

MINING & CONSTRUCTION

MECHANIZED ROCK EXCAVATION WITH ATLAS COPCO – NO 3 / 2013.



ATLAS COPCO CELEBRATES >>>



MEYCO magic for London's new metro

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Atlas Copco

Getting the priorities right

ASK ANYONE IN mining and construction to name the two most pressing issues of our time, and more often than not, the answer will be “safety” and “the working environment”. In fact, these issues dominate the agenda nowadays, and not just in the Western world but worldwide.

There are good reasons for this. We all agree that mining and infrastructure development are vital, integral elements of modern society and a prerequisite for economic growth. But workplaces that are polluted and dangerous are not only unacceptable, they are completely counter-productive. As a result, companies must invest, and are investing, in greener and safer technology.

Climate change is another major challenge for the whole international community. Naturally, the development of mining and construction activities must not be impaired, but we see emissions of carbon dioxide continuing to rise on a global scale.

It is high time to reduce this global environmental footprint. One way is to insist on the use of more efficient equipment and the new technologies that already exist, solutions that will lead to substantial emission reductions.

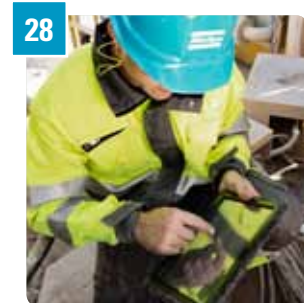
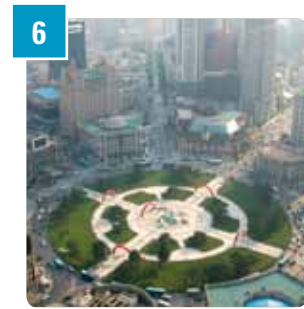
In this issue of M&C, we present some of the surface drilling solutions that do exactly that – from the functionality and automation of our SmartROC drill rigs to the amazingly low fuel consumption of the FlexiROC range, and these are just a few examples.

Safety, the working environment and climate change are important issues for us all. The time for action is now.

MARKKU TERASVASARA
President,
Atlas Copco Surface
Drilling Division



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SAFETY FIRST
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EFFICIENCY AS STRONG AS IRON

Simba M4 C sets the standard at Xingshan Mine





Under ground: Setting up for the first demonstration of the Simba M4 C rig's many capabilities.

running it for 1 100 hours it was still in very good condition.”

Star performer

The Xingshan operation produces iron ore at the rate of 3.2 Mt per year from an orebody that has a short strike length and a steep dip. Furthermore, to secure three different grades of ore, the mine decided that it needed to increase efficiency by improving the mechanization and automation of its equipment. In this respect, the Simba M4 C proved to be a star performer as its high precision makes it easier to separate and extract the different grades.

The main ores are poor magnetites and secondary iron pyrites with a grainy structure and are banded or gneissic. The mine has main and auxiliary shafts plus a main ramp 4.6 m wide and 5 m high with a maximum incline of 15%. The initial sublevel height is 15 m with an approach spacing of 20 m. This subsequently rises to 20 m with an approach spacing of 22 m.

Key advantages

Reviewing the rig's performance, Xudong explains that the introduction of the Simba M4 C has brought several key advantages to the Xingshan operation. “First of all, it provides ease of operation. After setting some

parameters, a row of medium depth and deep holes can be completed automatically and this reduces the burden on operators in opening the hole as well drilling,” he says. “Secondly, the automated functions, such as the automatic rod handling system, help to avoid human error and improve safety.

“The automatic set up gives us higher drilling accuracy – the precision of the angle of the medium and deep holes is 0.01 degrees and in hole positioning it is within 0.1 m.

“It will also be possible to achieve remote wireless operation at a later stage, enabling one man to operate several rigs.

Self diagnosis of any electrical faults can also be achieved and these faults can be directly located.”

To enable the mine to take quick advantage of these capabilities, Atlas Copco set up a 12-member training team to provide the Xingshan operators with a 12-day, intensive training course, something which Xudong sees as another major advantage.

“The introduction of new equipment and technology gives us a rich experience of modern machinery,” he concludes. “This also accelerates our speed in developing not only a world class mine for China but a mine that is a leader internationally.”



Simba M4 C is a long hole drilling rig for medium sized drifts in the 51 to 89 mm hole range. The rig is designed for 360 degree ring drilling, and is also capable of drilling parallel holes with a spacing of up to 1.5 m in the side walls and up to 3 m when drilling upwards and downwards. It is equipped with a high-performance, top-hammer rock drill and the Atlas Copco Rig Control System (RCS), provides a sustainable, high-precision solution for long-hole drilling.

The rig features the COP 1838ME 18 kW rock drill for high availability and high productivity or COP 2550UX 25 kW for a larger hole range and tougher rock conditions. It also has a rod carousel for 17 + 1 rods for mechanized drilling up to 32 m or 27 + 1 rods for mechanized drilling up to 51 m.

High-tech construction is in increasing demand in China as urban development programs continue across the country. The well known city of Dalian (pop: approx 6 million), on the northeast coastal peninsula, is a typical example.



DEVELOPING DALIAN

To some, the Chinese city of Dalian is mostly known for its elegant squares, beautiful lawns, sculptures and fountains based on Parisian-style architecture. To others, it is famous for being home to Dalian Haichang, formerly known as Dalian Shide FC, China's most celebrated football club.

Either way, its reputation as a modern, progressive community is unmistakable and visible in most aspects of Dalian

life. A good example is the city's vibrant construction industry which uses increasingly high technology equipment to carry out extensive urban development projects.

One such project is the development of a new train station, Dalian CRH, currently being built in the district of Ganjingzi, west of the city, by construction and civil engineering company Dalian Yeguang Construction.

The limestone aggregates required for this purpose are sourced from the company's own site in Ganjingzi where it uses top-of-the-line equipment for drilling, screening and crushing. The fleet includes a Powercrusher PC 5, HCS 3715 screener, and surface drill rig FlexiROC T40, all supplied by Atlas Copco. In addition, the company has a FlexiROC T15 which is used for construction and trenching.

The Atlas Copco fleet in action:
The mobile Powercrusher PC 5...



... drilling for limestone aggregates with the FlexiROC T40...





The city of Dalian: A fast growing and modern community.

The crusher and screener are used to filter the aggregates to Yeguang Construction’s size specification – 40 mm or less – and also meet the company’s need for mobile equipment that can be easily moved between different sites.

Quick service response

Atlas Copco’s Customer Center in Liaoning provides operation and maintenance training for Yeguang Construction’s personnel and also makes routine visits to the site to monitor the equipment.

As an indication of the scale of the operation, the site produces some 280 tonnes of aggregates per hour. And although the equipment performs well overall, failures sometimes occur, requiring a quick response from the Atlas Copco service organization. So far, downtime has been minimal with no disturbance to production.

The FlexiROC T40 has been in operation at the site for five years, drilling 115 mm holes, and has racked up about 9 000 engine hours. The difficult geological conditions comprised of fractured rock and complicated karst formations makes

it a tough challenge for the rig and the high silicon content of the rock quickly wears out the drill bits. Despite this, however, the average service life of the rig is satisfactory.

At the time of M&C’s visit, the Power-crusher PC 5 has been in operation for three years and 4 000 engine hours while the screener HCS 3715 had been on site for two years and had 3 000 engine hours. The FlexiROC T15, with its 28/32 mm drill rods, had been in service for three years and was said to be greatly appreciated for its high speed drilling capability and maneuverability.

Qingdong Hu, Technical Department Manager at Yeguang Construction, says he believes the FlexiROC rigs live up to the reputation of the Atlas Copco brand as they represent “high performance and a deep knowledge of mining and aggregates.”

“I think these world leading machines combine all of Atlas Copco’s global experience which gives us confidence and trust,” he says. “In addition, we get the benefit of experienced service engineers with their excellent service skills. I hope that there can be more potential cooperation between our companies in the future.”

“ These machines combine all of Atlas Copco’s global experience which gives us confidence and trust.

Qingdong Hu Technical Department Manager at Yeguang Construction

...material screening with the compact HCS 3715 mobile screener...



...and small dimension drilling with the multi purpose FlexiROCT15.





Moment of truth: The SmartROC D65 is closely monitored as it starts to drill the first row of holes.



Groundbreaker: The rig making history at Rio Tinto's Technology and Innovation quarry site in Australia.



Job done! The completed drill pattern of 15 holes, three rows of five per row, after remote drilling with full automation.

Australia makes AUTOMATION

A world first for Rio Tinto in fully automated production drilling

Renowned mining company Rio Tinto has become the first to achieve fully automated production bench drilling without human intervention at a test site in Australia.

All eyes were on the monitor as the advanced, automated surface drill rig carefully moved into its starting position. Its task: to follow computer generated instructions to complete an entire drill pattern without human intervention.

The rig leveled and then started to drill, completing the first hole. So far so good. The rig then extracted its drillstring and trammed to the next row of holes where it repeated the cycle with equal speed and efficiency. Before long, the entire drill pattern had been completed, fully automated, without any human intervention.

The scene was Rio Tinto's Technology and Innovation test quarry outside Perth in Western Australia. The rig was an

advanced Atlas Copco SmartROC D65, and the result was a major milestone in fully automated production bench drilling.

