco Serpent ventilation systems.

A customized setup

The Loading Optimizer tool enables each method, together with matching equipment, to be evaluated relative to the application. This way, it breaks from the conventional practice of simply relying on product specifications and loading capacities for decision-making.

By customizing the setup for loading, a complete overview of costs can also be given. Moreover, the flexibility of the tool enables the summarized results to be displayed in just the right way, with preferred units to match the project.

For example, capacities for loading blasted material from the muckpile can be shown in cubic meter volumes or tonnes. Similarly, all costs including labor can be viewed per hour, per tonne or per cubic meter.

Our experience tells us that using an analytical approach, backed up by the Loading Optimizer tool, can yield significant rewards in achieving more cost-effective loading operations.



SIDE BY SID

Keeping Detour Lake on target to becoming Canada's largest gold mine

Detour Lake is the flagship gold mining operation of emerging mid-tier gold producer, Detour Gold Corporation. A formidable drill rig fleet is making a major contribution to the mine's success.

Located in the Abitibi greenstone belt of Ontario, the Detour Lake mine lies approximately 8 km west of the Ontario-Québec border and 180 km north-east of Cochrane. The property had already produced 1.8 million ounces of gold as a Placer Dome underground operation between 1983 and 1989.

Purchased by Detour Gold in 2006, Detour Lake contains a total resource of 3.4 million ounces (indicated and inferred). Over time, the company grew the resources, completed a positive feasibility

study and now has proven and probable reserves of 15.5 million ounces (476.4 Mt and 1.02 g/t).

Detour Lake's production potential is 600 000 ounces of gold annually for the first 10 years and 660 000 ounces of gold annually for the balance of the mine's estimated 21.7 year life.

To realize that production, Detour Lake has entered a long-term relationship with Atlas Copco Canada. Six Atlas Copco Pit Viper 271 blasthole rigs – the first PV 271 rigs in this region – and three Atlas Copco

SmartROC D65 blasthole rigs are now in production at the mine.

Drew Anwyll, Detour Lake mine's Vice President, Operations, says: "Atlas Copco is our 21-year drilling partner. We chose Atlas Copco rigs first of all because of their availability, but also because of Atlas Copco's support network, which is transparent throughout Canada. We are having great success with these rigs."

Assigned roles

As the nine rigs were delivered over the past two years, they were put to work side-by-side to rapidly expand the current pit, which is 700m wide by 2.5km long and 100 m deep, to a final footprint of 1.3km by 3.5km at 700 m depth. The footprint will



*The Pit Viper 271 in the pit at
Detour Lake gold mine, Ontario, Canada.*

allow Detour Lake access to a hanging wall of goldbearing quartz veins with a 200m wide, 3 km strike length.

Two of the six Pit Viper rigs are electric models, and four are diesel powered. All nine PV 271 and SmartROCD65 rigs were drilling 8-inch diameter holes using Atlas Copco tooling. Patterns were generally 250 to 300 holes with 6m by 7m burden and spacing, and each drill can complete a pattern in three to four shifts.

Craig Rintoul, Mine Manager at Detour Lake, says: "Once the footprint for the expansion is completed, the SmartROC D65 rigs will convert to presplit drilling 6.5 inch diameter holes. The PV 271 rigs will drill 8.5 inch blastholes at that point."

Detour Lake's own technicians handle

E





On the team at Detour Lake: From left, Derek Walsh, Atlas Copco on-site PST; David Linger, Atlas Copco Technical Service Supervisor; Wayne Martin, Parts and Service Support; Dan Brunet, Atlas Copco Field Electrician; Mike Dore, Atlas Copco Account Manager.

» all drill maintenance, but Detour has also hired Atlas Copco product support specialist Derek Walsh to ensure utilization.

Rintoul says: “We’re currently getting 80 to 85 percent utilization on all drills. We have to maintain a minimum of 70 to 85 percent to meet our goals.”

Walsh’s technical expertise includes Atlas Copco’s Rig Control System and software and electronics systems such as GPS, Rig Remote and Service Manager. He provides Detour Lake with OEM technical insight, conducts inspections and performance analysis and maintains documentation.

Though the first of the drills to arrive at Detour Lake has only been there a little more than two and a half years, it has already logged 18 000 hours. Walsh says: “18 000 hours and no issues? It wasn’t babied, and it needed no rolling, no injectors? That’s really something.”

Walsh said preventive maintenance does not present much downtime since it can usually be scheduled for when the drills aren’t being used. The technicians pay attention to scheduling and keep parts such as hoses right in the truck, ready to go. Though the drills came up from Garland, Texas, in the U.S., Walsh says Detour Lake warehouses everything it needs right on site.

Drilling adaptations

Mark McCallion, Detour Lake’s Chief Geologist, described the overburden as 3 to 5 m of peat soils over 65 to 70 m of glacial till in the expansion areas. The till is clay with free running sands. Below this are flows of basaltic deformation.

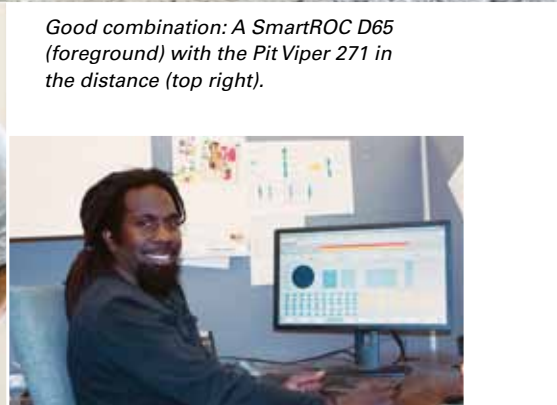
Some areas of the footprint covered by peaty overburden can be excavated by “free digging” in the warmer months, McCallion says. In late fall, as the ground freezes up,

the mine will pull the shovels off those areas to wait till mid-December. Then the Pit Viper rigs will change over to rotary technique to drill in the frozen ground. Says McCallion: “We switch to rotary because it doesn’t cause liquefaction in the hole. Rotary reduces fall back.”

Otherwise, all blasthole drilling is pneumatic percussion in volcanic formations. “The gold mineralization is generally best in greenstone,” McCallion says, “but we have visual control problems. Color isn’t a reliable indicator.

