

MINING & CONSTRUCTION

MECHANIZED ROCK EXCAVATION WITH ATLAS COPCO – NO 2 / 2012.



New Boomer boost for Poland

Smooth
operation at
Jinping

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Secret stars
at Las Vegas
show

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Why mining
is Turkey's
delight

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Atlas Copco

EDITORIAL



Over the past two decades or so Atlas Copco has grown substantially to become one of the biggest suppliers in the global rock excavation industry. Along the way we have also added a good many products to offer to our customers, both through our own R&D activities as well as through acquisitions.

But as a wise person once said, size isn't everything. The fact that we have our own representatives in every corner of the world is clearly an advantage to our customers, but more importantly we have always stayed focused on the people and industry segments we serve. We have been mindful not to try and be "all things to all men". Instead, thanks to a carefully defined product range and specialized know-how, we can claim with confidence to be your drilling specialist, pure and simple. Drilling is our business and after more than 130 years of experience we have become pretty good at it.

The upcoming MINExpo trade show in Las Vegas is a good example. At the Atlas Copco booth you will see that we are not offering "everything under the sun" but a selection of products that are world beaters.

You will witness the launch of our new, advanced Pit Viper rotary drill rig which has been specially developed for blasthole drilling in open pit mining. And together with our SmartROC and Boomer rigs, raiseborers and other key products, we hope you will see that Atlas Copco is the expert in drilling technology, including control systems, safety and communications.

PETER SALDITT

President

Atlas Copco Drilling Solutions, USA

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News from around the world.

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SAFETY FIRST

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Atlas Copco



RENDERING OF JINPING I DAM. SOURCE: SINOHYDRO

The Jinping I and Jinping II Hydropower Station project is scheduled for completion in 2015. Designed to supply energy to China's eastern region, it features a 305 m high arch wall dam which will be the tallest in the world.

Quan Li, Project Manager, No.18 Bureau of China Railway Tunnel Engineering Co. Ltd., stresses the importance of safety in drilling operations at the Jinping site.

the excellent performance of the equipment.

Li has been an Atlas Copco customer since 1984 when he was working in the Hong Kong area. With the best tunneling equipment on the market, he says, Atlas Copco enables him to go “full speed ahead”. And he adds: “The Boomer 353 E is made for this type of work. The rigs are simple to operate and the best size for these tunnels.”

Safety gets priority

Li concedes that finding skilled people to join the workforce is not easy here. Many come from the countryside where jobs are scarce, looking for new opportunities. It can take up to six months before they are proficient at operating the drill rigs.

The safety features of the drill rigs are another reason why Li says he likes Atlas Copco equipment. He has four men in each drilling crew and says: “No one gets hurt

here. That is important for us because we care about our people.”

Had the tunnels been drilled by the traditional jack-leg method, workers would not have had the benefit of distance from the rock face, and the extra length of the BUT 35 boom is further reassurance, Li points out.

The operator moves smoothly from control station to control station operating all three booms at once. He has no problem keeping all three COP 1838 rock drills, equipped with their 45 mm Secoroc bits, working simultaneously.

To secure the roofs, five Boltec LD rigs are used to install rock bolts every 1.2 m along the tunnel. Additional security for roofs and walls is provided by shotcrete over wire mesh. Once the excavation is complete the tunnels are lined.

With its sluice dam, spillway structures, power tunnels, a powerhouse complex and

the four headrace tunnels, the Jinping II station is an even more complex undertaking than Jinping I.

When completed, the tunnels will rank among the world's largest.

The total construction period is estimated at eight years with two tunnels due to come on stream in 2012 and the remaining two to start up in 2015. ☉

POWER FROM THE YALONG RIVER

At 305 m, Jinping I will be the world's tallest traditional hydropower dam and have a total capacity of 3 600 MW to produce between 16 and 18 TWh (billion kW/h) annually.

The Jinping II hydropower station will spin eight 550 MW turbines in an underground complex on the outlet side of the Yalong River Bend. Once it has been used for power generation, the water will then be released back into the river.



Location of the Semantan Water Transfer Tunnel which will boost supplies in Kuala Lumpur.

and the need for additional stabilization. The construction is carried out by the SNUI Joint Venture consisting of the four contractors Shimizu and Nishimatsu of Japan and UEMB and IJM of Malaysia. Atlas Copco has been involved in the project from the start and has four Boomer face drilling rigs on site as well as ground engineering equipment.

Boomer makes it easy

About 1 000 people are on the site. One of them is Sudhan Bahadur Shreepali, a Nepalese Boomer operator with eight years of drilling experience. Although familiar with Boomer rigs it is the first time he has used the computerized Boomer L2C. “The drilling here has mostly been predictable,” he says. “The east side rock is pretty good and the west side is less competent. The only real problem was drilling under the river but this rig made it easy.” The drillers work two, 12-hr shifts per day and at the time of M&C’s visit, the NATM 3 adit was being advanced at a rate of 8 m per day, taking Shreepali approximately two hours to drill a round. Three Boomer L2C rigs account for most of the drilling. These are equipped

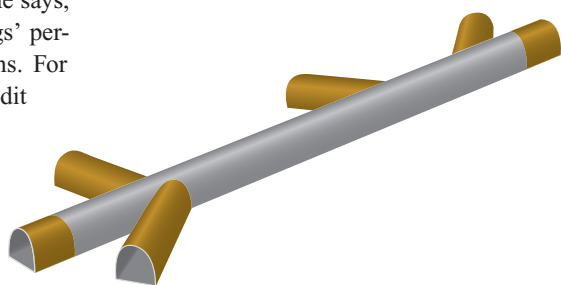
with COP 1838 ME rock drills and use Secoroc 105 mm bits for the pilot holes and 45 mm bits for the blast holes. A Boomer 352 is also on the site. SNUI Project Manager Takashi Kawata points out that after nearly two years, the NATM segments are either on schedule or as much as three months ahead of schedule. NATM 3 was delayed due to its slow progress under the river, but quickly moved back ahead of schedule once it made it beyond the river. NATM 4 was also delayed due to soft ground conditions, though for the most part, the rock has been consistent granite.

Exceeding expectations

Kawata estimates that advancement with the Boomer L2C is 10 percent better than expected. “We have been getting good results with drilling and blasting,” he says, and adds that in some months, the rigs’ performance far exceeded expectations. For example, the plan for the NATM 2 adit was 138.3 m per month but actual drilling averaged 149.4 m month. NATM 1 was the only section that had fallen behind schedule due to heavy water ingress. Once the problem area was passed,

excavation again outperformed forecasts for two consecutive months. In addition to the drill rigs, an Atlas Copco COP 1838 ME rock drill is used for drilling 76 mm probe holes in advance of the TBM while all rock tools used on site are also from Atlas Copco. With the high productivity of the equipment and the well trained drilling crews, the citizens of Kuala Lumpur may well be receiving their new water supply sooner than they expected. ☉

Water carrier: The 44 km long tunnel with its cut-and-cover culverts and four adits. The culverts and adits (brown color) are driven by Atlas Copco Boomer L2C rigs while the main tunnel is being driven by a TBM.