Charles McHugh, Manager, Mining Disciplines at Rio Tinto, explained that the drill pattern had been pre-designed in the mine office and the drill was controlled and directed at the touch of a button.

Integration with MAS

The success of this project represents a first for the surface mining industry and a milestone in a joint development alliance that was established between Rio Tinto and Atlas Copco in 2008.

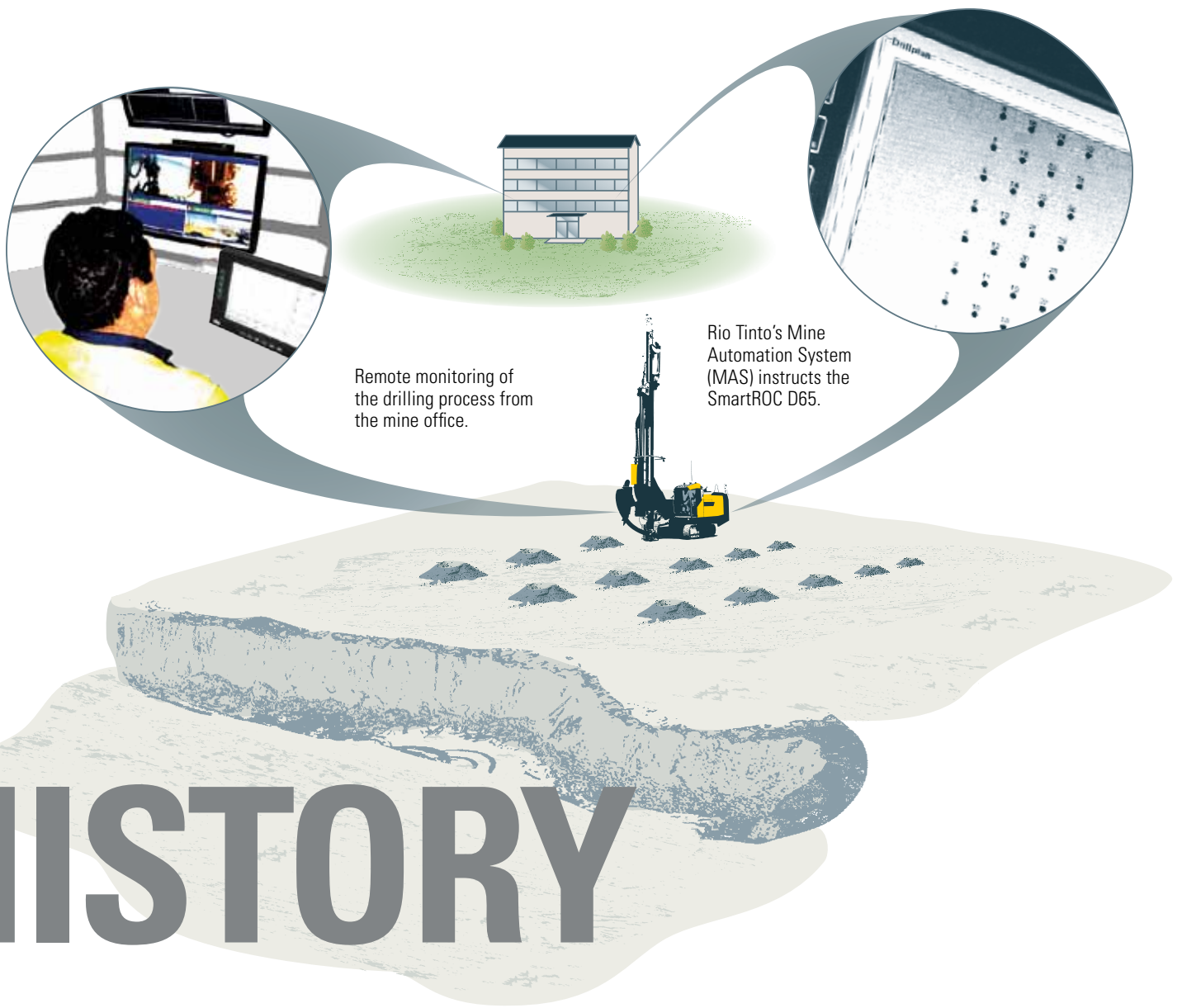
At that time, Atlas Copco's challenge was to develop an automated drill rig that could be integrated with Rio Tinto's Mine

Automation System (MAS), a system that provides the command and control of automated equipment at Rio Tinto operations.

Rio Tinto further developed the MAS system to remotely connect with the drill rig and these functions were put to the test as part of Rio Tinto's Mine of the Future program.

Charles McHugh continues: "Atlas Copco and Rio Tinto worked together to ensure that the tasks assigned to the drill rig could be received and carried out in an automated fashion with the drill operator located in the office.

"We expect benefits both from a single operator being able to operate multiple drills and from flexible operation which will be possible between operators and potentially between operating sites. Importantly, however, we are also seeing improved drill utilization and consistency



Remote monitoring of the drilling process from the mine office.

Rio Tinto's Mine Automation System (MAS) instructs the SmartROC D65.

HISTORY

in drill outcomes, providing more accurate information for mine operation.”

Accelerating the program

Rio Tinto has a substantial program in place to develop automated systems for its surface mining operations which create safer and more efficient operations.

McHugh maintains that the alliance with Atlas Copco will accelerate the development and deployment of autonomous drilling solutions for the surface mining industry. “The benefits resulting from automating drills include improved operator safety, higher precision of the drilling process and improved equipment reliability, resulting in superior performance,” he says.

“For Rio Tinto, these advances are about achieving competitive advantage through step changes in mining that come from leadership in technology, starting with

academic origin and resulting in a commercial outcome. Through this approach we’re changing the face of mining.”

He also says that Atlas Copco and Rio Tinto will continue to work on “other exciting drilling technologies through the strategic partnership”.

Communication with RCS

Tom Ross, Atlas Copco’s Surface Drilling Business Line Manager in Australia, says the test result is a landmark for the industry because it demonstrates the ability of the RCS (Rig Control System) software on board the SmartROC D65 to communicate with the MAS software, and complete drilling tasks effectively under instruction from a computer.

“Technology is the future in mining and I would like to think that Atlas Copco is at the forefront of that,” he says. “This is why the SmartROC D65 being able to do this

is like putting a big flag on top of the hill saying ‘we’re the first,’” he says.

“The really clever part was the ability of the machine to navigate 15 holes, three rows of five holes each, without any human involvement, then drill those holes and return to a waiting stance for further instructions.

“The MAS system ‘spoke’ to our rig, our rig understood the instructions and carried out the commands, rather than it being remote controlled. That is maybe the first time the MAS system has ‘spoken’ to control a drill rig.

“This is something we have been working on for three years, so this is the accumulation of a lot of work to get to this point. It’s been really satisfying that we were able to do it. For us it’s a world first on this class of drill rig, and for the alliance, it means that we’ve got the proof of concept completed.”

Introducing Boltec S

the compact bolter for tight drifts

The new rock bolting rig from Atlas Copco is a welcome development in underground mines where small, tight spaces are often unsupported.

Atlas Copco has developed a compact rig for rock bolting in small to medium sized tunnels and drifts. Called Boltec S, the new rig is fully mechanized and can operate in drifts as low as 2.8 m up to 7.5 m.

“With this launch we are filling a gap in the market in terms of small, fully mechanized rock bolting rigs,” says David Shellhammer, President of Atlas Copco Underground Rock Excavation.

“We’re glad that we have been able to offer a rock bolting rig that fits the smallest tunnels and mines; no-one should ever have to work beneath unsupported ground. Now miners will be able to eliminate manual bolting which in many cases has previously

been the only option in this segment.”


The low operating height has been achieved thanks to the short length of the feed as well as the low height of the cabin. Paul O’Neill, Product Manager, explains: “The Boltec S has a ‘dead length’ of only one meter, and that’s the best in its class. The dead length is the extra length required on the unit in order to install a bolt. For example, if you want to install a 1.8 m bolt, the total length of the unit is 2.9 m.”

Easy to operate

Designed for all types of common bolts from 1.5–2.4 m in length, the Boltec S can be equipped with the new 14 kW COP 1435 rock drill which offers up to 30% faster

drilling than the lighter 11 kW COP 1132. In addition, both rock drills are built from the same, short housing parts, giving maximum room for installing longer bolts.

Another practical improvement is a new operator panel with only two multi-functional levers that control the whole operation from drilling to bolting. There’s a new resin injection steering system, also controlled from the operator panel, which makes the loading of resin cartridges into the pre-drilled hole a lot easier since it is not necessary to move the whole bolting unit.

The bolting unit is mounted in a forward facing position, making it simpler to install bolts in both the left and right hand corners, and also allows for face bolting when necessary. Furthermore, the bolt carousel can be loaded in a vertical position, resulting in a much faster reload time and a better working environment for the operator. 



The new Boltec S for small tunnels and drifts: It can be used for the safe installation of bolts from 1.5 to 2.4 m in length.