“We find our better chances are where sulfide content is higher, for example, where the quartz becomes carbonite. But it can be where we don’t expect it. We have to exercise grade control over the whole zone. We even sample blasthole collars in what we expect to be barren zones.”

The PV 271 rigs are using the



Good combination: A SmartROC D65 (foreground) with the Pit Viper 271 in the distance (top right).

Above, Craig Rintoul, Mine Manager at the Detour Lake property (left) and Drew Anwyll, Vice President Operations of Detour Gold Corporation.

Arthur Hannett, Mine Operations Engineer, receives real-time information transmitted wirelessly from each rig.

Atlas Copco Secoroc QL80 hammer. The SmartROC D65 rigs were using COP 64 hammers.

High-tech production

The SmartROC D65 rigs were also converted from Rock Manager electronic management to Surface Manager, matching the PV 271 Measure-While-Drilling setup. All rigs report real-time information back to Detour Lake's Mine Operations Engineer Arthur Hannett on the same software. And Hannett programs their patterns wirelessly through a dedicated server.

Hannett says: "We're shoveling 300 000 tonnes a day total – 60 000 tonnes of that is ore." When M&C visited the site, the rigs were about two weeks ahead of excavation. Hannett credits a large part of this to the Surface Manager software.

"Layout surveys are a hassle to do


manually. Manpower required for survey and layout is a two to three hour job for two guys for each pattern, and we have nine drills running. They have to locate and mark information for each stake.

"Then during drilling, the driller has to either get out of the rig to read the stake and then position over it, or have a spotter. Surface Manager eliminates that. And the GPS is accurate to just a few millimeters for offsetting patterns and giving target elevations."

Hannett said Surface Manager has increased quality control overall. "It's not just faster—our drillers are always within spec." Currently Detour Lake is drilling 12 m holes. Single pass drilling with the Pit Viper rigs means each PV 271 can drill about two holes an hour. The greatest variance has been less than 30 cm at the hole bottom.

"And with Surface Manager," Hannett says, "we have accurate documentation of explosives energy distribution for planning subsequent blasts. We can also fine-tune drilling economy, since it transmits things to us like rock hardness, drillmeters per second and fuel consumption."

Teleremote capability

Four of the Pit Vipers came wired for teleremote control, though Detour Lake so far has no definite plans to use it. When surface operations here in some areas of the footprint come within a few levels of historic underground drifts, it may opt to incorporate teleremote control at that time. But Anwyll says that can be decided at a later date. For right now, the mine is concentrating on establishing the mine plan footprint. 

Insight On INDIA



With approximately 1.3 billion people and a rapidly developing industrial society, India is poised for substantial growth over the next decade. **Sanjay Ahuja**, General Manager of the Atlas Copco Mining and Rock Excavation Customer Center in Pune, talks to M&C about the country's future prospects.

Q: What are the key factors driving growth in India today?

A: India has emerged as a reasonably strong economy. The recent global financial crisis had an impact, but the economy has been remarkably resilient. It has managed to escape relatively unscathed owing to strong fundamentals which continue to drive growth.

The economy exhibited lower growth from 2011 to 2014 but we expect to see annual growth rates of 8–10% starting from 2016. This would mean that segments of the construction industry covering power (coal, gas and hydro), highways, railways, metro projects and development of smart cities will be the main drivers.

Enhanced investment in infrastructure will also fuel long term demand in ancillary industries comprising coal, cement (limestone) and steel (iron ore).

Q: What's the role played by the construction industry?

A: Our GDP is comprised of 60% services, 26% industry and 14% agriculture. Industry comprises 15% manufacturing, 7% construction, 2% mining and 2% electricity/gas. So after manufacturing, construction is a significant sector. Construction has slowed down during the past two years due to a decline in infrastructure development – highways, power, railways, ports and airport projects have all stalled.

But the government is making serious efforts to restore confidence in the industry and has undertaken policy initiatives

and made regulatory changes to fast-track project implementation.

Q: How does mining fit into this scenario?

A: India is the third largest global producer of coal (565 Mt in 2014). In the past, applications that would have allowed new mines to get started quickly got stuck in bureaucracy and securing land for new projects was another bottleneck. All these delays have hampered new mining capacity.

However, two new bills in Parliament have now been passed which provide a huge shot in the arm for the mining sector. This was sorely needed to boost the industry's prospects. Now investments are envisaged over a long period of time, not just in coal but in other minerals too, such as iron ore and bauxite.

India has opened up coal mining to the private sector after more than 40 years of state control. Domestic and foreign companies (with Indian subsidiaries) will now be allowed to commercially mine coal and sell it on the open market. Transparent auction of coal, bauxite, iron ore and other minerals will kick-start the economy and provide large scale employment.

Q: What is Atlas Copco's position in India today?

A: Extremely strong. We have been established here since the 1960s and today we are without doubt one of the leading companies in the country serving the mining and construction sector. With our headquarters in Pune (State of

Maharashtra), Atlas Copco India has some 2 500 employees and eight regional offices based in Mumbai, New Delhi, Kolkata, Chennai, Nagpur, Udaipur, Ranchi and Hyderabad. We also take care of the neighboring markets of Nepal, Bhutan, Bangladesh and Sri Lanka.

In addition, we have a product company in Nashik with three separate assembly units for surface and underground drill rigs and two exclusive assembly units for construction equipment, while in Hyderabad we have a state-of-the-art manufacturing plant for rock drilling tools.

Q: What major changes have taken place in the last few years?

A: We have ramped up our service strength considerably which has more than doubled the number of people we have on the service team. Right now about 200 of these are employed at Hindustan Zinc where we have a Level 3 Service Agreement in place. In January last year we invested in a new training center equipped with simulators and this facility also functions as a distribution center supporting the 80 underground machines we have supplied to HZL.

With a lot of RCS (Rig Control System) rigs coming into India for underground construction, surface mining and to some extent underground mining, we are ramping up our internal competence as well as training our customers. In addition, we have strengthened our distributor network right across India, Nepal, Bhutan and Sri Lanka and our business from these partners has



increased year on year. Today, one third of our business is via distributors compared to a quarter in 2012.