Simba M7 C is a long-hole drill rig capable of ring drilling with parallel holes upwards and downwards with up to 5.5 m spacing. It is equipped with a top hammer rock drill for the 51–89 mm (2–3.5 in) diameter range and offers excellent precision, low-emission, 4-wheel drive, Rig Control System (RCS) and an ergonomic cabin.



Pit Viper 235 will be displayed with several new features. The hydraulic tophead drive, multi-pass rotary drill rig can be configured to accommodate a wide variety of rotary and DTH drilling demands to depths of 73 m (240 ft). The RCS system features wireless remote tramping, auto-leveling, auto-drilling, reporting functions and GPS navigation. A patent-pending automatic clutch option saves on fuel and maintenance.



SmartROC D65 is a DTH drill rig designed for the future. Drilling in the 110–203 mm (4-1/3"– 8") range to a maximum depth of 54 m (175 ft), it has been developed for the toughest open pit environments offering full drill cycle automation and office-to-rig communication thanks to its computerized Control System (RCS).



The Pit Viper Simulator provides a complete training experience in a safe and efficient way. Mounted on a motion platform, it has all the advanced features of a real drill rig – plus the added benefit of an audience screen allowing for easy group training.





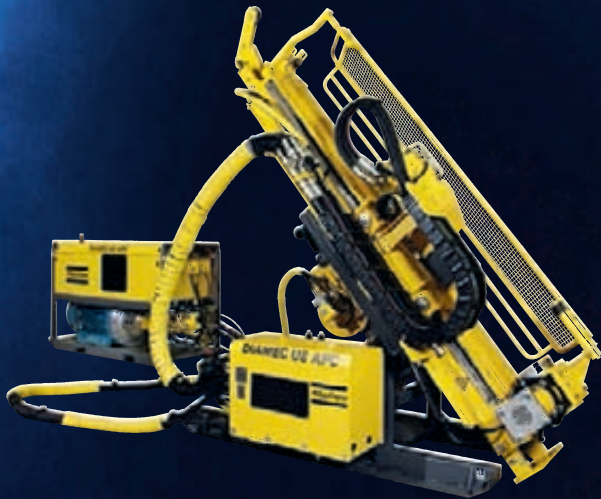
T-Wiz is a top performer in T-thread drilling systems giving up to 30% longer service life. Coupled with increased stability, the combination of T-Wiz Speedrods and shank adapters adds up to fewer rod changes and more productivity per shift.



Secoroc Omega is a series of sealed bearing, rotary tricone drill bits offering first class drilling precision, excellent penetration rate and bit life.



Excure is Atlas Copco's premium line of core drilling tools. Developed by an international team of engineers and metallurgists it ranks among the best quality drill bits on the market today.



Diamec U8 is the most technically advanced underground core drilling rig yet with a capacity of 2 000 m. The Automatic Performance Control system (APC) helps increase drilling productivity and gives you more core in the box. Available with electric or diesel power units.



Get ready for surprises!

The countdown has begun for two top-secret products to be unveiled at the MINExpo show. When the curtain goes up at the Atlas Copco booth, the company's tradition of releasing a new Pit Viper at the show will continue. This automation-ready, blasthole drill rig is equipped with the Atlas Copco Rig Control System (RCS) and several new features designed to enhance safety and ease of maintenance, with RCS displays to showcase the latest in machine control, reporting and automation. At the same time, a new underground product will share the spotlight and mark a new milestone in the industry. But that's all we can reveal for now. Don't miss this great double-act that awaits visitors to the Atlas Copco booth!

See more at: www.atlascopco.com/minexpo

TOUGH TASKS IN

Atlas Copco equipment helps Turkish miners make the most of their mineral rich resources

With 53 different minerals at its disposal, Turkey is one of the most mineral rich countries earth. But Turkish miners also face one of the world's most challenging mining environments. M&C reviews their progress.

Over the past 10 years, Turkey's mineral production has increased by some 300 percent and the country's mining industry continues to grow. In 2011, mining exports reached USD 2 billion with chromite, copper, natural borate and zinc taking the lion's share.

To keep up the momentum and meet their ever increasing productivity targets, mining contractors are increasingly relying on Atlas Copco equipment.

Copper from the Black Sea

The copper mines at Murgul, in the northeast, are a typical example. Privatized in 2006, these are now operated by Eti Bakir, a subsidiary of Cengiz Holding. In addition to its open pit, Eti Bakir also has an underground operation about 5 km away, with both mines now using Atlas Copco equipment.

In the open pit, a fleet of seven Atlas Copco drill rigs are used for production drilling and two for secondary blasting and other ancillary work.

In the Aralik underground mine, Eti Bakir operates a Boomer 282 two-boom development rig, a Simba 1254 production rig, two Scooptram ST1030 loaders and two MT2010 mine trucks. Added to this is a specially adapted Scooptram ST-3.5 with a dozer blade designed for placing backfill in worked out stopes.

First to arrive was a ROC L8 (renamed FlexiROC D60) in 2007. "Since then," says Bahadır Egener, Atlas Copco's Business Line Manager in Turkey, "Eti Bakir has added another four FlexiROC D60 rigs giving them sufficient drilling capacity

as well as the luxury of always having a machine in reserve so that they can keep their maintenance on schedule.

"The ore here is very abrasive, while the climate is a real challenge for all of our equipment," says Hasan Kesimal, Mechanical Manager. "Summers are hot and dry, with temperatures of up to 35° or 38°C, and the dust is a problem for the machines. Winter is something else. It's cold and wet, down to minus 15°C, and the mud is abrasive and really hard on the rigs' undercarriage."



An Atlas Copco DM 45 at the Kisladag mine.

TURKEY



To maintain its production schedule, the open pit has to move 10 000 t of ore per day plus another 30–35 000 t of waste. The target for 2012 is about 10 Mt of waste and 3 Mt of ore, with an output of 100 000 t of copper concentrates. The waste in the Murgul open pit is typically tufa, relatively soft volcanic rock, while the ore is in hard, high-silica dacite.

Mustafa Mert has been operating a FlexiROC D60 for the past six years. He says: “In ore, a 12 meter hole takes around 20 minutes to drill and in waste about ten minutes or more if there’s a mixture of rock types in the hole.”

The FlexiROC D60 drills a 165 mm hole, using a COP 64 Gold DTH hammer with a

convex spherical bit and 114 mm rods. The benches are 10 m high and are drilled with 2 m of sub-drilling. Typical productivity is 15 holes per 10-hour shift, although some of the drillers can complete up to 25 holes if the conditions are good.

Eti Bakir has found that a 4×4 m spacing is suitable for ore and 5×5 m for waste, although natural fracturing in the dacite means that oversize boulders are common and require secondary breaking.

The mine uses a ROC D7 rig (renamed FlexiROC T35) equipped with a COP 1840 HE (High Energy) topammer rock drill to drill 89 mm holes for secondary blasting of the large boulders, while the smaller boulders are taken care of by

two Atlas Copco HB2000 breakers.

According to Mine Manager Ferhat Ekren, ore production is 140 000 t/y, with the ore from the open pit and underground mine treated in separate concentrator plants. The high and low grade ores from the underground mine are also stored separately on the surface before treatment.