KEEPING RUSSIA'S pellets rolling



Efficiency drive pays off for Karelsky Okatysh

The Karelsky Okatysh iron ore mine, located in the Russian Republic of Karelia, continues to increase its production year on year, irrespective of fluctuations in metal prices.

At a time when many mining companies are reducing their output to adjust to lower demand, Russia's Karelsky Okatysh iron ore mine continues to increase production with a positive outlook on the future.

The reason is that this young mine, founded in 1982, is now reaping the benefits of investments it has made over the last few years in modern technology and automation solutions.

Karelsky Okatysh is owned by Severstal, the second largest producer of iron ore pellets in Russia, and one of the world's

most profitable steel producers. It is also one of Russia's most modern mining operations, accounting for some 20 percent of the country's iron ore.

The nearest town is Kostomuksha, about 12 km to the southwest, which has more of the look and feel of a college campus than a typical mining settlement. Here, more than 5 000 people out of a population of 30 000 are engaged in the mining industry in one capacity or another.

The ore from this region is magnetite quartzite which produces high quality pellets with an iron concentration of up to

68 percent. Four pits are active on the site with two of them responsible for most of the output – Central and Korpanga – which have a combined lifespan of 34 years and probable reserves of 480 billion tonnes.

Central Pit, which was the first to be mined, and will probably be the last, is the largest one. It is currently 5 km long, 2 km wide and 300 m deep and will eventually reach a depth of 460 m.

Continuous efficiency

The company's strategy is to not allow the fluctuating price of iron to affect its operations,

The Atlas Copco DM-M3 rotary blasthole drill rig on site at the Karelsky Okatysh mine.





“ Whenever there is an issue, the service technicians come up with a quick solution.

Zakhar Pavlov Mine Manager, Karelsky Okatysh mine





Single-pass to multi-pass drilling: The DM-M3 rigs arrived at the site in 2012 and can be used for single-pass drilling to depths of 12 m. Currently, these rigs are used for multi-pass drilling, using two 12.2 m pipes, to drill down to a depth of 21 m.

» but rather to increase production year on year through continuous efficiency improvement. Investments in lean technology and automation solutions have made a great contribution in the effort to meet this goal.

For example, when a hauler is loaded with



Evgeny Zhdanov, Atlas Copco's Service Technical Manager: "The rigs average 600 drilling hours a month."

rock, a sensor is able to measure the ore-to-waste ratio contained in the load. If the sensor detects less than 10 percent ore, the material is sent to waste; if the ore is rated in the 10-to-25 percentile, the ore is directed to the crusher, and if the load grade is more than 20 percent, the ore is transported to the railway and sent directly to the ore dressing plant.

Of the 35 Mt of ore produced each year, 10 Mt are crushed in the pit while 20 percent remains in the crushed tonnage.

Total application package

The mine's drill and blast fleet includes four DM-M3 diesel rotary blasthole drills as well as a FlexiROC D50 and a FlexiROC D60, all from Atlas Copco. Added to these are a number of Russian SBSH blasthole rigs.

The DM-M3 units, which originally made their name in coal mining, are used here for drilling the main production holes with the FlexiROC rigs doing the pre-splitting work.

An Atlas Copco Christensen exploration rig, which is used on a daily basis for core sampling, completes the total application package.

The DM-M3 rigs arrived at the site in early 2012 and can be used to drill in a single pass to depths of 12 m. However, these rigs are used for multi-pass drilling, using two 12.2 m pipes, to drill to a depth of 21 m. They typically drill a 7 x 8 m pattern with an average of 120 holes per pattern, although some patterns require up to 500 holes.

The large capacity of these rigs was one of the main reasons they were chosen. As Chief Mining Engineer Denis Golubnichy explains: "We liked the DM-M3 because it allows us to drill a larger diameter hole, giving us more blasted material per meter. Having four DM-M3s at work drilling these large holes has enabled us to increase our blast production."

As part of the deal, the mine has a service



agreement with Atlas Copco whereby eight Atlas Copco service technicians and one technical manager will be stationed on the site for three years. When M&C visited the mine in May this year, the service team had completed almost a year handling all rig maintenance and repairs, with the exception of the engines which are normally serviced by the mine's personnel.

Commenting on the service, Mine Manager Zakhar Pavlov, says: "So far it has been excellent. Whenever a spare part is needed or a particular issue arises, the service technicians come up with a quick solution."

Alexey Korobchenko is Atlas Copco's onsite Project Manager, liaising with the mine and organizing the tasks for the service office in Kostomuksha. His main contact at the mine is Drill Site Manager Oleg Romaniko. Together they plan the maintenance schedule, operator training, discuss future plans and new equipment for

the mine, and assess the status of all Atlas Copco rigs on site.

Korobchenko says: "Oleg supervises our activities and controls operations so we can meet a 100 percent work safety standard. We are thankful that Oleg has helped us with information and critiques from the customer side, which is critical for our rigs to remain productive."

Cold weather protection

Evgeny Zhdanov, Atlas Copco's Service Technical Manager, confirms that only a few issues have affected the performance of the rigs beyond the wear and tear that rigs of this size usually endure.

With availability at around 90 percent, he says the rigs average 600 hours of drilling per month, and compared to the Russian electric drills, they are faster and give better uptime and maneuverability.

In the extreme weather conditions here

during winter, the DM-M3 rigs are well protected. Thanks to a cold weather kit they are able to operate in temperatures down to -38°C . For temperatures that low, effective lubrication is essential and special synthetic oil is used in the hydraulic systems. »



Alexey Korobchenko, Atlas Copco's onsite Project Manager: "Critique from the customer side is critical to keep the rigs productive."



Tackling the hard stuff: A number of Atlas Copco Pit Viper 275 multi-pass blasthole drill rigs are also used in the pits and the mine recently took delivery of a new one which will be used in locations where the rock is exceptionally hard.

» Exposure and constant ground contact subject the crawler undercarriage to particular abuse in low temperatures. And the base material, steel and rubber, have been upgraded for rotating of components with an articulated movement.

Others need heating and Atlas Copco has designed a series of heater packages for lubricants, fuel, engine and batteries. Today, more than 150 Drillmaster and Pit Viper rigs work in mines where temperatures can drop below -40°C .

Karelsky Okatysh is also planning ahead. The rock type in most of the pits is hard and in some places extremely hard. To help deal with this, the mine has now also taken delivery of its own Pit Viper 275 multi-pass rig equipped with Atlas Copco's automated Rig Control System. In addition, the mine uses a number of other Pit Viper 275 rigs operated by a local contractor.

The PV-275 is designed for rotary drilling of blastholes up to 270 mm ($10\frac{5}{8}$ ") in diameter with bit loads up to 70 000 lbf and to a maximum hole depth of 59.4 m (195 ft).

Mine Manager Pavlov says: "We think the Pit Viper 275 will be the best drill to use in our pits with the hardest rock, so we will start in the central pit and go from there."

Training and expansion

In addition to a strong focus on safety, Karelsky Okatysh places high demands on operator training before allowing employees to take up positions of responsibility. For example, a driller is required to have at least 10 years' experience before being considered a full fledged, blasthole drill operator, known

as a "6th grader" – the highest achievable level according to the Russian scale.

Exploration also plays a major role in the mining process as this is critical to expansion and to achieving continuously increasing production rates. A good example of this is the mine's ongoing Deep Horizon project which involves core sampling at

depths of 200–250 m and will continue until 2016.

By the end of 2013, the mine will have drilled 1.4 million meters for blast and has seen its output grow from two million tonnes per employee to 2.6 Mt. By 2015, the mine expects to produce 10.7 Mt of pellets. ☉

DM-M3 TOUGH AND FLEXIBLE

The DM-M1 was developed in the early 1980s and was designed for rotary drilling of $9\frac{7}{8}$ " holes with bit loads up to 60 000 lbf.

Of the first four rigs produced, three went into operation at Peabody Energy's North Antelope & Rochelle Mine in the Wyoming Powder River Basin, USA which is one of the largest coal mines in the world.

In 1989, the model was upgraded to the DM-M2 on which the maximum bit load was increased to 75 000 lbf and the hole size capability extended up to $10\frac{5}{8}$ ".

The DM-M3 was designed primarily for deep drilling of overburden for cast blasting in large coal mines, and it was the first with a bit load raised up to 90 000 lbf and a new cable feed system allowing the use of 40 ft long drill pipes. The first production rig went into operation in 1993 at Arch Coal's Black Thunder Mine, also one of the world's largest.

The proven DM-M3 and now the PV-275 are currently the drills of choice in large scale mining operations in Wyoming. These robust drills, with their ability to drill large, deep holes at an angle, have become the standard in the Powder River Basin which is home to 13 major open pit coal mines.

Jon Torpy, Vice President, Marketing – Blasthole Drills at Atlas Copco, says: "When this rig was designed there were definitely miners involved.

We constantly have customers tell us how much they love the DM-M3, referencing its power and reliability."