Q: What are the most important products right now?

A: Surface coal mining is very big in India and most of it is government owned. Our locally-assembled rotary blasthole drills help meet our customers' needs in a cost effective way. We are also able to offer large diameter rotary blasthole drills from Nashik to meet demands from big open pits in coal and iron ore, and DTH drills are sought after in surface metal mines and limestone. Added to this is a wide range of pneumatic surface drill rigs which are very popular in aggregate quarrying, small mines and civil engineering applications. We also locally assemble one


model of a hydraulic drill jumbo which is needed in underground civil engineering applications.

Q: Are training and safety the biggest challenges Indian customers face?

A: Both of these issues are vitally important, and in many ways go hand in hand. Most of our customers see these as major success factors and we are doing all we can to assist. As a recognized solutions provider delivering sustainable productivity, we listen to our customers and provide tailor-made solutions with full training and service as part of the package. Onsite service support from supervision (Level 1) to guaranteeing availability and TCO (Total Cost of Ownership, Level 3) can be provided by us and customers today are demanding this support.

Success with new technologies is guaranteed when we train customer operators via our simulators. At the same time, the competence of our own service workforce is a focus area. Today all of our service engineers are certified as Service Level 1 and we have made big strides to get a majority of the team certified as Service Level 2.

Q: How do you see the future over the next decade?

A: I see it as very encouraging. Provided the country's present growth and development prospects are sustained, the economy will continue to improve and the country will grow more prosperous. This, in turn, will have a multiplying effect on the demand for our products and services – and we are better prepared than ever to meet those demands. 

THE ZINC KING of Rajasthan



Interaction and dialogue get results in Indian mines

India's Hindustan Zinc Limited (HZL) owner of the world's largest zinc mine, is successfully developing its operations to meet future challenges and demands. A long-term partnership with Atlas Copco is helping the drive for more mechanization, higher productivity and increased safety. M&C reports on the progress so far.



An Atlas Copco Minetruck MT6020 emerges from the Rampura Agucha decline.



The huge state of Rajasthan in the northwest of India is famous for its maharajas, historical landmarks and stunning palaces. But in the mining world, this “Land of the Kings” is recognized as the home of one of the world’s leading zinc producers – Hindustan Zinc Limited.

HZL, a subsidiary of Vedanta Resources, is India’s powerhouse of zinc, lead, silver and cadmium with an annual ore production in excess of 16 million tonnes extracted from five mining operations including open cast and underground mines.

But it is the Rampura Agucha and Kayad mines that are currently in the spotlight as the company moves to meet 21st century challenges in terms of efficiency, productivity and safety. And in this process, close collaboration with long-term supplier Atlas Copco is proving especially fruitful.

On target at Rampura Agucha

Rampura Agucha (RA), situated about 200 km southwest of Jaipur, the capital of Rajasthan, is widely acknowledged as the world’s largest zinc mine and the third largest open pit. Over the past five years this site has been gradually making the transition from open cast mining to underground operation.

Today, both techniques are in operation simultaneously with mining in the open pit

taking place up to a depth of 372 m with a fleet of Atlas Copco drill rigs including FlexiROC D50, D55, D60 and D65, while underground mining is carried out below this level. Together they produce some 6.25 Mt/year.

Explains Praveen Kumar Jain, Location Head at Rampura Agucha Mines: “We have a target of 6.25 million tonnes per year from the open cast zone and 3.75 million tonnes per year from the underground mine which we hope to achieve by 2018 or 2019. So far

our progress has been very positive.”

In the underground RA mine, much of the progress to date can be attributed to the productivity and efficiency of the extensive Atlas Copco fleet including drill rigs Boomer 282, Simba H1354, Boltec 235H, LHD Scooptram ST1030 as well as Minetruck MT436B and MT6020.

In fact, progress is right on target. The company has deployed operators with international experience and proven skills and is now actively discussing deployment of



Going underground: Below the 372 m level, excavation of the Rampura Agucha orebody continues underground with proven and probable reserves estimated at 100 million tonnes, will have a lifespan of 25 years.



An Atlas Copco Minetruck MT5020 hauls out its load from the Kayad Mine.



Drilling blast holes to reach the high grade zinc ore with the Boomer 282. Having 'clocked' many hours in this rigorous environment the rig is still performing well.



“ We have been on a big learning curve and we now have a win-win situation.”



PRAVEEN KUMAR JAIN Location Head, RA Mine, HZL.

» automated machines for production drilling. The mine believes that more mechanization and automation will increase the level of safety and precision, and thereby increase productivity and make the entire operation more cost-effective.

Win-win situation

It is not surprising that Jain puts his faith in this fleet at Rampura Agucha as he has more than 30 years of experience of working with Atlas Copco equipment at other sites. In addition, he says constant interaction and dialogue between the managements of both companies has contributed to making the transition process smoother.

“We have been on a big learning curve together over these past few years, but now I think we have established a win-win situation,” he says. “You could say that we have moved to the next level and are able to make use of each other’s competencies. Of course, now that the machines have clocked so many hours, there are new issues that will soon need addressing, but I have no doubt that Atlas Copco is geared to meet these fresh challenges.”

For example, wear and tear on the equipment and the safety of the operators is a top priority and will require close cooperation and innovative solutions in the coming years.

Con Panidis, Head of Underground Operations and Deon Joubert, Head of Engineering, both of whom work in the underground mine, advocate increased computerization as one way to improve safety in the mines as well as boost productivity. Another way is through training.

“Training our operators is a never-ending process as the technologies are constantly being upgraded,” Panidis points out. Joubert adds: “Well trained operators is the key to

minimizing downtime and keeping safety as high as possible.”

Smooth process

The lead-zinc deposit at Kayad is a green-field project on the eastern fringe of Kayad village, 9 km south west of Ajmer city. When fully developed, the mine is scheduled to produce one million tonnes of ore per year. The geology here is characterized by gneisses and migmatites with overlays of quartzites, calc-silicates and quartz-mica schists.

Though mining at Kayad has been a relatively smooth process compared to other HZL operations in Rajasthan, Associate General Manager, Balwant Singh Rathore, says there have been some challenges.