The Boomer 282 is used for mine development which involves the excavation of 5×5 m drifts. Using 3.5 m rods and 45 mm ballistic insert bits, operators achieve a 3 m advance per round using a burn cut pattern with around 60 holes per face. Atlas Copco Swellex bolts as well as split set bolts provide immediate roof support, with fibre-reinforced shotcrete sprayed throughout. >>



Hasan Kesimal, Mechanical Manager for Eti Bakir at Murgul: “The abrasive ore and the harsh climate here is a real challenge.”



In full swing: Atlas Copco equipment is used in all phases of the operation in the Murgul pit, from drilling to haulage. Here, the benches are 10 m high and drilled with 2 m of sub-drilling with a pattern of 4 x 4 m in ore and 5 x 5 in waste.



Good teamwork: The Pit Viper PV-235 above was delivered in mid-2011 and working together with two DM45 rigs, it helped to complete 650 000 drillmeters in 11 months.



Serkan Yüksel, Mine Manager at Tüprağ, confirms that the mine aims to double production.

» Stope drilling with the Simba uses holes 15 m long and 89 mm in diameter, mainly vertically but also inclined at the orebody edges to follow the ore/waste boundary.

The Scooptram LHDs load the mine trucks for hauling ore to the surface and the stopes are then backfilled using cement-bonded waste rock. The LHDs are also involved in placing the fill, as is the dozer-equipped Scoopram ST-3.5 which can pack the material tighter into place.

Kisladag to double its gold

On the other side of the country, high on the Anatolian plateau, Canadian company Eldorado Gold Corp has successfully commissioned its Kisladag gold mine.

Operated through Eldorado's subsidiary, Tüprağ Metal Madencilik Sanayi ve Ticaret, the mine opened in 2006 and is now Turkey's No.1 gold producer with an annual production of about 285 000 troy ounces.

In contrast to the volcanogenic massive sulphides of the Black Sea region, the ore at Kisladag is in porphyry-type mineralization. It grades up to 1 g/t gold

with softer, oxidized material at a depth of 30–80 m.

Serkan Yüksel, Mine Manager at Tüprağ, explains that the company plans to more than double its ore production by 2014. Since Tüprağ took over mining from a contractor in 2008, the operation has relied on two Atlas Copco DM45 blasthole drill rigs for production drilling. Then in mid-2011, it took delivery of a new Pit Viper PV-235. Together, the three rigs completed 650 000 drillmeters in 11 months.

"That's over 58 800 individual holes," notes Yüksel, "and during the first four months, the Pit Viper contributed around 70 000 m to that total. We are using it in the harder rock in the pit so we're not really in a position yet to make direct comparisons with the DM45 rigs."

The Pit Viper is powerful and can drill a 12 m hole in one pass," says operator Yasar Senturk. "You can also move the rig from setup to setup without lowering the mast which is a big advantage. That means you can drill an extra five holes each shift."


Both ore and waste are drilled on a

diamond pattern, with a 4.5–5.25 m burden and slightly larger spacing. 152 mm holes with a COP 54 Gold hammer or 165 mm blastholes with the COP 64 Gold hammer cover the depth of a 10 m bench, with typically 800 mm of sub-drilling.

However, the blasthole rigs are not the only Atlas Copco rigs that have helped make Kisladag successful. The mine also runs a ROC L6 (renamed FlexiROC D50), equipped with a QLX 35 hammer primarily for presplit holes for wall control. The rig drills 20 m double bench holes with a diameter of 95 mm and 1 m of sub-drilling. The layout involves a spacing of 1 m per hole around the entire pit periphery, requiring very accurate rig set up to achieve parallel drilling.

"Another challenge is that the pit slope varies from 65 to 77 degrees, depending on the geotechnical sector from area to area," Yüksel explains, "and we have experimented in the past with both single and double plane inclined holes."

Keeping a watchful eye

Both mining contractors Eti Bakir and Tüprağ have chosen to maintain their equipment themselves. Nonetheless, the Atlas Copco local service teams keep a watchful eye on both operations. Atlas Copco service technicians visit Murgul regularly every week, alternating between the surface and underground mines and making sure that the equipment is running well. 

“ The Pit Viper is powerful. I can drill an extra five holes each shift. **”**

Yasar Senturk Pit Viper 235 operator, Kisladag Mine

ON THE CUT

Atlas Copco's diamond wire saw is causing a buzz as it migrates from dimension stone quarries to urban development applications. The latest generation SpeedCut is proving to be the world's fastest, most versatile rock cutter.



When the diamond wire saw was first introduced in the 1980s, it rapidly gained popularity in the dimension stone industry (DSI) and in surface quarries. Production levels increased and the technology continued to be improved. Now SpeedCut is migrating into new areas.

With the acquisition of Perfora of Italy

in January 2012, Atlas Copco provides a wide range of rock cutting equipment. The jewel in the crown is SpeedCut – the world's fastest rock cutter which saws at a speed of 120 km/h under average conditions.

As more and more infrastructure projects get underway in urban areas that are sensitive to vibration and noise, the ability to carefully cut and remove large slabs of rock is

becoming a popular alternative to drilling and blasting. A case in point is the City Line project in Stockholm, Sweden, which is built on 14 islands and steeped in history.

Here, underground operations are taking on a new dimension as the city is undergoing a major upgrade of its commuter transport system. Scheduled to open in 2017, City Line will double the passenger

TING EDGE



Keeping the peace in Stockholm: The SpeedCut saws out the rock to make way for a new subway tunnel without creating disturbing vibrations.

capacity and improve the overall flow of Stockholm's public transport system.

The project involves the construction of a 6 km tunnel, some sections under water, with a number of adjoining stations. Moreover, it will run through the heart of the city just meters away from existing subway lines and directly below historical buildings, many of which are listed as heritage sites.

On the island of Riddarholmen, 3–6 m below ground, large sections of rock had to be removed to make way for the new tunnel. As a rule, drilling and blasting is the method of choice in the hard Swedish granite, but the risk of endangering the foundations of nearby structures was too great.

The answer came in the form of SpeedCut and the latest generation diamond wire saw

operated by Norrbottens Bergteknik AB, a drill and blast company that also specializes in cutting rock.

Minimal vibrations

“Wherever vibrations are a problem, this diamond wire machine is the perfect solution,” says Leif Arvidsson, Project Manager for Norrbottens Bergteknik. “We were very »



Keeping vibrations at bay: Protecting the nearby residential homes and, right, St Matthew's Church both just about one meter from the edge of the worksite.



happy with the way the machine performed, we didn't break any wires and downtime was minimal."

Slicing through the rock at a rate of 7–8 square meters per hour, the SpeedCut completed the delicate task within two weeks and without damaging buildings or installations.

"Perfora has a great range and with Atlas Copco we know that we can rely on getting complete support wherever we are working," he says.

At another site, north of the city center and in a densely populated area, SpeedCut was used for horizontal cutting of so-called "blind cuts" by sawing through a series of tightly positioned drill holes, only a few meters away from the 113 year-old church of St Matthew.