Some specifications for the DM-M3:

- Hole diameter range 251–311 mm
- Multi-pass drilling down to 61 or 73.2 m depending on drill pipe size
- Single-pass hole depth 11.3 m using a 40 ft drill pipe
- Diesel or electric power pack
- Three or four jack configuration
- Cold weather package
- Patented system for angle drilling, 0–30 degrees
- Auto level system (optional)

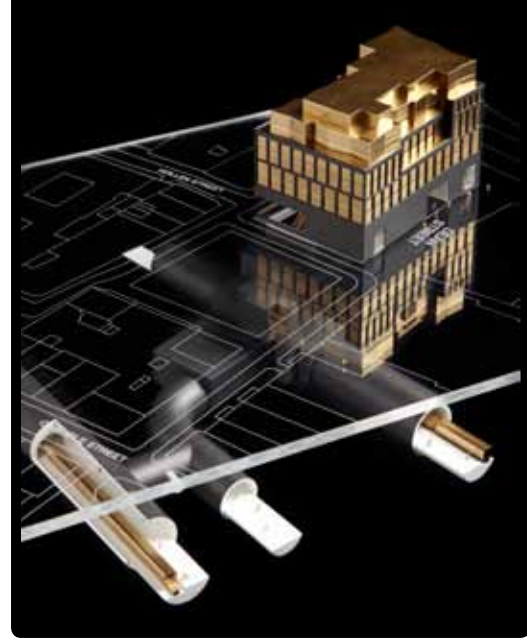
Development of the new Pit Viper 316 has taken these strengths and added to them. The single-pass model PV-311 was launched at MINExpo 2012 and the multi-pass PV-316 will launch in 2014.



A major upgrade of the London underground system is currently taking place with compressed air and shotcreting equipment from Atlas Copco playing a key role in the construction work. M&C reports from Tottenham Court Road.



How the station will look: An ultra-modern hub, fit for the demands of the 21st century, due to be opened in 2017.



QUALITY AIR

at the new LONDON UNDERGROUND

Tottenham Court Road is one of the busiest subway stations on the London Underground system, used by more than 150 000 passengers every single day.

That figure is soon expected to double, which is why this famous transit hub in the heart of London's West End is now undergoing a complete makeover at a cost of more than EUR 500 million.

The project is being carried out for the city's Transport for London (TfL) organization by the joint venture contractors Taylor Woodrow and BAM Nuttall. It includes:

- an enlarged ticket hall, six times the size of the present one
- new station entrances
- additional access points to the Northern and Central Line platforms, to reduce congestion
- a total of 14 new escalators and six new lifts, providing step-free access.

Atlas Copco is supporting the contractors and playing an important role in the production process, both on the surface and below ground.

Two Atlas Copco compressors positioned on the surface of the site provide

compressed air for the equipment being used in the tunnels, primarily Atlas Copco MEYCO concrete spraying equipment as well as drilling and chipping tools.

These compressors are stationary, Elektronikon® controlled, fully weather-proofed and winterized Atlas Copco GA 132FF units, which provide guaranteed high quality air round the clock.

The GA132FF is a single-stage, fully integrated rotary screw compressor that delivers 7 bar of oil-free, dry air at the rate of 400 l/s via a built-in refrigerant dryer, a three-stage air/oil separator and oil filters housed within the compressor canopy.

Quality air essential

This high quality, oil-free air is essential to the delivery of uncontaminated, fibre-reinforced liquid shotcrete to the walls and roofs of the new subway tunnels.

It is introduced at the delivery nozzle to spray the concrete mix onto the receiving surface. This so-called wet-gun procedure produces less rebound and waste with the added advantage that larger volumes can be applied in a shorter time. By installing the compressors, Taylor Woodrow BAM

Nuttall benefited from two completely fit-for-purpose machines, incorporating all the drying and filtration equipment needed to provide the required level of air.

As Ben Thomson, Tunneling Engineer at Taylor Woodrow BAM Nuttall, explains: "We felt it was the right decision to go with Atlas Copco who provided us with two new compressors and the reassurance of continuous, reliable performance, which is vital to our below-ground operations. Guaranteed air quality was the primary deciding factor – oil and concrete are not a good mix!"

Once the shotcreting phase is complete, the two compressors will be transferred to another well known London subway – Victoria Station – where the joint venture partners will also carry out a major upgrade of the facilities there.

MEYCO's total package

As many as eight MEYCO spraying units have been used at the Tottenham Court Road site for a range of different applications. These include three Suprema units for shotcrete pumping, three Oruga units for general spraying works, and two Piccola units for dry spraying applications as well



A birdseye view of the worksite: The Tottenham Court Road station is just one part of the massive Crossrail project to upgrade the entire London metro. With some 10 000 people working across 40 sites, it will be the biggest construction project in Europe.

as the application of a Masterseal, waterproof membrane.

The shotcrete spraying works, which were also carried out by the Taylor Woodrow – BAM Nuttall team, mainly focused on pedestrian walkways, escalator shafts and general tunnel lining.

According to Jamie Hart, who manages Sales and Technical Support at MEYCO in the UK, the contractors chose the equipment because Atlas Copco MEYCO is the market leader in shotcreting technology.

Explains Hart: “The MEYCO equipment working on the Tottenham Court Road station transformation is known for its robust quality, ease of operation and versatility. The very fact that it was chosen for such a prestigious and time-sensitive job is testament to the market leading MEYCO brand.

“The equipment worked in conjunction with air provided by the ever reliable Atlas Copco compressors and proved to be a great working relationship.”

MEYCO equipment is used on several sites in the Crossrail project, including at Liverpool Street Station (cover picture on this issue). All worksite photos: Crossrail.



Star performers: Left, the GA132FF compressor stationed on the surface, which powered tools and equipment under ground. Below, the high quality, oil-free air is used to power MEYCO shotcreting equipment such as this remote controlled Suprema concrete spraying unit.





Insight On **INNOVATION**

A chill wind is blowing across the mining and construction industry. It is not the first time and probably not the last. M&C talks to **Johan Halling**, recently appointed President of Mining and Rock Excavation Technique, to get his views on the slow-down and a glimpse of what the future holds in store.

Q. Some people say that despite the current downtrend, mining companies have never had it so good. Is that a fair statement to make?

A. Yes, I think it is. Companies are certainly much better equipped than ever to cope with the ups and downs of the market and still remain successful. It is also important to see the current downturn in the mining industry in context. It comes after an all-time high in market demand that is unprecedented in the industry's history. As a result, I believe that some companies may have overinvested during 2011 and 2012 and are suffering a bit from that today. It is also interesting to see that metal prices right now are actually not too bad. So looking at the big picture, I am not overly concerned.

Q. What is it that makes today's companies better equipped to cope with these market fluctuations?

A. Thanks to a continuous stream of new products and solutions they are now able to do things better, faster and at a substantially lower cost than just a few years ago. Productivity, cost efficiency and flexibility have all been increased tremendously which has made them more efficient and more competitive. But I believe we have only just begun to scratch the surface. There's much more to come in the years ahead.

Q. How much has Atlas Copco contributed to this development?

A. I believe that our contribution is immeasurable. We are a product driven company and we stand or fall on the benefits that our products bring to our customers. Innovation is one of the key elements in our strategy which is why we continuously increase our investments in R&D. In a downturn, R&D is the last thing we would consider reducing. Without our strong focus on R&D, we would not be one of the world's leading equipment suppliers in our industry as we are today.

Q. However, some might say that it takes too long to get innovations to market. Do they have a point?

A. Yes, in some areas I think that's true. But innovation takes time. You don't suddenly come up with an idea and then get it into production the same year. It's a long process. Prototypes have to be designed and built, and they have to be thoroughly tested in the field before we feel we can launch them on the market with complete confidence. And even then, we continue to make improvements. Of course, for the customer who wants to increase productivity or improve the working environment right away, it will always seem like a long wait.

Q. Which innovations represent the most significant benefits to mining and construction companies today?

A. In general terms, I would say all of the remote control devices and automated systems that make life easier and safer for

operators. It is a fantastic achievement to be able to maneuver a drill rig or a loader by remote control and keep operators out of harm's way. Safety is a major priority, particularly in the mining industry. It is at the top of the agenda at every meeting, and consequently a big issue for us at Atlas Copco, too.

Our customers work in potentially hazardous environments and it is our job to do everything in our power to offer products that reduce those risks as much as possible. We do this by incorporating computerized safety systems such as automatic shutdown, safetylocks and warning systems.

We have also broken new ground when it comes to fuel economy by developing the most fuel efficient surface drill rigs on the market, in some cases cutting fuel bills by half for their owners. We have also drastically reduced engine emissions and we are now offering electric powered mining vehicles to reduce energy consumption.

Q. What other innovations are in focus today?

A. The new RigScan concept is a good example. This enables the condition and performance of key components on a machine to be analyzed and also identifies and locates faults. This means that the service auditor can find out what's going on inside the machine and make a diagnosis without having to dismantle or reassemble anything, saving time and money.

Another example is the Oralyzer. This device, mounted on an exploration rig for example, analyzes the cuttings from the drill hole and determines the grades. Then there is the Edge system which constantly monitors the rock being drilled into and automatically adjusts the rig's parameters



Johan Halling is President of the Atlas Copco business area Mining and Rock Excavation Technique.

accordingly. Normally an unskilled driller drilling a water well hole, for example, will drill say, 100 meters. A skilled driller will drill 140 meters, but with Edge, the unskilled driller is able to drill 180 meters. My vision for the future is that very skilled drillers will not be necessary as everything will be automatic.

