

MINING & CONSTRUCTION

MECHANIZED ROCK EXCAVATION WITH ATLAS COPCO – NO 1 / 2014.



Colombian hydro in full swing

Dramatic rescue for Turkey's ancient shrine

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A champion for the next Winter Olympics

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New Scooptram ST18 gets top marks

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Atlas Copco



The mining industry is facing some tough challenges these days. Investments have slowed down and companies are reluctant to mine certain minerals such as gold due to a decline in market prices. As a result, the focus today is on productivity and cost control – and that’s where Atlas Copco is lending a helping hand.

As one of the world’s leading suppliers of rock drilling tools, we have a responsibility to develop a constant stream of innovative products that can meet our customers’ needs and support them in their efforts to achieve their tough objectives.

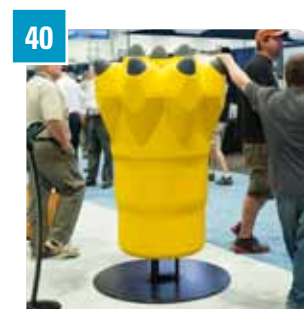
In fact, the demand for our innovative products has never been greater.

At the same time, we are developing and expanding our organization to meet the demands of the future. For example, over the past few years we have made substantial investments in automation and quality enhancement at our production plants in Sweden, India, North America and China. In addition, we have strengthened our focus on R&D, improved our technical skills by introducing new, worldwide training programs, and expanded our product range in all of the fields in which we operate.

In this context, exploration drilling deserves a special mention. This is one of the industries that has suffered more than most from the slowdown, but we strongly believe that it has a bright future. Consequently we are determined to continue developing this technology to ensure that our many exploration customers around the world will be well prepared for the upturn when it inevitably comes.

HELENA HEDBLOM
President,
Atlas Copco Rock Drilling Tools Division.

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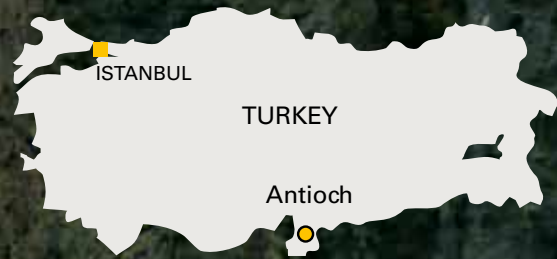
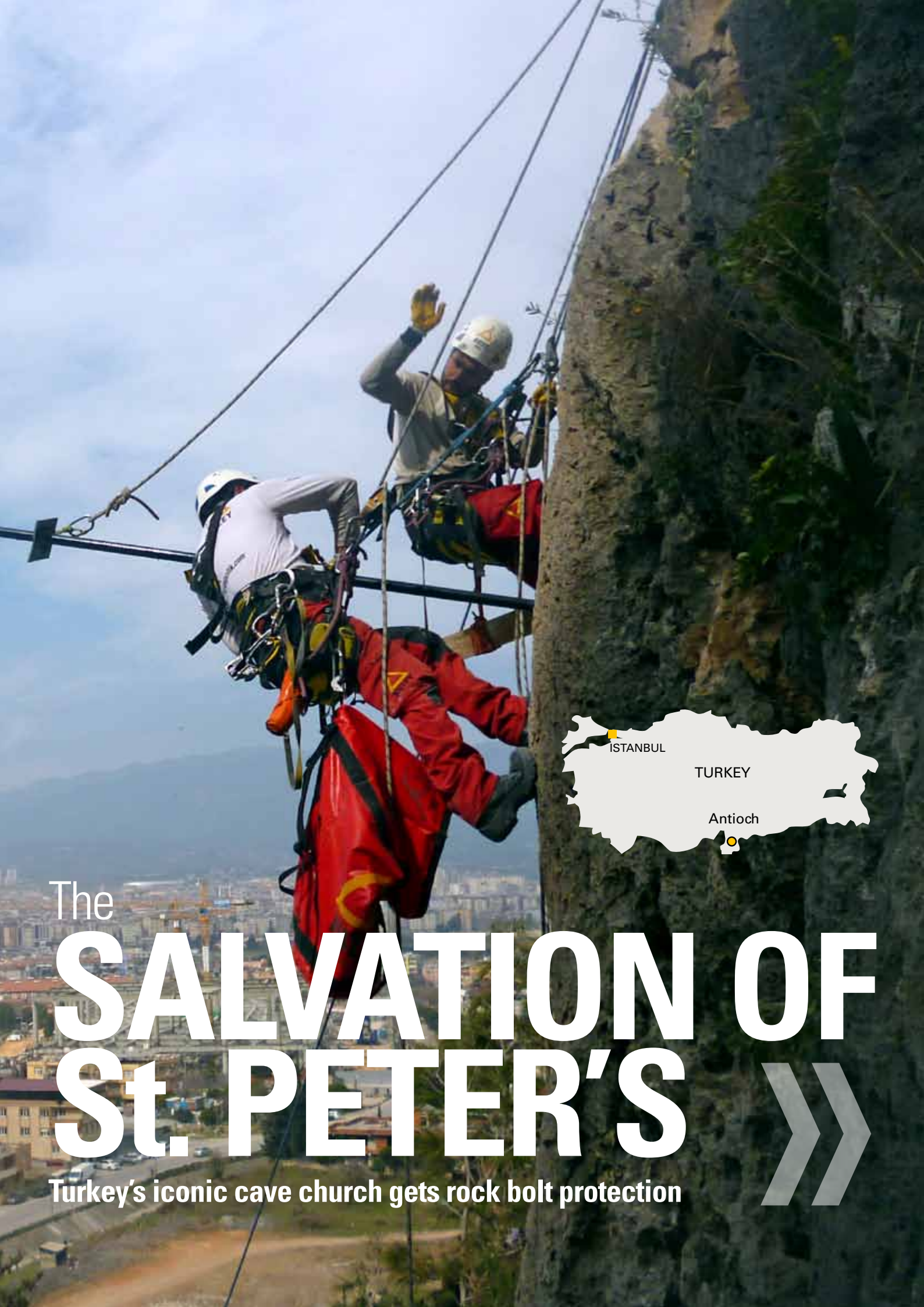
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SAFETY FIRST