Here too, Norrbottens Bergteknik was engaged to apply its expertise to help build the foundations for a new station that will connect to City Line through a 60 m long tunnel at an incline of 30 degrees. With vibration restrictions set at 22 mm for the church compared with 70 mm for other nearby buildings, wire cutting proved to be the ideal solution.

Andreas Christoffersson, Managing Director of Norrbottens Bergteknik, points out that the flexibility which the technique brings makes it an invaluable resource for

contractors. "It's a smooth job that can be performed even during the night time as the noise stays well within decibel limits," he says.

Buzz better than blast

Christoffersson adds: "The wire makes a buzzing sound during the first incision but as it works its way through the rock, you barely notice any noise or vibration. Furthermore, the machine is powered by electricity so there are no diesel engines running."

Under normal conditions, a wire lasts for approximately one week, or 200–300 m before it has to be replaced. The most commonly used wire is 11.2 mm in diameter and equipped with 35 diamonds per meter.

HOW SPEEDCUT WORKS

With a cutting speed of up to 45 m²/h, SpeedCut is the fastest diamond wire cutting machine on the market. Its unique, patented wire tensioning system makes it possible to combine high cutting speed with low wire consumption.

This enables constant tension to be placed on the wire irrespective of a surge in water flow, a drop in electricity supply, non-homogeneous material and other variable conditions. The Panel Machine Interface and connection cable are easy to handle and allow the machine to be controlled from a safe distance.

SpeedCut can cut both vertically and horizontally and close to ground level. Furthermore, its main flywheel can be rotated 320°. As a result, it can make parallel cuts with a maximum distance of two meters without repositioning.

Optimal performance is ensured with full documentation and control of the cutting parameters and cutting processes. Working parameters such as cutting time, wire performance and error code lists can be easily downloaded to a computer via a USB memory stick. The SpeedCut will be rebranded with Atlas Copco colors (yellow and grey) from September 1, 2012.

Scan the code to the right to see SpeedCut in action.



“Wherever vibrations are a problem, this machine is the perfect solution.”



Leif Arvidsson, Project Manager, Norrbottens Bergteknik

The Fuel Cost Killer of Queensland

New technology behind substantial improvement in drilling economy

Mining contractor DDQ of Queensland, Australia has slashed fuel costs dramatically since adding a new Atlas Copco Pit Viper 235 rotary drill rig to its fleet. The secret is in the clutch.

“With the Pit Viper 235 you don’t get air unless you ask for it. You just press the button.”

Nigel De Veth Owner and founder of Deveth Drilling Queensland





Nigel De Veth, owner of DDQ, is delighted with the fuel savings and other advantages of the Pit Viper 235.

About 75 000 dollars in three months. 1 000 liters every 24 hours. Half a million dollars per year ... these are the kind of fuel savings now being experienced by Australian mining contractor Deveth Drilling Queensland (DDQ) after adding a new drill rig to its fleet.

DDQ is benefiting from the first class economy of Atlas Copco's Pit Viper 235 rotary rig – and is passing these savings on to its client, the New Hope Corporation and its New Acland coal mine.

Nigel De Veth, owner and founder of DDQ, says: "In the first three months alone we've saved the mine 75 000 (AUD) in fuel, and that was through a trial period, really just phasing the machine into the work. The potential savings are over 1 000 liters every 24 hours so you're looking in the vicinity of half a million dollars a year."

The low fuel consumption was a decisive factor behind the company's decision to purchase the PV-235. De Veth adds: "We're now getting about 50 to 55 liters an hour with this rig and the main contributor to that is the wet clutch technology on the compressor."

Push-button economy

The hydraulically operated automatic clutch (patent pending) is an outstanding feature of

this hydraulic tophead drive rig which can be configured to perform a range of rotary and DTH drilling operations.

"With the PV-235 you don't get air unless you ask for air, so if you want air for drilling, you press the button and the clutch engages and the compressor throws in. So the compressor is only ever used when you want it," explains De Veth.

He continues: "Atlas Copco has replaced all the rod greasers and air greasers, etc, with electric pumps so they are not reliant on air. There's nothing on the machine that relies on air other than your drill bit."

DDQ has been operating at the New Acland coal mine for about four years and introduced the PV-235 there in February 2012, drilling mainly 229 mm blastholes to a depth of 50 m.

"The best that we've drilled so far is close to 1 200 meters in 10 hours and I think there's much better to come yet," says De Veth. "The guys have only just finished getting used to it and things are starting to happen. We're probably looking at 10 meters an hour more with this machine."


Key to the efficient operation of the compressor and other functions of the high-tech rig is the Atlas Copco Rig Control System (RCS). This system also facilitates wireless remote tramping, auto-levelling,

auto-drilling, remote reporting functions and GPS navigation.

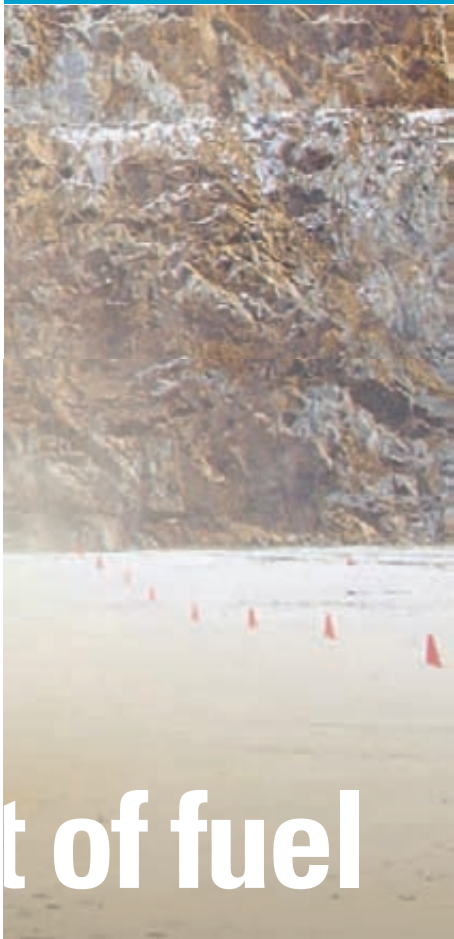
Other factors underpinning De Veth's confidence in the Pit Viper includes the single-pass drilling capability. "Just the advantage of being able to drill a 12.2 m clean, single hole with the lead rod has been very advantageous to us with some of the interburden shots," he says. "The new breakout system on the machine is unbelievable – it is better than anything we've seen before. The drill is just a lot quicker and smoother to operate."

But there's also another important benefit, De Veth says. "The operators don't get tired. Everything is easy and accessible from the seat so you come out of the drill still fresh and alert. And that's a big thing on the night shift."

Besides the PV-235, the drill fleet consists of two DM25 rigs and one DML HP. Two bigger PV-275 units are on order for delivery in 2013.

Atlas Copco has supplied more than a dozen Pit Viper rigs to customers in Queensland, all equipped with the computerised RCS control system. 

READ HOW THE CLUTCH SAVES FUEL IN "TECHNICALLY SPEAKING" ON PAGE 22.



t of fuel

Fig 1

CLUTCH SYSTEM



The patent pending automatic clutch system supplied as an option for selected rotary blasthole drill rigs. Right: A rig equipped with this system only uses compressed air for drilling and hole cleaning (yellow arrows).