Q. How does Atlas Copco contribute to education and training today?

A. I believe we are among the absolute leaders in this field. We have developed international training programs that are second to none and our customers welcome it. To be an Atlas Copco trained operator really means something in the industry these days. As our equipment becomes more technically advanced, so our training programs become more important in order to teach


people how to get the maximum benefit from the technology. We have trained 6 000 people so far this year and by the end of the year we expect that to rise to 10 000. That's a fantastic achievement and means that we contribute significantly to raising the general level of skills across the industry and on a global scale.

Q. So what does the future hold in store?

A. Well, in the long term when it comes to mining, I actually see a new golden age on its way. I believe that companies will embrace automation technology on a much larger scale which will make them more productive and more profitable than anyone thought possible. I also believe they will become much more sustainable in the sense that they take better care of available resources.

Q. What other trends do you see on the horizon?

A. I believe that we will see many more innovation projects being developed in joint ventures between suppliers and their customers. At Atlas Copco we have several major development projects running right now together with some of the world's largest mining companies – Rio Tinto, Boliden, Barrick and others.

I think we will see much more of this type of cooperation in the future. It makes perfect sense because our customer are the experts in the practice of rock excavation and they have an idea of what they want, and we have the know-how to make it happen. Together, I am sure we will develop some great things which will help our partner companies to gain a competitive advantage. 

REMAN ON THE RISE

Remanufacturing services now in China and Mexico



The remanufacturing of worn components and even entire products is an increasing trend among users of Atlas Copco mining and construction equipment. Following the opening of a reman center in Satpayev, Kazakhstan in 2012, a new reman center in Kunming, China, has started to serve local customers, and Mexico is underway.

Mines and contractors using Atlas Copco equipment now have the possibility to renew their equipment by remanufacturing components or entire machines – with a level of quality that makes them almost as good as new.

To meet a fast growing demand from customers, Atlas Copco is establishing so-called “Reman Centers” across the globe, the latest of which are located in China and soon in Mexico.

Collaboration in Kunming

In China, the newly opened Reman Center in Kunming is a multimillion dollar facility covering an area of 1 500 m². All divisions within Atlas Copco’s Mining and Rock Excavation organization across the globe, as well as staff from the Atlas Copco hub in Nanjing, collaborated with the Kunming team, completing the facility in just five months.

Jesus Retuerto, Service Operation Business Manager, Atlas Copco Service, says the Kunming facility is a testimony to Atlas Copco’s willingness to invest in increased customer satisfaction.

“As a global leader in the mining and construction industries, Atlas Copco has not only put its energies into designing and producing excellent equipment, it is also working towards becoming the best service provider in the industry,” he adds. “I believe Kunming can be the benchmark within Atlas Copco and even in the industry.”

The Kunming Reman Center consists of a state-of-the-art workshop with three bays designed for complete machine overhauls. There are also separate lines for component disassembly, inspection, cleaning, repair, assembly and function testing.

Atlas Copco’s high technology industrial tools and compressed air solutions are used to ensure a smooth workflow, and the

use of Atlas Copco fluids and fluid management solutions ensure that Kunming is not only efficient but also environmentally friendly.

The facility also includes a world-class parts washing and cleaning room for rock drills and hydraulic components. These modern work flow solutions aim to guarantee that an increasing number of high quality, key component rebuilds will be available “off the shelf”. The aim here is to shorten lead times and further lower customers’ operating costs.

The organization, and experience of the Atlas Copco engineers, also enables the center to provide customized modifications, overhaul plans, technical consulting, and in-time quotations.

“ I believe that Kunming will be the benchmark within Atlas Copco and in the industry.



Jesus Retuerto Service Operation Business Manager, Atlas Copco Service



Technicians at the Kunming Reman Center assembling the main frame of a Boomer 281 drill rig.

Jiahong Song, Business Line Manager, Atlas Copco Service, Greater China, adds: “Kunming is an environment friendly solution which aims to extend the life of our equipment and upgrade its performance.”

The first product, a Boomer 281 underground face drilling rig, was recently moved into the new workshop where it was given a complete overhaul.

The concept of remanufacturing is now being introduced to customers across China

and it will be extended in the near future to Central and South East Asia.

Gearing up in Zacatecas

A similar reman center is now also being developed to serve Atlas Copco customers in Mexico. The foundation stone was laid in September this year, construction is well



Here, a Boomer drill rig axle is being disassembled for inspection.

underway, and the project is expected to be completed during 2014.

Located in the state of Zacatecas, close to the many mining companies in this region, the center is designed to meet the highest expectations from customers and the increased interest in remanufacturing services in the country. At the same time, it is intended to strengthen Atlas Copco’s service “footprint” in relation to competitors.

Global economic turbulence and lower metals prices, has increased demands for alternative service solutions in the mining industry as companies seek lower cost options for changing machine components such as cylinders, rotary heads, airends and drives.

Atlas Copco is well known in Mexico for its strong focus on customer needs, and operates a remanufacturing/component exchange program based on multiple



Good teamwork: The remanufacturing staff at the Kunming Reman Center in China.



Above, inspecting a new consignment of feed cylinders and (insert, right) the mine takes delivery of a new airend for a Pit Viper 351 drill rig.



» options and a portfolio of products with a wide variety of applications.

At present, the program is run in conjunction with Atlas Copco's Reman Center in Garland, USA, which has proven to be highly successful. A good example of this is the Minera Peñasquito mining operation, owned by Goldcorp Mining, which has a fleet of seven Pit Viper 351 rotary drill rigs, plus one DM45 rig and a DML.

Miguel Padilla, Maintenance Planner, Drilling Equipment at Minera Peñasquito, says: "This program enables us to obtain

vital components for our rig fleet which keeps the mechanical and operational availability at a lower cost.

"In addition, it gives us constant access to expert advice, service, parts and quality products."

Randy Rodriguez, Warehouse Manager at the mine, sees the choice of equipment supplier as a priority. "It is important to have suppliers who understand and comply with the safety standards that we require and who can also deliver a high volume of components and parts."

“The service program goes a long way to helping us secure long term, sustainable growth.


Miguel Padilla Maintenance Planner, Drilling Equipment, Minera Peñasquito



Referring to the new remanufacturing facility now in progress, he adds: "We are convinced that Atlas Copco knows how to handle this kind of operation."

In recent months, Atlas Copco Mexico has delivered remanufactured Pit Viper cylinders, rotary head and airends to the Minera Peñasquito mine.

When such components arrive, Atlas Copco's Juan Sanchez, Parts Specialist, Rotary Drills, carries out an inspection together with the mine personnel.

Sanchez says the exchange components program goes a long way to helping the mine to secure long term, sustainable growth. 

Spain's famous Rio Tinto mine has a history that dates back to pre-Roman times. Now plans are on track to revive these dormant, Andalusian copper fields and give them a new life in the 21st century.



A NEW CHAPTER

in the story of RIO TINTO

Modern exploration helps revive iconic Spanish copper mine

The huge mining area of Huelva in the Andalusia region of southern Spain is well known for the redness of the river that runs through its center – and for being one of the oldest mines on Earth, dating back more than 3 000 years.

Located about 65 km northwest of Seville, it is also the site that gave its name to one of the world's largest and most famous mining companies, Rio Tinto.

However, at the end of the last century, mining operations here came to a halt due to low copper prices and declining demand. The site was finally closed in 2001, but that does not mean the story of Rio Tinto has come to an end. The site's present owner, EMED Mining, is currently rehabilitating the site in preparation for a restart in 2015.

It's an ambitious plan, but with an estimated 123 Mt of copper still unmined, plus the added benefit of a processing plant and other installations still in good condition,

EMED expects the mine to be up and running again in a comparatively short time.

Site preparations will continue through 2014, including a new program of exploration drilling. This is being carried out by MATSA (Minas de Aguas Teñidas), which, in turn, has engaged the mining and civil engineering contractor Ensersa, a company that is able to offer the very latest exploration technology.

Tough task at Colorado Cerro

Ensera's drilling fleet is comprised of exploration drill rigs from Atlas Copco. This includes Christensen surface rigs for different depths and capacities, as well as Diamec rigs for underground core sampling work. But it is the newest version of the Christensen rig – the CT20 – that is making the biggest contribution to the project.

On the face of it, this powerful, robust and fairly compact unit, which is capable

if reaching depths of 2 450 m (N diameter), was the perfect choice. However, the drill crew soon discovered that the geology at Rio Tinto, mostly in and around the Cerro Colorado pit, was more of a challenge than they had imagined.

Using Hobic and Excore diamond rock drilling tools, the majority of the boreholes were drilled using the HO wire-line system. The underground rock and sediment encountered beneath the surface was hard, varied and littered with layers of quartz, in strong contrast to the smooth, rolling hills of the surrounding Andalusian landscape.

The rough conditions produced an excessive amount of cuttings which threatened to block the core barrel and increase the wear on the drillstring. Furthermore, this was also causing water loss, resulting in excessive wear on the bit.