“The initial mine development got under way in 2010 and in the weak strata where the whole portal excavation had to be done by shovel and truck without the use of explosives,” he explains. “In some places, a rock breaker was used to loosen the hard rock. Furthermore, the decline, which is 70 m long, was also achieved without blasting.”

Another challenge was to control the maximum charge per delay to minimize disturbance to nearby inhabitants. The result

was that it took about 20 hours to complete one work cycle. Today, with a decline depth of 250 m in place, mechanized equipment has taken over and one cycle takes approximately 975 minutes (16.25 hours).

Productivity and safety

“With the Atlas Copco machines we have today, we have not only added a lot of productivity but also given safety the importance it deserves,” maintains Rathore. “Volume, cost and quality are the three main parameters in the mining business, but safety is paramount. In this respect, the Atlas Copco machines have been doing a good job, and that goes for the maintenance of the machines, too.”

Kayad employs the sublevel stoping mining method and uses a fleet comprising Boomer 282 face drilling rigs, Scooptram ST1030, Minetrucks MT436B and MT5020, and Simba 1254 long hole drill rigs. The Simba 1254 rigs, which are the main production units, are specially adapted for the mine’s small to medium-sized drifts and equipped with tophammer rock drills for drilling 51–89 mm holes. The rig’s versatile positioning system enables them to be easily matched to a variety of



A great team: Atlas Copco service personnel taking care of 20 machines at the Rampura Agucha underground mine.



Below: Rajeev Mahato, Service Planner at Kayad Mine with the Boomer 282.



professionals from outside India to help us address the various issues and reach the ore in the fastest time possible. We are confident of delivering.

Q: Has the Atlas Copco equipment helped in terms of productivity?

A: These are all modern machines some of which, the Simba rigs and MT6020 trucks for example, have not been used elsewhere in India. They have added value to our operations. Atlas Copco has helped in bringing expertise into India in terms of machines, people, training and their skill. The simulators have been a good help in training our operators. In terms of maintenance, the right steps have been taken but there is always a better way.

Q: Have the CPH and CPM service models worked in your favor?

A: Yes, the CPH concept is a good one because it creates a win-win situation for both parties and the CPM model is even better because Atlas Copco takes the responsibility to deliver the whole package including rock drilling tools. We want this model to be applied for all our underground mining activities.

Q: What kind of technologies do you think will be applied in the future?

A: Our focus in the coming years is to automate most of the mining processes, especially underground. First of all, we should be able to track the health of the machines automatically through the supervisory control and data acquisition (SCADA) system so that we know how each machine is functioning at all times. We would also like an automated system of monitoring the efficiency of each machine by way of output. We would like systems to monitor the ventilation in the mines along with the flooding level and emission of gases. All this will help to take mining operations to the next level and are very important for the safety of our people.

Q: What's the relationship you are looking at with Atlas Copco?

A: We co-exist. As long as we are there, they are here. If one dies, the other one will not live. We are married and therefore we listen to each other and nurture each other.


Q: What has HZL achieved over the past five years?

A: One of our benchmarks is that we are

surpassing each year's record in terms of the meterage we do in development. Meanwhile, we take pride in the fact that we have been in tune with the technologies that are being introduced in the mining industry. This has helped to use the state-of-the-art machines very effectively and keep the development costs under control.

Q: What are the most important initiatives that you have taken recently?

A: Environment conservation has been a very important issue with us. For example, in our open cast mines we have joined up with infrastructure and realty companies to use the waste rock. We are also involved in a lot of plantation work, zero discharge and conservation of water which is such a precious resource in the state of Rajasthan.

Meanwhile, most of our initiatives revolve around the safety of our people. We review the reports of our partners, including Atlas Copco, to ensure that incidents are reduced to the lowest possible level. We have been working hard on inducing a safety culture through a responsible mindset of every person engaged at the mines. 



Impressive lineup: Part of HZL's large fleet of Atlas Copco mine trucks at Rampura Agucha, mainly consisting of the 60-tonne Minetruck MT6020.

» planning, ordering, logistics, stocking of parts/components as well as the expertise needed to maintain the equipment.

New distribution and training center

To ensure that the maintenance models work smoothly, Atlas Copco has set up a regional Distribution Center and a Training Center at Bijaynagar, in the Ajmer district, providing Atlas Copco parts to all HZL sites across Rajasthan as well as training for operators using simulators.

At present, the center offers simulator training for Boomer and loader operators with the aim to increase productivity at the mining sites.

As Sanjay Ahuja, General Manager at Atlas Copco, says: "Prior to these service models, HZL had experienced maintainance of machines by their own workforce followed by an annual maintenance contract whereby the equipment supplier would guarantee machine availability but parts stocking was the responsibility of HZL. However, HZL wanted to move ahead up the value chain and desired a 'single point responsibility' from the supplier. Accordingly Atlas Copco was asked to take full ownership of underground mining equipment for its economic life time and provide a guaranteed cost of operation (parts and labor) for the entire period apart from ensuring Machine Availability of 87% in Year 1, 85% in Year 2 and 82% in Year 3-4 and 5. This was how CPH was born."

K C Meena, Unit Head, Kayad Mines, emphasizes the need for more automation to make the operations safer, more productive, and more profitable. "Bulk mining is the order


“Computer controlled equipment will take mining to a new dimension in India.”



K C MEENA Unit Head, Kayad Mines.

of the day," he says, "and therefore computer controlled equipment is what will take mining into a new dimension here in India."

Jain adds that the current transition from open cast to underground mining in Rajasthan is just one example of a growing, global trend. "Fortunately, large sized

equipment is now possible for underground mining and that's helping a lot," he says. "In addition, development of competency levels and a continuous engagement with local communities are also some of the other factors that are now a central part of our industry." 



The new Distribution and Training facility at Bijaynagar with extensive stocks of parts and components to meet HZL's needs as well as drill rig simulators for operator training.

ENGAGING THE GROUND

Swedes put upgraded Scooptram bucket to the test

With narrow drifts and a tricky combination of ore to contend with, Sweden's Lovisa Mine was the ideal testing ground for the upgraded GET – a new Scooptram bucket with smarter and longer-lasting features.