WORKING CYCLE

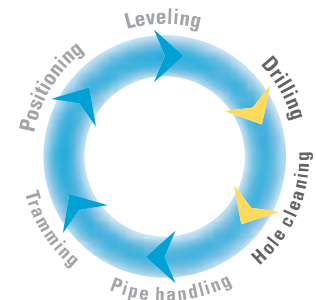
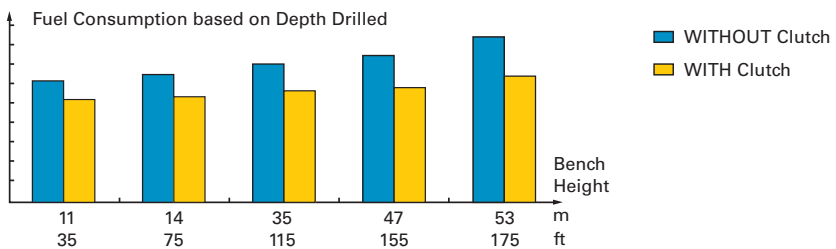


Fig 2



An indication of fuel savings when drilling at different depths in soft formations. Savings with the clutch increase with the depth of the hole and number of pipe changes and will also be greater when drilling in soft rock where the rate of penetration is high. Actual savings must be estimated for each drill rig and application.

working in the exact same rock formation, it is easy to visualize the immediate fuel savings from one single drilled hole.

Extending out the fuel savings of one hole over a mine's yearly production can greatly assist in reducing the bottom line.

As we can see from the chart (Fig 2), the fuel savings tend to increase during multi-pass drilling since the machine spends more time performing non-drilling functions when compared to a single-pass machine. Furthermore, the fuel savings are also higher in soft rock formations when compared to a hard rock formation.

The reason for this lies in the fact that in order to drill hard rock, the machine typically spends more time drilling the rock compared to handling the drill pipe, ultimately consuming more horsepower and fuel than a machine used purely for rotary drilling.

Great potential for savings

Regardless of whether a mine is multi-pass drilling or single-pass drilling in a soft or hard rock formation, the reality is that there is potential for sizeable cost savings. In fact, with some preliminary studies of this option we have seen fuel savings of up to 30%.

Here are some of the added benefits of the clutch option. Combined with Atlas Copco's large capacity fuel and water tanks,

the clutch system can greatly increase production time while reducing the amount of time that fuel and water trucks spend making trips down to the machine at the bottom of the pit. For example, a mine can maximize the fuel capacity on a PV-275 up to 2365 liters (625 gallons), and still have a 3100 liter (822 gallon) water tank. The combination of the large fuel and water tanks would allow the machine to run for over 24 hours of operation without the fuel truck needing to make a visit, as well as provide the machine with over 24 hours of water.

As an ISO 14001 certified company, Atlas Copco continually strives to ensure that the highest environmental standards are adhered to during the design, assembly, and utilization of our machines. This additional and welcomed option is just one item in a large portfolio of options that we offer on our machines, all catered toward

designing and manufacturing environmentally conscious equipment.

The clutch system not only contributes to reducing a mine's operating budget, but more importantly we are able to support the mine through a wide range of safety and environmental options. Our ability to do this ultimately helps our customers to pursue their goal of responsible mining which benefits not only the environment but their personnel as well.



Maureen Bohac is Product Marketing Engineer at Atlas Copco Drilling Solutions, USA. She provides information on large blasthole drill rigs and liaises with Atlas Copco customer centers worldwide.

THREE BENEFITS OF THE CLUTCH OPTION

- ▶ The clutch omits the parasitic load of the compressor on the engine during start-up, specifically in cold weather environments. This ultimately increases engine and compressor life over the life of the machine.
- ▶ On previous configurations, the compressor did not have a dedicated hour meter and therefore the service interval and rebuild time was dependant on when the engine had to be serviced or rebuilt. With the clutch, the compressor has its own hour meter and its own service interval based only on hours of actual use.
- ▶ The advantage of getting the job done with less fuel is an added benefit in itself, not just for the mine but for the environment as well.

“ To meet the special demands on this job, this drilling method was a good choice.

Geir Veslegard General Manager of Hallingdal Bergboring

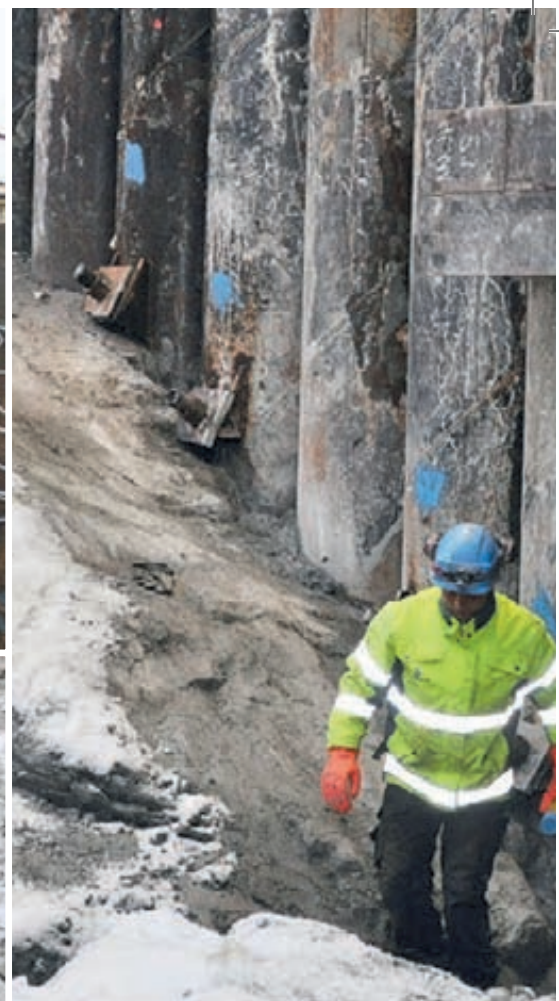


Winning the Day in Norwegian Clay

Special solution meets tough challenge in Trondheim tunnel

Geotechnical engineers have successfully completed a new road tunnel in the Norwegian city of Trondheim after overcoming challenges of difficult ground and the preservation of the city's cultural heritage.





Clockwise from left: Welding the casing shoe with its oversize ring bit prior to drilling; aligning the interlocking casing wall; the retracted inner drillstring after pipe installation.

Pleased with the result: A Norwegian engineer inspects the clay in front of the pipe wall.

Construction work on the eastbound E6 motorway between Trondheim and Stjørdal in Norway is on track to meet the 2014 completion deadline. However, the project has had its challenges, not least in the construction of a 2.6 km road tunnel on the approach to central Trondheim.

Under normal circumstances, this would have been a routine job. But the engineers soon found that this site was far from ordinary. Firstly, the planned tunnel path ran into 300 m of loose, watery clay, including 100 m of extremely sensitive “quick clay,” and secondly, the route was close to a number of historical wooden buildings, precariously perched on wooden piles.