In an effort to bring the CT20 up to its



The Atlas Copco exploration rig Christensen CT20: Initially, the rig did not perform to the best of its ability at the Rio Tinto mine in southern Spain, but after changing the drilling parameters and with extra training for the crew, the results exceeded expectations.

full potential, Atlas Copco organized a one week training course for Inersa personnel, and technicians were brought in to study the on-site conditions. The main concern was that the bits were wearing away too quickly and bit changing was making downtime unacceptably high.

After three days the drilling parameters were changed on advice from the Atlas Copco technicians. The rpm, penetration rate, and water flow were all increased. In addition, the crew improved their skill at regulating the drillstring pull and WOB (weight on bit).

Prior to the changes, the drillers reported an average bit life of 50–60 m. After the changes, bit life increased dramatically – to 240 m. Furthermore, the drillers began to achieve their objective: more core in the box in less time and with increased productivity.

Isidoro Sanchez, Operations Manager for Inersa, told M&C: “The CT20 is a great

machine and a testament to the quality Atlas Copco delivers. We are very happy with it and the results it has yielded. Moreover, the training provided by the Atlas Copco service technicians was invaluable, and I came to realize just how much more this machine is capable of achieving.

“My drillers are also now more comfortable with the CT20. What’s truly impressive is the silence of the machine as it drills and the ease of operation.”

More core in the box

The CT20 enables the drillers to adjust the water flow, rpm, torque and penetration rate. As varying rock formations and hardness are encountered, the ingenious control system enables a constant penetration rate which maintains optimum drilling efficiency.

This also allows the operators to focus on other aspects of the operation, such as

documenting results or bit sharpening, without having to constantly adjust levers, spin knobs and push buttons on the control panel.

Roberto Pascual, Atlas Copco’s Business Line Manager in Spain for geotechnical drilling equipment, sums up: “There are three important lessons to be learned in this case. Firstly, that it is important to understand the capabilities of the machine and the systems that it uses to drill. Secondly, to test the capabilities of the equipment and identify how to get maximum productivity, and thirdly, the importance of openness and close collaboration.

“It is communication and collaboration which led to the development of the CT20 and that has also enabled us to help our customer to achieve higher productivity, and that translates into reduced operational costs, reduced downtime and more core in the box.”



RigScan in action: The concept brings together Atlas Copco expertise, cutting-edge technology and proprietary data from customers' equipment.

The next level in preventive maintenance

By Bill Xuan, Product Manager, RigScan & Reman Solutions

Downtime is every mining or construction company's worst nightmare. Productivity falls, deadlines are missed, costs rise, and revenues are lost. In today's tough marketplace, it is more important than ever to keep machines up and running.

Over the years, the concept of preventive maintenance has been a great help in the battle against downtime. However, service technicians still need a substantial amount of time for routine service checks, especially if they have to perform fault-finding procedures which may require dismantling and reassembling components.

All that is now a thing of the past with the integration of new technologies which enable a machine to be inspected, faults to be detected and diagnosed in an efficient

and visual way, and parts and services to be scheduled into maintenance intervals.

This is the Atlas Copco RigScan concept which takes preventive maintenance to the next level. It enables equipment owners and operators to streamline service and maintenance for an entire fleet, thereby safeguarding uptime, productivity and safety.

The RigScan concept is designed specifically for Atlas Copco mining and construction equipment. It enables our certified auditors to collect and analyze data on the spot, using a variety of intuitive,

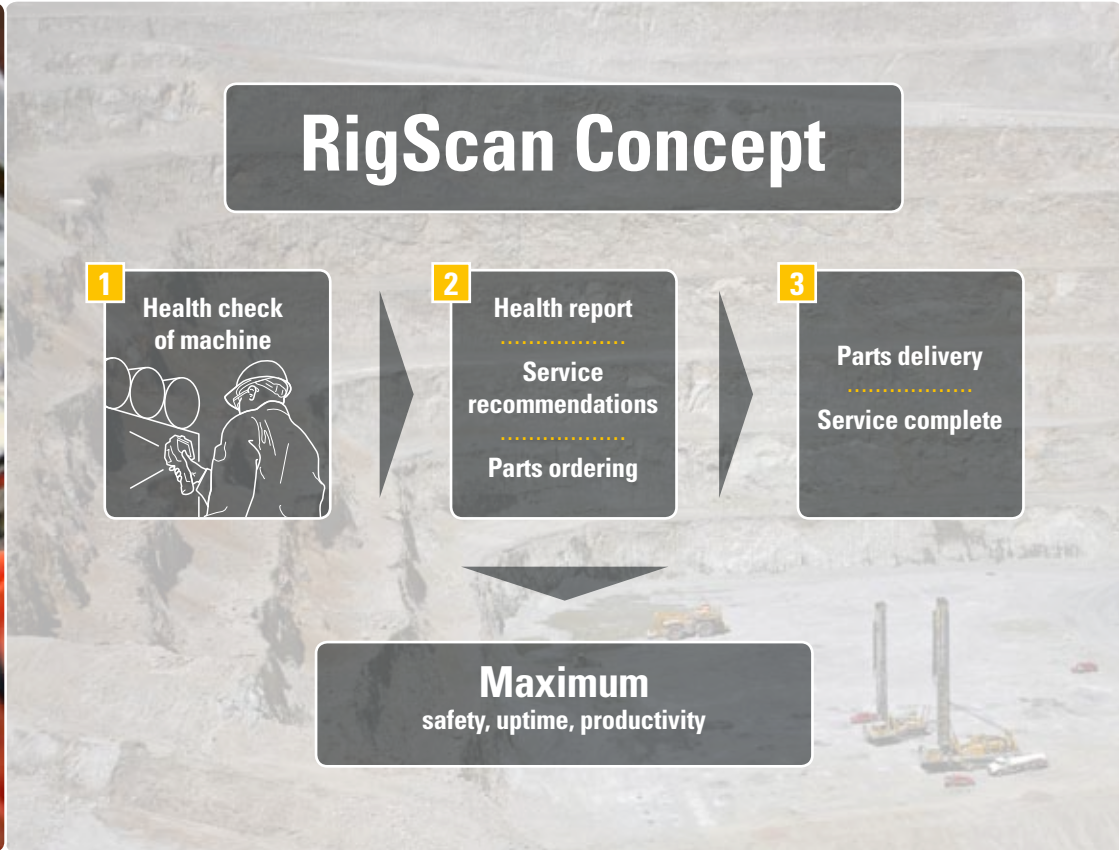
high-tech tools and devices in accordance with our standard protocols.

The Atlas Copco auditor is the expert. He or she has unique knowledge of the equipment and how it should perform, and will initiate corrective action if required. Not only that, each auditor has immediate access to global, best practices so that the customer can be advised on the setups that will give the best results in terms of operational performance and safety.

Three step process

The RigScan procedure is carried out in three steps:

STEP 1: The auditor performs a 'health check' on the equipment using a modern tablet with which to collect data, take



A three step process: By adopting the RigScan concept, equipment owners gain total control over service costs.

pictures and record video in accordance with standard protocols for each machine.

This extensive process comprises about 500 check points, covering the entire machine. In addition to monitoring pressure, oil, flow, rotation and speed, the auditor is also able to scan key components and systems with a thermal imaging camera for signs of wear, blockages or internal leakage. This eliminates dismantling work.

STEP 2: The auditor diagnoses the condition of the machine and generates a customer report, including all critical findings, good and bad, and any necessary replacement parts.

STEP 3: When all replacement parts have been delivered to the site, the recommended service measures, plus any necessary repairs, are carried out quickly and efficiently by Atlas Copco service technicians.


The big difference

In contrast to conventional audits, RigScan provides OEM standard inspections with the aid of new, high-tech, non-intrusive tools which substantially improve the accuracy and, therefore the quality of the results, of an audit. Added to this, RigScan

provides an opportunity for the customer to pinpoint specific issues and raise other matters with the Atlas Copco expert, that may lead to further improvement.

It is the level of predictability which contributes to increased safety and productivity and gives our customers total control over the cost of their service operations.

I believe that RigScan is the perfect solution for those who want to keep their Atlas Copco equipment in excellent working condition, for productivity, safety and the protection of the environment.

This concept represents the very best practice in proactive equipment support, and is a great complement to our other service solutions such as service agreements, remote monitoring, remanufacturing of components and fluids management. 



Bill Xuan is Product Manager, RigScan & Reman Solutions at Atlas Copco's Mining and Rock Excavation Service division. He is based in Texas, USA.



SOME OF THE HIGH-TECH TOOLS IN THE RIGSCAN AUDITOR'S PORTABLE TOOL KIT

- ▶ Thermal Imaging Camera
- ▶ Tablet
- ▶ 8700 PSI Digital Gauge
- ▶ Photo Tachometer
- ▶ Particle Counter
- ▶ Manometer
- ▶ Vacuum Gauge 0-30" Hg
- ▶ RCS Service kit
- ▶ EARS Tester

These instruments and more are available from Atlas Copco.



Atlas Copco's cluster drill concept, in which several DTH hammers are gathered together in one synchronized assembly, has passed its initiation in Korea with flying colors.



Cluster of suc

Large hole drilling concept makes its Korean debut at pier construction

The city of Samcheok on the east coast of Korea is renowned for its pristine natural beauty, fresh seafood, crisp coastal breezes and sparkling turquoise waters. Nowadays it can also claim to be the first location in the country to use Atlas Copco's cluster drill technology.