The buckets mounted on LHD vehicles have an unforgiving task in mining as they are repeatedly driven into muck-piles with tremendous force. More research into how to make them stronger and longer-lasting is welcome among mines, as was proven during a recent field test in Sweden.

First launched in 2010, the GET bucket features a flexible Ground Engaging Tools system. The upgrade project included a number of key objectives: to improve penetration of the muck pile, extend the service life of the bucket, make repairs an easier process, increase productivity, reduce

downtime and total cost of ownership.

Over a test period lasting 18 months, the GET bucket was put into action in a challenging environment – the Lovisa Mine, or Lovisagruvan, which is a zinc and lead operation near the community of Lindsberg.

“There was hardly any downtime at all on the loader when they changed the bucket, so that was the first good sign,” says Jan-Erik Björklund, General Manager, Lovisa Mine, who has commissioned the upgraded bucket for full-time use.

The Lovisa Mine is located in a mineral-rich region of Sweden known as Bergslagen,

north of Lake Mälaren, which has a long history of metals mining. It has an annual production of 100 000 tonnes of zinc and lead, including waste rock.

Narrow drifts, winding ramps

Due to the mine's narrow drifts that measure just 3.5 m wide, loading and haulage is the most sensitive part of the production cycle. LHD vehicles also have to deal with tight cornering on all the ramps.

Another challenge is the mix of zinc and lead ore, with small quantities of silver, which can be difficult to muck out. This is

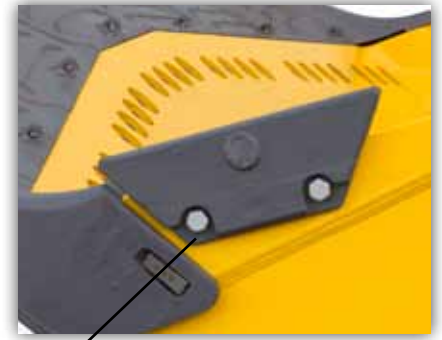


Testing the GET bucket: Operators, from left, Stefan Nordqvist, Peter Johansson and Per Erickson.



*Ground Engaging Tools:
Removable, bolted parts
enable easy service and reduce
downtime from days to hours.*

*Stronger than ever:
The GET bucket's new steel
grade gives better penetration
and 30-40% longer service life.*



THE GET BUCKET CHALLENGE

- ▶ Extended service life
- ▶ Improved penetration
- ▶ Removable service parts
- ▶ Bolted components

why the Lovisa Mine proved an ideal testing ground for the upgraded GET bucket.

“Our Scooptram ST7 does most of the mucking out which usually takes four hours. This corresponds to roughly 160 tonnes of rock that are blasted in each round,” Jan-Erik Björklund explains.

The buckets are emptied directly onto haulage trucks at loading bays that are spaced 80–100 m apart. About 400 tonnes of material is mucked out and transported each day. Waste rock is also hauled back underground to fill the blasted voids.

30–40 % longer service life

The GET bucket has been designed to withstand extreme wear. The Ground Engaging Tools system mounted on the edge of the bucket gives it greater penetration through the muckpile, as noted during the test by operator Peter Johansson.

“We were surprised to see there was hardly any wear and tear after six months. This is a huge difference from the previous bucket where the edges wore down faster. It had to be repaired a lot sooner,” he says.

“Also, with the old bucket you could really tell when it was getting worn. The

action just got slower when attacking the muckpile. This hasn’t happened with the new GET.”

The improved penetration of the bucket is the result of a more robust steel composition used in the manufacturing of the bucket. This has also led to longer service life which was recorded as an improvement of 30–40 % during the test.

Removable service parts

In contrast to conventional buckets, the bottom edge of the bucket, which first comes into contact with the muckpile, has been divided into removable segments. This means that repairs can be carried out on specific parts, the corner shrouds for example, giving cost benefits as a complete overhaul is no longer needed.

According to Stefan Nordqvist, who has more than 20 years of loading experience, maintenance is now “a question of hours instead of days.”

“On the GET bucket we can change side cutters in less than an hour and get the loader back up and running. Welding is no longer needed and that’s a big relief,” he says.

Most mines have understood the benefits

of using Ground Engaging Tools according to Johannes Turesson, Product Manager, Atlas Copco: “The bolt-on wear parts require a fraction of the time to be replaced compared to welded wear parts,” he says.


Bolted instead of welded

Unlike most standard buckets, the GET system is bolted together which enables operators to easily deal with maintenance issues. Moreover, it significantly reduces downtime for the Scooptram loaders while the bucket is being repaired.

The report from the Lovisa Mine notes that it took 50 minutes for two workers to change wear parts.

With better penetration, less force is also needed to move the bucket through the muckpile, which cuts energy consumption, reduces wear on tires and improves the working environment.

Other key results included an even wear and tear on the bucket which helps to maintain peak level performance despite extensive use over long operational hours.

“The sense of newness stays much longer with the GET bucket, and that’s a good feeling,” concludes Stefan Nordqvist. 



Success on the Surface

Construction recovery is good news for drillers

As the construction industry recovers from the global recession, drilling contractors are finding that new technology goes a long way to meeting the increasing demand for materials.

Few industries have suffered quite so deeply from the effects of global recession as construction. With uncertainty in financial markets innumerable construction projects in the private and public sectors came to a halt and many plans for urban renewal were shelved.

Today, many of those projects are now back on track and the future looks considerably brighter. In the European Union, the UK stands out as a typical example. Here, the building of new road and rail networks are at an all-time high and many other projects are now well under way.

This is all good for quarry owners and drill and blast contractors, many of whom are gearing up with the latest surface drilling technology in order to meet the increased demand for aggregates and other construction related materials.

As evidence of this trend, Atlas Copco in the UK has reported record deliveries of its SmartROC and FlexiROC drill rigs, both of which typically provide world class solutions for maximum productivity, flexibility and environmental friendliness.

Smarter technology

One company that is tapping in to the latest developments in high-tech surface drilling is

BAM Ritchies (part of the Dutch company Royal BAM), the country's largest drilling and blasting contractor. Based in Glasgow, Scotland, BAM Ritchies has some 400 employees and operates a fleet of 60 drill rigs providing site investigation, ground engineering and blasthole drilling. The majority of the blasthole rigs in the fleet are supplied by Atlas Copco, and last year these produced some 41 million tonnes of aggregates from a variety of quarries.