As a result, when it came to installing retaining walls on either side of the tunnel’s eastern portal, conventional piling with a

Hydraulic Impact Hammer could not be employed as this would have created vibrations in the clay, possibly leading to disturbance and potential damage to the historical buildings.

Taking no risks

To protect the city’s cultural heritage, the Trondheim authorities arranged for five of the most endangered buildings to be removed from the area. These were simply lifted off their wooden foundations by a giant crane and carried away intact to a safe location.

While this precautionary work was under way, NCC, the project’s geotechnical engineers, concentrated on finding a way to stabilize the ground for the installation of retaining walls, to be drilled into the

bedrock with cement injection of the rock socket.

With the site consisting of layers of clay between 9 m and 23 m thick, as well as a groundwater level only about 1.5 m below the surface, all activities that could disturb the clay or lower the groundwater were strictly prohibited.

The Norwegian roads administration, in cooperation with the contractors, decided to test a new method of using drilled casings equipped with an interlocking system along the length of the pipes. Three casings were drilled into rock directly and three were drilled through the quick clay layer and then into the rock.

Extensive measuring was conducted including piezometer, total pressure and inclinometer tests as well as geotechnical testing of samples taken from the soil surrounding the casings. It soon became clear that this was a favorable solution and that Atlas Copco’s large diameter casing system was the only one capable of meeting all of the requirements.

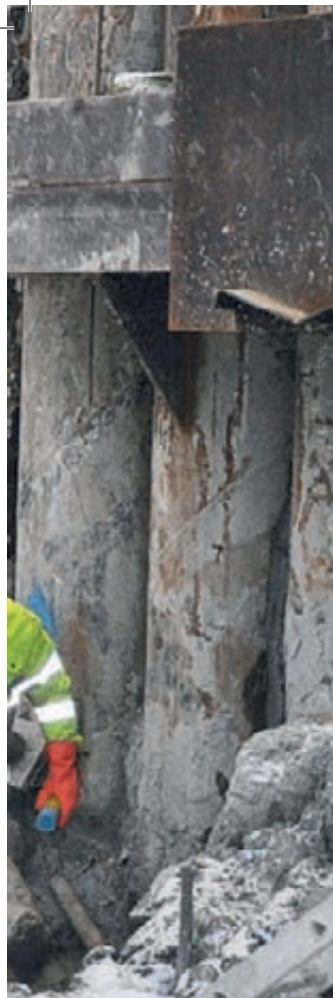
Developed for the task

The system, called Elemex, has been developed by Atlas Copco specifically for installations in difficult ground. It consists of a ring bit attached to a casing tube and a pilot bit attached to an inner drill string.

“This has not been done before on such a large scale and it worked out very well.”



Trond Imset Project Manager, Kynningsrud Fundamentering



Too close for comfort: One of the buildings that were removed completely intact and later put back in exactly the same location.

Good choice: The Elemex pilot bit that was attached to the inner drill string inside each casing.



The casing was advanced with the Elemex pilot bit driving the ring bit and with gentle air flushing across the bit face. Each pipe was gradually “pulled” down through the clay until it reached bedrock. Then the pilot bit was used to drill into the bedrock in the normal way. Once the pipe was securely installed in the bedrock, the inner drill string was removed leaving the pipe ready for cement injection.

Watertight and load bearing

To drill the casings in place, two modified sheet-piling units were used as DTH (down-the-hole) drill rigs, each equipped with Atlas Copco QL200 hammers, 610 mm casing and 674 mm oversized ring bits. The oversized ring bit allowed the locking elements of each pipe to slide into each other easily and also drilled holes that were large enough for each new casing that followed.

With this setup, a total of 349 interlocking pipes were installed to depths ranging from 11–33 m and 1.2–4.6 m in solid rock. The result is retaining walls that are both watertight and load bearing, horizontally as well as vertically.

The installation work was carried out by Hallingdal Bergboring as a sub-contractor to Kynningsrud Fundamentering which, in turn, was contracted by NCC.

Geir Veslegard, Project Manager for Hallingdal Bergboring recalls: “To meet the special demands on this job the Elemex system was a good choice. It was a continuous solution whereby we were able to get through the clay and into the bedrock in one operation. Once we got it right, it became routine.”

He adds that the solution fully met NCC’s demands. “In these conditions, I don’t think it would have been possible to install the walls in any other way. They are rigid, watertight and secure and the job was completed on time.”


Comments Trond Imset, Manager of Kynningsrud Fundamentering: “We prepared this solution in partnership with Atlas Copco and Ruuki [the pipe system manufacturer] as an alternative to sheet piling. It has not been done anywhere in the world on such a large scale. The start was slow but when we became more familiar with the method we were installing 14 tubes per day with an average length of 20 meters and boring 1.5 to 4 meters in rock. Overall it went according to plan thanks to good planning and cooperation.”

Vibro-rotation

Gunnar Schmidt, Business Line Manager for Atlas Copco in Norway, explains that

the normal procedure when using Elemex is to lock the pilot bit into the ring bit, then rotate and flush to penetrate the soil and bedrock. This normally works perfectly, but in Trondheim a slightly different procedure had to be adopted.

“No percussion was allowed and the friction in the interlocks proved difficult to overcome with rotation and flushing alone,” he said. “Instead we used resonance-free, vibro-rotation, which means that there was just enough force applied to the pipe to get it through the clay without causing vibrations. This was then followed by drilling and flushing with the pilot bit once we got to the bedrock.”

The cut-and-cover Trondheim tunnel was completed at the end of 2011 after which the five historical buildings that had previously been removed were replaced on their original sites. The tunnel was subsequently opened to traffic at the beginning of 2012 – right on schedule. 

FOOTNOTE: Construction of the E6 highway is a 450 million euro project involving the building of 9.5 km of road between Trondheim and Stjørdal. The project was started in 2009 and is scheduled for completion in 2014. Geotechnical expertise is provided by NCC and SWECO.

Insight On AFRICA

As the global economy continues to struggle, Asia is not the only region worthy of a gold star for growth. Africa has also been surging ahead at an impressive rate. M&C talks to the region's mining specialist Andy Ndulubila to get the inside story.

Q: *Africa has been showing positive growth at a time when other parts of the world are struggling. What's the secret?*

A: There are several factors involved. Firstly, the financial crisis did not affect Africa in the same way as other parts of the world. African countries did not have such massive debts to deal with. Secondly, the world demand for commodities was strong, metal prices were up and this region had plenty of mineral resources to offer. This combination, coupled with a young and enthusiastic population inevitably led to rapid growth right across the region.

Q: *Africa is now described as one of the world's fastest growing economies. How fast is it growing?*

A: In the past ten years, growth in Africa has surpassed that of East Asia. Data suggests that parts of the continent are now experiencing fast growth comparable to or greater than that of the Asian Tiger or Latin Puma markets, giving Africa the nickname of the Lion Markets. The fastest growing

nations experienced growth significantly above the global average rates and many international agencies are increasingly investing in emerging African economies where the rate of return is currently the highest in the developed world. Growth was 3.4% in 2011, down from 5.0% in 2010. But with the recovery of the North African economies and sustained improvement in other regions, growth across the continent is expected to accelerate to 4.5% in 2012 and 4.8% in 2013.