Engineers currently building a new fuel loading pier was faced with the challenge of drilling of 84 holes, 1 100 mm in diameter, into the sea bed for the installation of piles to support 21 platforms.

After discovering that the net penetration rate of an Atlas Copco cluster drill was five times faster than conventional drilling methods, international civil engineering company Sambo E&C, decided to become the first company in Korea to put it to the test.

The cluster drill concept, which is based on bringing a number of DTH (down-the-hole) hammers together in one assembly,

are produced by Atlas Copco H&F Drilling of Scotland. They are individually designed according to different applications and customer requirements. In this case, Sambo E&C chose a reverse circulation (RC) version equipped with six CS8 (8-inch) hammers.

All of the hammers are fitted with Atlas Copco's Quick Change Bit System and the four gauge hammers are fitted with special self-indexing bits.

Sambo E&C's drill rig model STD150 was utilized for the drilling, applying a torque of 12 m per tonne.

The air package consisted of four air compressors including one XHVS 487 set at 16 bar, with the surge line taken from the same supply.

After Sambo E&C's cluster drill had arrived, John Henderson, consultant for H&F Drilling, traveled to the site to oversee the start-up and initial testing as well as to

train the local drilling team. The drill went into full production at the end of August this year. At this point, the casing had been driven to a depth of 25 m and installed 5 m into weathered rock. After product training and construction of the in-hole assembly, the drilling commenced in the broken rock within the casing.

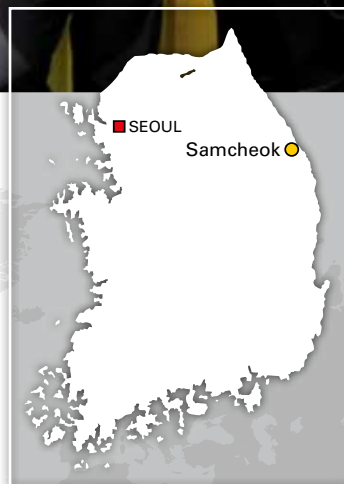
Flushing, a key factor

Although the penetration rate varied from 1.2 m–1.8 m/h during this period, it was clear that the combination of broken ground and poor hole cleaning was causing problems in-hole and that the penetration rates could be improved.

MyungHyun Ko, Sales Engineer at Atlas Copco Korea, says: "We had several hours of meetings with Sambo E&C to discuss the in-hole problems, DTH reverse circulation methods and the design of set up. It was then, when we had discussed all



Left, the Atlas Copco cluster drill is lowered into the rig. Above, the proud Korean drill crew at Sambo E&C.



cess

the other options open to us, that a joint decision was taken to change the flushing method.

“It was no small feat and the team went about the alterations on site with great enthusiasm. It was a real team effort with input from all parties, but even so, the alterations took two days to complete and rebuild the drill string.”

When the drilling got under way again, there was an immediate difference in the efficiency of the flushing and surging (cleaning of the hole). As a result, the drill’s penetration rate improved dramatically to 6 m/h. This equated to 3 m/h drill time due to the time spent surging the hole and lifting it off the bottom to self-rotate the gauge bits in order to ensure a clean hole and optimize the bit life.


Sambo E&C was able to continue drilling and finished the hole to 25 m at the same penetration rates through harder

formations with no evident bit wear. All in all, the drill lived up to its reputation, proving to be five times faster than other drills and methods previously used on the site.

Dong-Gil Kim, Project Manager of Sambo E&C, told M&C: “The penetration rate was incredible. The Atlas Copco cluster drill is innovative and it offers optimal solution for drilling in harder formations.”

John Henderson adds: “It was a fantastic learning experience for all concerned. This was on site product development, working closely with the customer and we owe a big thanks to Sambo E&C for this interaction and for being so proactive in helping to make the launch of our cluster drill successful in Korea.

“You learn a lot from working with an experienced contractor, and in this instance it certainly proved that you can only drill as fast as you clean the hole.”

It is now expected that Atlas Copco’s cluster drills will become the method of choice for large hole drilling in Korea within a wide range of infrastructure applications such as foundations for bridges, offshore wind turbines, piling, rock sockets, ventilation shafts and slurry walls. 

SAMBO E&C ON THE WORLD STAGE

Sambo E&C is an international civil engineering contractor specializing in roads, subways, high speed railways, maritime construction and foundation engineering. Launched in 1976 and headquartered in Seoul, the company has subsidiaries in Hong Kong, Taiwan, Vietnam and Singapore and has recently moved into new markets in South Asia and the Middle East. Sambo E&C has approximately 5 000 employees.



Mechanized charging is making an increasing contribution to efficiency and safety in mines around the world. One of the early adopters of this technology – Pucobre of Chile – makes sure that it gets the maximum benefit.

CHARGING AHEAD

in Chile

Pucobre continues to show the way with the latest technology

Chilean mining company Sociedad Punta del Cobre (Pucobre) was one of the first to adopt mechanized charging techniques. Today, some 40 years on, the company remains in the forefront of this technology, sourcing all of its charging equipment from Atlas Copco GIA.

The move towards mechanized charging began in 1974 when the company was expanding its Punta del Cobre copper mine in the Atacama region, one of the largest copper deposits in the world. At that time, the blastholes for this sublevel stoping operation were drilled with light, handheld, Atlas Copco rock drills, and the holes were charged with ANFO (ammonium nitrate/fuel oil explosive) using a manually operated tool.

There were two operators for each unit, one managing the suction line inside the sack and a master charger who charged the hole. In addition, the work was done manually from a wooden platform, mounted on the bucket of a loader.

Time to improve

As techniques evolved, this task was eventually carried out using specially designed charging equipment called ANOL, also supplied by Atlas Copco, and a ladder was used for charging at higher levels.

In 1988, the mine decided that it needed to improve on the efficiency of its charging operations in order to increase production, and ANFO self-propulsion loading

equipment was introduced for face development and production blasting. This equipment, ANFO PT-61, also supplied by Atlas Copco, was a big improvement. It enabled the mine to replace all manual charging with a system of electrically operated hydraulic pumps mounted on a carrier, with a diesel engine for tramping.

The charging of long production blastholes, typically positioned high at the face, was carried out with JET-ANOL from a platform consisting of wooden boards on top of drums and from a front loader. The master charger would position himself inside the bucket and fill the holes from there, improving charging at heights.

Good combination

Segundo Espinoza, who manages the charging operations at the mine, notes that all of the mechanized charging equipment at the mine is from Atlas Copco GIA, and that these units are well matched to the mine's fleet of Atlas Copco drill rigs.

For example, Atlas Copco Boomer 282 rigs, equipped with 4.5 m drill rods, are used to drill 45 mm horizontal production holes which are then charged using Atlas Copco GIA's Chargetec UV1 and Chargetec 2 charging trucks.

In addition, it is now possible to use ANOL CC with this equipment making it ideal for charging both horizontal as well as long holes. The fleet, which also includes Boomer M2 C as well as Simba 254 and


M4 C rigs, is in operation every day and completes about 7 000 m per month.

All of the previous charging equipment has been electro-hydraulic with diesel engines used only for tramping. Now, however, the mine's charging operations have taken another big step forward with its latest acquisition, the Chargetec UV2.

Optimum blasting

This new multi-directional, ANFO charging truck is the first diesel-hydraulic unit that is capable of working anywhere in the mine, including in areas without electrical installations. It also has a stronger boom and improved reliability overall, compared with its predecessors. But more importantly, it has a combined compressor and JET-Anol system that enables the operator to precisely adjust the density of the charge to ensure optimum blasting results. This, in turn, is supported by the combined ejector/compressed air blending vessel which ensures the correct flow of ANFO at an even and precise density.

The use of these charging trucks has successively enabled Pucobre's operators to do their work in a safer and more efficient way. It has also led to a reduction in the time previously required to charge holes by approximately 50%.

Similarly, with ANFO PT-61, it has been possible to reduce the number of operators from four to two, making better use of resources. 



The latest charging technology: The new Chargetec UV2 takes efficiency and reliability to new heights at the Punta del Cobre copper mine.



STAYING AHEAD OF THE GAME WITH CHARGETEC UV2

Pucobre's latest acquisition, the Chargetec UV2, enables optimized charging of a full drill pattern with fixed carrier positioning. The heavy-duty carrier has articulated frame steering and four-wheel drive, giving it high flexibility and maneuverability through the small turning radius of narrow drifts. It may be equipped with diesel or electric hydraulics and is considerably faster to move from one area to the next, which is an important consideration due to the long distances between some faces. It is equipped with either one or two ANOL CC vessels which are available in volumes of 300, 500, 750 or 1 000 liters. It is also considerably more comfortable and safer for operators, thanks to an operator platform equipped with a protective roof, extremely precise and smooth arm movement, two seats complete with safety belts as well as a camera mounted on the rear for easy and safe reversing.





The power: Some of the specially designed GA compressors on the surface.



Big in tin: Headquarters of Yunnan Tin, the world's largest tin producer.



Profitable solution: Entrance to Song Mine in Yunnan province where the Atlas Copco equipment helps to produce more than 1.3 Mt of tin per year.