Among BAM Ritchies' clients is Yeoman Aggregates, operators of the Glensanda superquarry on the west coast of Scotland where it has a variety of Atlas Copco drill rigs at work, including its most recent acquisition, a SmartROC C50.

"We were the first in Britain to get this particular drill rig and there's a very good

reason for that," says Ian Christie, Manager, Drilling and Blasting, a veteran contractor with 37 years of experience.

"As the UK's leading drilling and blasting company we pride ourselves on being able to offer our clients the best available technology, and right now that's being provided by the SmartROC C50. This rig represents a whole new approach to the job, making it easier, quicker and less costly."

Eyes in the mist

Christie says he particularly likes the rig's GPS and hole navigation systems which enable the operator to automatically locate the right drilling spot, in any weather conditions. "In the misty and foggy coastal conditions at Glensanda, that's a very helpful function," he says

“ SmartROC C50 makes the COPROD system perform so much better.



Ian Christie BAM Ritchies



Referring to efficiency, Christie adds: “The important thing these days is to do things only once, and not have to wait for the blast before relocating the rig to the next hole position. The SmartROC gets it right first time, and although we have only been using it for about eight months we can already see that this is a big advantage.”

The rig’s hole navigation system (HNS) also reduces the risk of error as there is no longer any reason for marking hole positions manually which, in turn, reduces planning time on site. Moreover, the SmartROC C50, which employs the COPROD system, delivers consistent hole quality, reassuring the company that it can supply Glensanda with the specified aggregate product.

Big lift for COPROD

“This rig will drill between 250 and 300 meters a day at Glensanda in the granite-silica rock,” says Christie. “That’s the same as we are getting with the ROC L7 CR [now FlexiROC T50] but the difference is that the SmartROC C50 makes the COPROD system perform so much better if you factor in all the parameters – longevity, penetration rates, and so on.”

Besides this, Christie says he is also getting good feedback on other outstanding features of the rig, such as its user-friendly controls, the warm and comfortable cabin which makes life more pleasant for operators working in the Scottish climate, and not least, the lower running costs. He confirms that the SmartROC C50 uses about 30% less fuel which is a significant saving.

Training the operators to use the new generation rig has been trouble-free, although Christie concedes that it is “a huge leap forward.”

“Moving from a robust drill rig to

something that’s more like driving a modern car understandably made some of our operators a bit apprehensive, he says, “but we are happy to accept the challenge to master the technology because we can see the benefits.”

The power of flexibility

Another contractor that relies on technology from Atlas Copco is CS Drilling Services, a much smaller but equally successful team operating throughout Scotland.

Founded in 2005 by Charlie Smith and Colin Stephen, CS Drilling turned to Atlas Copco for the equipment they needed from day one. They focus on drilling for a

broad range of applications including roads for forestry and wind farming to quarrying for highways and hydropower.

In recent years, energy development involving wind farms and hydropower have become CS Drilling’s largest customer base.

“Our business has gone from strength >>

Technology in practice: BAM Ritchies’ SmartROC C50 (in the company’s green color) at the Glensanda superquarry on the west coast of Scotland.



» to strength,” says manager Charlie Smith, also a veteran driller with 30 years of experience. “In the last two years, we have increased our turnover by about 50 percent and our customer base has doubled.”

A trusted brand

Smith knows Atlas Copco drill rigs well, having spent much of his working life operating them for other contractors, and along the way he has followed the evolution of drilling technology from small pneumatic machines to today’s large blasthole rigs.

“I have learned that you need to have quality and reliability if you’re going to be successful,” he says, “so when we started our firm it was a natural decision to work with Atlas Copco.”

Over the years, the company has had a variety of rig models, but it was the purchase of a FlexiROC T40 in 2012 that made the biggest difference in terms of flexibility. This was followed by a second in 2013 and a third in late 2014.

Discussing the benefits, Smith says: “The FlexiROC T40 enables us to drill holes with

“ You have to have reliability and quality to be successful.

Charlie Smith CS Drilling Services




depths of between three and 20 meters and diameters of 64 to 115 mm. It also allows us to drill acute angles for pre-split drilling contracts in the most difficult conditions, while offering our drillers a safe, comfortable environment to work in.”

In addition, he notes that the rig’s extending boom enables two to three holes to be drilled in one location, reducing the need for frequent tramming. “This is especially useful when we are working in the rough terrain of the Outer Hebrides, and even though the tramming capability is very good with this rig, it means that we can save a lot of time.”

FlexiROC technology also helps to extend the life of the drillstring as well as reduce fuel consumption which Smith says amounts to about 28 liters per hour during drilling.

Service vital

The service provided by Atlas Copco is also a vital part of the picture for both BAM Ritchies and CS Drilling and they appreciate the backup they receive. This will be further enhanced following the recent opening of a new surface rig service center in the Scottish town of Stirling. 



Drilling partnership: Colin Stephens (left) and Charlie Smith with one of their FlexiROC T40 drill rigs.

OPTIMIZATION in the quarries

Norwegians show the way



Brønnøy Kalk AS, owners of the Akselberg limestone quarry in northern Norway, has achieved consistency and reliability in its production process. This, in turn, has helped to boost efficiency throughout the operation.

The Akselberg quarry in central Norway, about 400 km north of Trondheim, produces about 1.8 million tonnes of limestone carbonate annually, a product widely used in the European paper industry.

Since it was established in 1997, this 2.5 km long and 1.5 km wide pit has consistently improved its productivity in drilling and blasting. Today, however, the Brønnøy team is getting better results than ever due to professional planning and meticulous attention to every step in the production process.

As Raymond Langfjord, Production Manager at the site, explains: “Everything here starts with the drilling. If we get that wrong, it has consequences for every other phase in our operation – from blasting and loading through to crushing and, ultimately, the quality of our products.

“Our vision has always been to achieve optimal utilization of the limestone here and that requires optimizing the whole excavation process. That’s why we are very happy to be getting top results with our equipment and to see the effect of this on the total efficiency of our operation.”