Q: *Which countries are growing the fastest?*

A: All countries that have major mineral resources – Mauritania, Angola, Mozambique, Burkina Faso, Ethiopia, to mention just a few. They are all working hard to meet the demand. Exploration projects have increased and we expect these to result in several new mining operations. And thanks to increased technological and application knowhow, which enables us to provide value added solutions, many workings that were regarded as marginal can now become profitable ventures. At the same time, existing mining operations are scaling up and both production and productivity are being increased. So the mining industry is clearly the driving force for growth.

Q: *What are the biggest challenges facing the mining industry in Africa today?*

A: We see three main challenges; retaining skilled personnel, safety and choice of equipment. The skilled operators in underground mines are often attracted by other mines around the world and this leaves a constant void. Everyone is aware of this so training is a top priority. One of the ways that this is being tackled is to focus

on the family. If several people from the same family are recruited to the industry it is often easier to retain them. Safety is also a big concern and this is emphasized in most companies which is why there is a constant need for the correct application and optimization of equipment.

Q: *What is Atlas Copco doing to support these companies?*

A: We stress the importance of training and safety in relation to all our products in every country of the region. Some companies now use our training simulators and this will increase. Simulators speed up the training of new operators and allow them to make errors without injuring themselves or anyone else before they are permitted to take control of a real machine. We are also very focused on helping customers to achieve long term sustainability by providing cutting edge solutions and efficiency through optimization.

Q: *Which products do you think will make the most significant contribution?*

A: If they are used optimally, all Atlas Copco mining equipment will make a big contribution. But the strongest contributors will be those units which offer a combination of good ergonomics and control systems, are easy to use, accurate and safe and give high performance. These capabilities will increase productivity resulting in a lower cost per tonne.

Q: *How important is customer financing?*

A: It's a key element of our service and in recent years more and more companies have been taking advantage of it. If a mine or mining contractor finds it difficult to raise funds for an equipment purchase, for



Added value solutions: Andy Ndulubila with Riccardo Torres, Underground Mobile Equipment Manager at Kamoto Mine, DRC.




Andy Ndulubila has worked in Africa for the past 30 years

example, or if local terms are too demanding, we can usually offer a solution with Atlas Copco Finance. As a leading supplier with a long history in Africa, we know the mining business well and the challenges that the mines face. And we look at the whole operation with a view to establishing a long-term relationship. Today we are assisting a long list of companies including AAC, Reliant Drilling, Rig Resources, Blue Rock, Drill Africa, and others. And this involves exploration

and mine development as well as production equipment. We recently assisted mines in Sierra Leone and Ghana to secure the financing they need for mine development.

Q: What's your personal aim?

A: My mission is to help our customers to achieve and exceed their targets, to secure their sustainability and ensure that the industry regards Atlas Copco as the first choice solution provider. 

AFRICA'S RICHES IN THE GROUND

Africa's 30 million km² of land contains more than 60 different metal and mineral products and around 30 percent of the world's mineral reserves including 40% of the gold and 60% of the cobalt.

Gold is the predominant mineral and major deposits of gold, copper, diamonds and other minerals are mostly found in the copper belt of southern Africa.

Mining is therefore the largest sector involving some 665 mining companies. The industry is dominated by South Africa, Ghana, Zimbabwe, Tanzania, Zambia and Congo.


According to some reports, the region is said to contain six of the world's ten fastest growing economies.



EXPANDING the horizon

The Boomer M1 L is helping companies around the world to stay ahead of their targets. Launched in 2011 and based on the Boomer S1 L model, this robust hydraulic face drilling rig was designed together with Polish mining group KGHM to set operations on a new path. The development was such a success that KGHM and Atlas Copco are looking at other ways of collaborating to improve mining technologies.





Better by design: The new Boomer M1 L offers robustness, more power and maneuverability, with improved access to service parts.

GOING DEEPER AT RUDNA

It's modern times at Poland's copper belt mines. To match the challenge and improve working conditions, Atlas Copco and mining group KGHM have rolled out the new co-designed Boomer M1 L with impressive results.

» In the southwest region of Poland known as Lower Silesia, the Rudna mine stands as one of the most significant copper deposits in Europe. It is also a resource base for one of the country's largest exporters, the mining group KGHM Polska Mied.

Established in 1961 as a state enterprise under the name Kombinat-Górnizo-Hutniczy Miedzi (Copper Smelting Mining Combine), it was transformed in 1991 into a joint stock company.

KGHM is today the largest producer of silver and the ninth largest producer of copper in the world with core operations extending throughout the area typically known as the Legnica-Głogów copper belt.

An evolving challenge

As the largest employer in Lower Silesia with 18 000 people directly involved in the mining process and a further 10 000 working for its subsidiaries, KGHM's properties cover an area of around 467 000 km². These include the Lubina, Rudna and Polkowice-Sieroszowice mines, as well as

a concentrator, two copper smelters, a wire rod plant and various auxiliary units.

At the Rudna mine, which opened in 1969, mining is carried out 24 hours per day over four shifts. KGHM extracts 30 M tonnes of ore per year, with a copper content of 1.8 % and 46 g per tonne of silver, taking miners and equipment deeper and deeper into narrower drifts.

Divided into 13 mining sections, Rudna has 11 shafts in operation that range from 950–1 250 m in depth. Here, KGHM has used Atlas Copco's Boomer S1 L low profile, hydraulic face drilling rig and operators and engineers have been pleased with the

performance. But as conditions become more demanding and with plans to extend the workings at Rudna even deeper over the next few years, KGHM turned to its long-term supplier to propose a new drill rig.

Atlas Copco has worked closely with KGHM for many years to provide sales, service and support for machines at all three mines and stepped up to the new challenge.

To get the full story, M&C visited the Rudna mine where KGHM uses room-and-pillar mining methods, working in high ambient temperatures due to heat generated by machines and rock mass.

"The older models were just not meeting our customers' requirements for mining deeper, narrower seams and so we began exploring options for a new model," explains Andrzej Szołtysik, parts and service manager for Atlas Copco in Poland.

“ The articulation point has been designed more like that of a loader than a rig.

Robert Jankowski Business Line Manager for underground rock excavation, Atlas Copco



A MINE



Boomer M1 L goes to work: The rig is pictured here in the 2–2.5 m high drifts at Rudna mine.



Birdseye view: KGHM's Rudna mine in southwest Poland is one of Europe's most important copper deposits.

Together with his colleague Bogusław Holda, Szołtysik began working on plans for a new rig prototype in 2005 at Atlas Copco's service base in Polkowice. As part of the project, KGHM sent three engineers to join the design-and-build team.

The key offering

"It was a perfect example of team work," Szołtysik tells M&C. "This level of cooperation meant that we understood the mine's requirements exactly and the results were outstanding. The Boomer was to become a very significant part of our product range and we expect it to remain a key offering in the next ten years or more."

Although the project was shelved temporarily following the global financial crisis in 2008, plans were revisited and, in 2009, the development of the Boomer M1 L began at Atlas Copco's facility in Sweden. After nearly two years of development, the prototype rig was delivered to Rudna mine on November 15, 2010.