MINING RECORD for YUNNAN TIN

China's Yunnan Tin Company, the world's largest tin producer, has set a new mining record with the aid of specially designed compressed air solutions to support its mechanized mining equipment.

The underground Song Mine tin operation in Yunnan province, southwest China, has a large fleet of Atlas Copco mining equipment including Boomer face drilling rigs, Boltec bolters, Scooptram loaders and Diamec core drilling rigs.

But it was the introduction of specially designed compressed air solutions, also from Atlas Copco, that led to a new mining record for the owner, Yunnan Tin.

In just one month, exactly 464.3 drill-meters were completed, representing a new record throughout the Yunnan Tin group.

The air supply is provided by 29 compressors that have been designed and adapted to the prevailing conditions in the mine. These include GA500, GA250, GA110 and GA55 oil-injected screw units, as well as an ES130 internet remote monitoring and central control system.

These units have an input voltage of 6KV and a pressure of 7 bar, in line with the air demands of the mining industry, and have different configurations depending on whether they are used on the surface

or under ground. At ground level they are mainly large-scale GA500/250 units, while under ground they are mainly small GA110 air-cooled, oil-injected screw units with short gas transmission pipelines to due to the restricted space.

Air filters protect the core components from high dust environments, and since the mine is located at a high altitude, the compressor motors are more powerful than normal in order to prevent the area's low atmospheric pressure from reducing their efficiency.

No worries

Located near Gejiu City, Song Mine covers an area of 45 km² and is currently 770 m deep. Ore production exceeds 1.3 million tonnes per year.


Guang Gu, Manager, Equipment Division at Song Mine, explains: "Ore extraction not only requires these compressors to run at full load for a long period of time, but also requires them to endure the demanding tests of the underground wet

environment as well as high temperatures and dust.

"The Atlas Copco equipment has displayed excellent performance and super- high stability since it was put into use. Besides this, Atlas Copco has provided permanent service technicians for pre-determined maintenance in order to safeguard our production schedule and free us from any worries."

Optimized control

Each GA compressor complies with ISO 9001, ISO 14001 and ISO 1217 and are engineered for reliability, even in ambient temperatures up to 55°C/131°F and in very harsh environments. In addition, thanks to an optimization system, each unit can be operated according to the total air consumption, largely reducing idling time.

Accurate pressure control also helps lower pressure on the piping network, saving up to 30% of the required energy while at the same time, a communication module transmits all operation parameters to a central monitoring terminal. 

WORLD'S LARGEST: Yunnan Tin Group is the world's largest producer of tin, accounting for approximately 20% of global production. Headquartered in Kunming, in southwestern China, and with a production capacity of 40 000 tonnes, YT also produces and markets tin-lead solder, anode tin and tin chemicals. By-product metals refined by the company include platinum group metals, copper, lead, zinc, indium and bismuth.

GENUINE PARTS AND



New arrival: As M&C went to press, this new rock bolting rig was delivered to the Sasa site. Called Boltec S, the rig represents the very latest in rock bolting technology (see p 11) and will also be maintained within the mine's overall service agreement with Atlas Copco.



At the Sasa Mine Service Center: From left, Ismet Sadulov (Sasa Fleet Manager) and Borce Gocevski (Sasa Deputy General Manager) with Gero Nikolovski (Atlas Copco Service Specialist), and Milco Cosevski (Atlas Copco Office Manager).



Genuine parts close at hand: Original Atlas Copco hoses are manufactured at the on-site hose workshop. This strategy is a key contributor to equipment availability at Sasa Mine.

SERVICES ...

... the recipe for success at Sasa



Among the winning ingredients at Sasa: Original hoses and Engine 100 oil.

A comprehensive service agreement, strong cooperation, Atlas Copco genuine oil, and on-site production of Atlas Copco hoses are proving to be the recipe for success at Macedonia's Sasa Mine.

When the Sasa lead and zinc operation near Kamenica, in north-eastern Macedonia, reopened in 2005 after a two-year closure, expectations were high. The new owners, Romtrade of Russia, pledged to make the mine more productive and profitable than at any time in its 37 year history.

As part of that plan, the management also decided to make Atlas Copco its main supplier of high performance mining equipment. New equipment was installed and an extensive service agreement was signed. Since then, the collaboration has grown increasingly stronger, and today, the fleet includes 27 Atlas Copco machines, all covered by a total maintenance and service program.

In addition, to enhance the mine's productivity and profitability, around 30 Atlas Copco technicians are at work round the clock, providing maintenance, service, coordination and follow-up of the fleet. Atlas Copco has also established a service center with workshops and offices on the site to be in close proximity to the mine.

One result of this commitment is that the mine's production of lead and zinc ore has almost doubled since the reopening, and, in 2011, production reached 850 000 tonnes, its highest level ever recorded.

Service agreements

When M&C visited the site, a service team was busily working on a Scooptram loader with 32 000 hours "on the clock", to get the vehicle back into operation as planned later that day. Vlatko Stojov, Atlas Copco on-site Service Manager, says: "Thanks to the regularly scheduled preventive maintenance and

only using genuine parts on this machine, we have been able to ensure a high level of operation year after year – and it is still going strong."

Vlatko's team provides the mine management with monthly status reports on each machine, with statistics on availability, drillmeters, and more. Based on this information, and predictions from the service team, decisions can be taken of what spare parts need to be ordered.

To make monthly predictions and plan spare parts supply has become a winning concept for Sasa. To have just one main shipment, once a month, keeps logistics costs down and also ensures that the right parts will be on hand for planned repairs and servicing of the machines.

Milco Cosevski, Atlas Copco Office Manager, says the statistics show high availability of the machines in the mine specifically because parts delivery and preventive maintenance are planned in advance.

On-site hose production

Another important contributor is the on-site Atlas Copco hose container, where all of the hoses required are produced, guaranteeing 24 hour availability.

Cosevski, who initiated the on-site hose container, explains: "We order hoses in full lengths in different dimensions from Atlas Copco in Sweden and we can produce all of the hoses the mine needs in our workshop here at the site. This has proven to be a major benefit to the mine."

The hoses are not only of the highest quality; their easy availability on the site is crucial for the consumables. Atlas Copco Service specialist, Zvonko Stamenkov, says: "It is very

important to produce the hoses in the right way to ensure high quality. As the hoses face a tough environment down in the mine, the couplings have to be fastened with great care in order to be secure. Therefore it is crucial to have well trained people producing the hoses."

Futhermore, the mine is informed twice a month of which hoses have been replaced, for which machines, and the reasons for replacement. In this way, there is no need for Sasa to keep money tied up in stocks. In the future, a small hose workshop may even be set up under ground to be even closer to the machines.


In addition to hoses, Atlas Copco is also the mine's preferred supplier of engine oil. Atlas Copco Engine 100 is a top quality oil that is approved for use on all Tier IV engines. Engine 100 contains special additives, protecting the engines from premature wear in the harsh, underground environment, reducing service costs.

Another benefit is that this oil is approved for use on almost all engines, regardless of type, make or vehicle.

A bright future

Alexander Rakov, General Manager of Sasa Mine, says he is positive to the strong cooperation between Sasa and Atlas Copco and that he is hoping to strengthen the relationship further in the years ahead.

This year, Sasa has added a number of new Atlas Copco machines to its fleet, including a new Scooptram ST7 loader as well as the new Boltec S, the latest rig for rock reinforcement.

Clearly, these services not only keep the machines up and running at Sasa, they also lower the life cycle cost of the fleet. 




A powerful team: Six Boomer XE3 C drill rigs are at work on the new road-rail tunnel projects in Norway.

Six Boomer drill rigs on major road-rail project

NORWAY The ongoing development of high speed transport links continues to make traveling easier in Norway. One of the latest additions is the E6-Dovrebanen project now being constructed for Jernbaneverket and Statens Vegvesen (Norway's rail and road administrations).


The joint venture contractors Veidekke-Hochtief are building three new tunnels – one for a road and two for rails – to run parallel along the eastern side of Lake Mjøsa, some 80 km north of Oslo. The 2.3 km Morskog Tunnel will be a two-lane, twin road tunnel while the 3.9 km Ulvin Tunnel and the 200 m Morsu Tunnel are both twin-track railway tunnels.

Most of the drilling at these sites has been carried out using a fleet of six advanced Atlas Copco Boomer XE3 C face drilling rigs which are equipped with COP 3038 rock drills and backed up by special service arrangements. These include round-the-clock COP Care service for 24 rock drills, a grinding machine for the drill bits and on-site parts stores. In addition, Atlas Copco Unigrout units are used at the tunnel faces providing high pressure pre-grouting for sealing and stabilizing the rock. 



Now on site: One of two new PV-311 rotary drill rigs gets set up for its first assignment.

MINExpo star makes its debut

USA Two Pit Viper 311 rotary blasthole drill rigs are now working in open pit mines in the southwestern United States. This follows the successful launch of this model at last year's MINExpo in Las Vegas, the world's largest trade show for mining equipment. These single pass rotary drills are the first prototypes from Atlas Copco's new PV-310 series and are being put to the test in some of North America's largest open pit mining operations. The new PV-310 series is expected to be available to customers worldwide in early 2014. 

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