Precision on the benches

The equipment on site consists of Atlas Copco SmartROC topammer drill rigs complete with the Hole Navigation System (HNS), AutoPos function and ROC Manager, which creates drill plans and reports. HNS and AutoPos together are key functions that enable the operator to locate and collar the hole with accurate angles, first time every time.

There are three rigs at work in the quarry

– a SmartRig ROC F9C, a SmartROC T40 and a SmartROC T45 – drilling on 15 m high benches. The holes are drilled at an inclination of 10°. Five rows are drilled with a burden of 2.8 m and a spacing of 3.5 m. After charging and firing, 20 000 to 80 000 tonnes of rock are removed with each blast and the quarry carries out an average of 10 blasts per month.

The rigs use T51 drill rods and 89 mm ballistic button bits from Atlas Copco Secoroc and have no trouble penetrating the overburden. On the contrary, the rock is relatively easy to drill with penetration rates of 1.8 to 2.5 m per minute. The bits only need to be reground every 250 m and, at best, one bit can last for up to 6 000 m.

But if the rock is easy to drill, Langfjord explains that it is more difficult to blast and that parallel holes are vital for success. “We have to make sure that all of the holes are drilled to the right depth and with the right inclination and absolutely parallel,” he says. “In addition, the hole bottoms have to be positioned in exactly the right spot. Any deviation, however small, will undermine the success of the blasted round. And

as these rounds are spread out over such a large area, small errors can become big problems.”

The all-important last row

Fortunately, the drillers are able to meet these tough demands using the rigs’ HNS system together with the AutoPos function.

“The last row of holes, which is always at the rear of the bench, is the most important one,” continues Langfjord. “This is the master row and it has to be right. Otherwise it will negatively affect the rest.

“With HNS we can import the drill plan that has been created in ROC Manager, using a USB, and the system helps the operator to navigate the rig to the precise hole location. The rig’s AutoPos function then sets up the correct inclination on the feed, ensuring that the bit will hit the right spot on the ground at the touch of a button. The operator starts drilling and then simply switches to automatic mode and the rig drills the rest of the hole by itself.” In this way, the AutoPos function minimizes the risk of human error.

After the hole has been drilled to the >>

“The good results we get with this equipment have a positive effect on total efficiency.”



Raymond Langfjord Production Manager, Brønnøy Kalk AS.

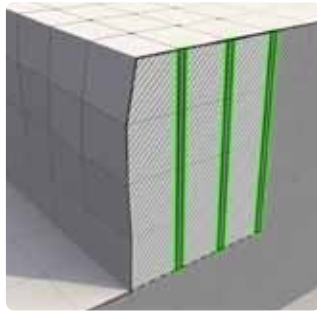


Careful planning at every step: Norwegian drillers in the Akselberg limestone quarry. The team has succeeded in optimizing the entire production process through precision drilling and blasting to achieve parallel holes.

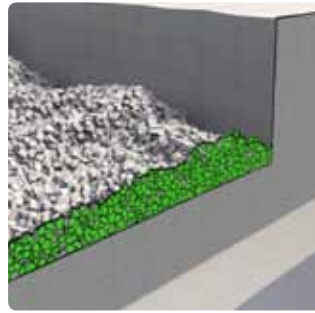




It starts with the drilling
Using the high-tech functions of the SmartROC drill rigs, each row of holes on the bench are collared in precisely the right spot.



The inside view
Perfectly parallel holes, drilled at the correct angle and to the right depth.



The desired result
A clean, smooth blast and the right fragmentation required for maximum efficiency at the crusher station.

» correct depth, log files are stored and can be viewed as status reports in ROC Manager, enabling the actual hole to be compared with the plan. If there is any deviation, adjustments can be made to correct the error before continuing.

“In that case we can either adapt the charge for that hole or drill a new hole altogether, Langfjord points out. “It makes life very easy.”

Furthermore, HNS-equipped drill rigs can also be equipped with Atlas Copco’s optional Measure While Drilling (MWD) function, gathering information such as variations in rock type, hardness, the presence of fissures, cavities and so on, which is analyzed prior to blasting.

“Obviously, all of these devices are a great advantage,” Langfjord says. “They help us to achieve our prime goal which is to optimize the blasted rounds, and therefore create the conditions for making the operation as efficient as it can be.”

Increased drill pattern

Correctly blasted rounds produce the required fragmentation, which in the Brønnøy quarry, is maintained at an absolute maximum of 1.2 m x 1.6 m. Satisfactory fragmentation is important,

both for optimizing the loading of the quarry’s wheel-bound loaders as well as for fast throughput at the crusher station.

With the correct dimensions of the rock, the crusher station runs evenly and smoothly, using the right amount of power required to crush the stone while consuming as little energy as possible to minimize costs.

An added advantage is that correctly blasted rounds increase safety and improve the environment for the 45 people at the site by reducing the amount of flyrock and dust.

“Obviously equipment like this costs extra money so you’ve got to get it out at the other end,” Langfjord maintains, “and that’s exactly what we’ve done as we have been able to increase the drill pattern from 8.6 to 9.8 square meters.”

Mats Birkestål, Product Manager at Atlas Copco’s Surface and Exploration Drilling Division, sums up the Brønnøy experience. “What’s important here is that this company has understood the value of each step in the process,” he says. “They plan the holes they are about to drill and follow up after each drilling operation in order to secure the best possible rock fragmentation. They know that this process is the key to total efficiency. ☉

“ They have understood the value of each step. They plan the holes and follow up after each drilling operation.

Mats Birkestål Product Manager, Atlas Copco Surface and Exploration Drilling Division.





Making the grade

AUSTRALIA Global underground mining contractor, Byrnegut Mining, has notched up more than 1 900 hours on an Atlas Copco Scooptram ST18 loader at the King of the Hills gold mine, 40 km north of Leonora in Western Australia.

It was the first of the new Scooptram ST18 loaders to be delivered to a contractor in Australia and followed the earlier commissioning of a unit at Crocodile Gold's Stawell gold mine in Victoria. The Scooptram is now part of Byrnegut's huge fleet of 28 LHDs in the 18-tonne capacity range.