Following a six-month trial period, the Boomer M1 L prototype had completed nearly 800 operational hours and drilled more than 32 000 holes averaging 3.2 m in length. And during this period it achieved 90% availability and 75 % utilization with

several maintenance stops. A comprehensive test report was compiled after the trial, which included the opinions of operators and the management team in addition to operating statistics.

"We were satisfied with the positive design and test of the unit," explains Leszek Szewc, manager of Rudna's mechanical division. "Our goals were met."

While some improvements were made to operator controls, electrical components and the location of rear-view cameras, the success of the prototype meant that KGHM purchased four Boomer M1 L units in 2011. A fifth unit was delivered in March 2012 and KGHM has since placed orders for a further 15 to be delivered through 2013.

Serviceable and robust

When asked about the ongoing relationship between KGHM and Atlas Copco, Szewc says: "It is absolutely necessary. We are currently concentrating on optimizing the number of machines that we use across our organization and improving their utilization.


"The orebody at Rudna is declining and the older areas are now mined out, so we are working very low-profile drifts. At 1 100 m depth, the drifts are around 2–2.5 m high,

and operations at Glogow Deep Industrial will be deeper than 1 200 meters so it is very important that our equipment is up to the task."

Serviceability and robustness were two of the main focuses during the rig's development. Measuring 13.6 m long and 1.8 m high, the Boomer M1 L is ideal for drifts of over 2 m and provides face coverage of 5.8 m high and 8 m wide without having to move the rig.

The Boomer M1 L has a modular design where around 80–90% of the electrical and hydraulic components are the same as on the Boomer S1 L.

"The articulation point has been designed more like that of a loader than a rig," says Robert Jankowski, Business Line Manager for underground rock excavation at Atlas Copco.

Another key feature of the M1 L is the new, enclosed, air-conditioned operator cabin. Operator Mariusz Gawronski demonstrated the prototype: "It is a revelation," he says. "Compared to the Boomer S1 L and other rigs, it is much more comfortable. The air-conditioning makes a big difference and because the cabin is enclosed, it is much quieter now which means I can concentrate better." 



Highly appreciated: Atlas Copco's bestselling Scooptram ST7.

Bestselling Scooptram ST7 racks up 100 sales

KAZAKHSTAN Atlas Copco's bestselling LHD, the Scooptram ST7, has been delivered to its 100th customer. Owner of the milestone loader is mining group Vostok-Metall TransLLP which has put the unit to work at Kazzinc's Ridder-Sokolny gold mine in Kazakhstan.


The sale clearly confirms a global appreciation for this new generation LHD for loading technology and design.

The success story began immediately after the product was launched in 2010 when the first owner, Lovisa Mine of Sweden, gave it top marks and reported dramatic improvements in operations as well as the underground environment.

A stream of praise followed, most recently from the German industrial minerals group, Geomin Erzgebirgische

Kalkwerke. Geomin is the first to introduce the Scooptram ST7 in Germany and has one unit in operation at its white marble mine in Hermsdorf, near the Czech border, and another at its fluor spar operation in the same region.

Among the many top-notch features of the Scooptram ST7 are spring-applied, hydraulically released (SAHR) brakes, automatic brake testing with diagnostics and logging, an oil-free cabin environment and outstanding traction. But perhaps the most significant plus point is fuel efficiency – just 10 liters per hour with its water-cooled Cummins Tier 3/Stage III engine.

Scooptram ST7 has a 6.8 tonne tramming capacity, articulated steering and oscillating rear axle, a tramming height of 2 160 mm and a width of 2 280 mm. 

Pit Viper 351 rigs for Sishen Mine




Bound for Kathu: The Pit Viper 351 which drills up to 406 mm (16") holes.

SOUTH AFRICA Atlas Copco has received a record order in South Africa to deliver Pit Viper 351 blasthole drill rigs. The order is from Kumba Iron Ore Ltd., owned by Anglo American.

The PV-351 will be supplied to their Sishen Mine located in Kathu, 620 km south west of Johannesburg, with all units due to be in operation by March 2013.

Atlas Copco was recently identified by Anglo American as one of two preferred suppliers of surface drill rigs with a drill diameter larger than 165 mm. Sishen, one of the seven largest open pit mines in the world, already has ten PV-351 rigs.

"We are proud to have been chosen as a strategic long-term partner to Anglo American and we look forward to building the relationship further," says Bob Fassl, Business Area President, Atlas Copco Mining and Rock Excavation Technique. "The PV-351 has a good reputation among our customers and we see great interest in this product from mining companies around the world." 

IN BRIEF

iPad app for the underground world

A great opportunity to learn about and explore Atlas Copco's world of underground mining and construction has been opened up with the release of a brand new application for iPad and Android tablet users.

Launched by Copco's division for Underground Rock Excavation, the dynamic new app provides a 360°, 3D gallery which enables tablet users to examine the full product range from every angle.

The app also provides access to HD quality videos, product specifications, technical data, case stories, contacts and a news feed. An added plus is the ability to synchronize all content so that the tablet experience can be enjoyed at all times, online or offline, on the surface or underground.

The underground app is available free of charge through AppStore and Google Play.



Smarter Mining on the web

An innovative and unique presentation dedicated to profitable and sustainable surface mining can now be accessed on the web. Produced by Atlas Copco in cooperation with Orica, "Smarter Mining" demonstrates how the industry plays a key role in sustaining human existence. In addition, visitors can view a range of educational videos, get the opinions of experts and meet some of the world's most successful mining companies. www.smartermining.com/



Piecing together the integration puzzle: The new system provides underground mines with a complete overview of operations from the control room.




New integration system for underground mines

SWEDEN A unique collaboration between Atlas Copco and ABB has led to a significant advance in mobile fleet integration for underground mining. The two companies have come up with the world's first system to give mines a complete overview of operations.

The technology integrates data from Atlas Copco's advanced underground mobile mining equipment in real time (via a WiFi network) with ABB's Process Control System 800xA. This gives control room personnel a complete overview of all activities, allowing them to make informed decisions on production flow.


Mattias Pettersson, Product Manager, Data Management and Communication at Atlas Copco, says: "This is a very exciting development that brings the future of underground mining right into the present. Underground mines will be able to run their operations and meet their targets more effectively than ever before and organize fleet maintenance much more efficiently."

David Shellhammer, President at Atlas Copco Underground Rock Excavation, says: "Our future mine operators want a compelling, all-in-one information center to optimize the utilization of our machines underground. I am certain that this project will result in a big leap forward in the optimization of underground mining." 

World zinc giant expands



INDIA Hindustan Zinc Limited (HZL), the world's largest integrated zinc producer, is expanding its underground operations with a major new fleet of equipment. HZL, a subsidiary of Vedanta Group, operates the world's largest zinc mine, Rampura Agucha in Rajasthan, and has placed an order with Atlas Copco for a large number of drill rigs, loaders and mine trucks.

The fleet will be used at HZL's Kayad and Rampura Agucha mines with delivery due for completion in 2012. Anirban Sen, Business Line Manager Underground Rock Excavation, says: "HZL has invested in our products to achieve ambitious production targets and this order confirms the confidence that Vedanta has in our abilities to provide products which will help them to boost productivity while lowering costs." 

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