Barry Scanlon, Byrnegut Australia's Maintenance Area Manager, says: "Going on the history of the previous ST1800 the new unit is a vast improvement. There were some initial teething issues as would be expected with a machine that has been



redesigned from scratch but we have had no major issues generally with the unit and Atlas Copco's support has been good."

Scanlon notes the good visibility, bogging power, ride and speed on grade and that

feedback from the operators so far is positive. "They particularly like the footbox designed into the cabin, allowing them to sit in a more conventional driving position when operating the machine," he says.

The Scooptram ST18 was officially launched in Australia at the AusIMM 2014 Underground Operators' Conference in Adelaide. Designed to partner the Minetruck MT6020, the Scooptram ST18 has a range of features aimed at making maintenance simpler and faster and at increasing the productivity of loading cycles.

Swedish rock experts get taste of the future

SWEDEN A keynote presentation from Atlas Copco topped the agenda when the Swedish Rock Construction Committee recently celebrated its 60th anniversary in Stockholm.

Delivered by Swerker Hartwig and Gunnar Nord, both Senior Advisors to Atlas Copco, the presentation traced the development of rock blasting from the Swedish Method of the 1950s right up to today's sophisticated techniques for excavating tunnels and mines.

But what concerned the speakers most was the rapid increase in the demand for energy worldwide, coupled with the urgent need for new technology solutions.

The challenge, they told the delegates, will be to excavate rock faster than ever before while at the same providing maximum safety for tunneling and mining personnel as well as environmental protection. Atlas Copco is already playing a

leading role in this process together with a number of high profile global companies.

*BK Bergsprängningskommittén is a non-profit organization comprised of companies working with the planning, construction and operation of rock installations and mines, as well as equipment manufacturers.



The future? An artist's impression of what hard rock drill rigs may look like in years to come.



Pit Viper 316 on site

CHILE The first of two Pit Viper 316 drill rigs (diesel version) has now been commissioned at the Minera Los Pelambres copper mine and the second rig is expected to go into operation during May 2015. They join a fleet of seven Pit Viper 351 rigs at Los Pelambres which is part of Antofagasta Minerals group, owner of one of the largest copper mines in the world. The equipment is part of a strategy to modernize the fleet in order to increase productivity and introduce new technologies which have been developed in the Pit Viper series.



Meeting the construction upswing


NORDIC REGION As infrastructure development in the region expands, a new drill

rig – FlexiROC T25 R – has been launched to help drilling contractors meet demands for speed and efficiency.

Product Manager Marcus Leü, says: “A number of large infrastructure projects are either underway or being planned right now and this, together with the growth and expansion of the big cities, is generating an increasing amount of drilling and blasting work.

“As a result, the contractors need to have a wide hole range for small to medium-large blasting work, particularly in and around densely populated areas, and this new rig gives them this capability.”


The Atlas Copco FlexiROC T25 R is optimized for hole diameters of 45–57 mm but can also be used in the 38–64 mm range making it the perfect choice for foundation drilling, trenching and to some extent road construction.

Furthermore, the rig is equipped with the high frequency COP 1435 rock drill, a tophammer that is perfectly matched to small-hole tasks. 

Joint development project aims for mining milestone

WORLD A joint development project involving Atlas Copco and Anglo American is making headway towards a potential milestone in mining technology. The two companies are set to test a new type of mining machine that is expected to transform the extraction process of ore from underground hard rock mines.

If all goes according to plan, it may be one of the most significant examples of innovative technology to emerge from Anglo American’s FutureSmart™ approach to mining. Donovan Waller, Group Head of Technology Development at Anglo American, adds: “Atlas Copco shares our vision that we need to work together for the future benefit of the industry. Atlas Copco is therefore the ideal choice to partner with us on this exciting journey.”


According to Anglo American, the project focuses on rapid mine development and on making hard rock mining faster and safer. 



Serving Svappavaara

SWEDEN Mining company LKAB has chosen Atlas Copco to be its equipment supplier in the development of three new iron ore mines in Svappavaara in the far north of the country. Atlas Copco will supply production equipment together with full service agreements for drill rigs and rock drilling tools.

The new mines – Gruvberget, Mertainen och Leveäniemi – will be started up successively over the next few years. Gruvberget is already under way.


“Mining in the Svappavaara fields is a key part of LKAB’s operation but is also important for Sweden’s supply of iron ore,” says Bo-Göran Johansson, Business Line Manager at Atlas Copco’s Swedish Customer Center. “Atlas Copco and LKAB have a long history of cooperation and we are very pleased that this cooperation will continue into the future.” 

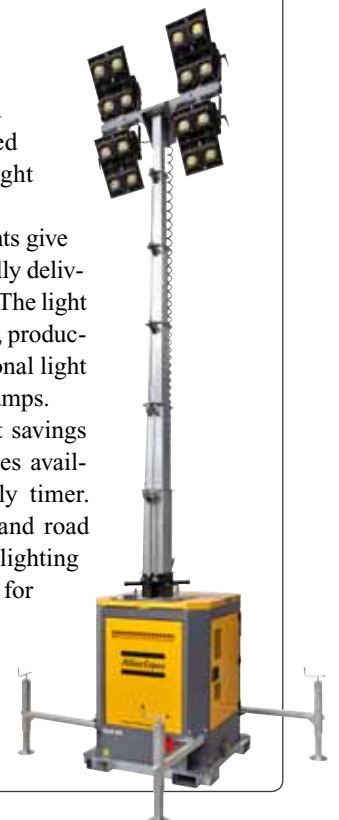
Seeing the light!

WORLD Atlas Copco has launched a new compact light tower equipped with a new, extra powerful LED light combination.

The QLB 60’s four 350W LED lights give more luminous coverage that is typically delivered by 4x1000 W metal-halide lamps. The light tower is also environmentally friendly, producing up to 75% less CO₂ than a traditional light tower using 4x1000W metal halide lamps.

The unit also generates significant savings thanks to different remote start modes available via the photocell and a weekly timer. Typical applications are residential and road construction sites and as temporary lighting in the oil and gas industries as well as for various events.

The QLB 60 is available worldwide with the exception of North America. 



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