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The

SALVATION OF St. PETER'S

Turkey's iconic cave church gets rock bolt protection





Swellex to the rescue: These mountaineers had to abseil down the mountainside to reach the section of loose and crumbly rock that threatened to fall on the famous cave church of St. Peter's.



Above: The rescue team working for Turkish contractor Kuzey Dacılık line up for a photo to commemorate the completion of their successful mission.



Atlas Copco's Deyvi Akkris and Bahadır Ergener, Sales Engineer and Business Line Manager, instruct the team on how to install the Swellex Pm24. Right, the APSP 300 Swellex pump is hoisted into position.

» The Church of Saint Peter near the city of Antioch in southern Turkey, believed to be one of the very first Christian meeting places, has been spectacularly saved for future generations with the aid of modern rock bolting technology.

From a distance, the cave in the side of Turkey's Mount Starius, close to the Syrian border, looks no different to the many others that are found in this part of ancient Europe. However, this one is no ordinary cave.

Measuring 13 m deep, 9.5 m wide, and 7 m high, it is believed to be one of the first founding churches of the Christian faith and a place where none other than the first apostle, St. Peter, once preached the gospel.

What is known for sure is that the site, which now has walls, colonnades and an altar, was established as The Church of St. Peter in the 4th century.

Today, it is a museum and one of the most popular tourist attractions in the country, but in recent years it has been subjected to frequent rockfalls which threaten to destroy the church for all time.

To save and protect this iconic site, a spectacular rescue operation was recently carried out in order to eliminate the immediate risk of more rockfall and to secure the mountainside for as long as possible.

For this work, Turkish contractor Kuzey Dacılık used professional mountaineers armed with modern rock stabilization technology from Atlas Copco.

Suspended from climbing ropes high on the mountainside, they drilled a series of 48 mm holes into the rock face with Atlas Copco drill bits, using stabilizer bolts on the rock drills to prevent deviation. Each hole took approximately 10 minutes to complete.

Immediate support

Atlas Copco Swellex rock bolts were hoisted up the rock face and inserted in the holes. Next, a Swellex pump was hoisted up and used to inflate the bolts. The total installation time was about five minutes per bolt.

A compressor on the ground provided pressure of 7 bar, but at the top of the rock face this dropped to 4 bar so the pressure of the Swellex pump had to be increased to 300 bar. Water with a pressure of 2–3 bar was pumped up and it was then possible to inflate the bolts to fit tightly in the holes, taking just a couple of minutes per bolt and


giving immediate support to the rock mass.

In this way, the section of the rock face that posed the greatest danger to the church was stabilized.

To achieve this objective, the mountaineers needed only 25 plastic coated Pm24 Swellex bolts, 3 m and 3.6 m in length. As soon as the bolts had been inflated, they provided immediate support to the weight of the rock mass and, on some sections, wire mesh was also used.

"No alternative"

According to Fatih Tomba, Site Manager, the possibility of further rockfall has been averted for at least the next 50 years. "We came here to clean up the surface of the mountainside and found that there were huge sections of rock that were in danger of falling at any moment," he explained. "It obviously needed immediate attention."

In Tomba's view, there was no alternative to the Swellex bolt, saying: "It was the only rock bolt that could do the job properly. If we had used standard rock bolts I think they would have come down along with the rock mass. Due to the inflatable design and immediate support capability of the Swellex bolts we are confident that this won't happen." 



Since its introduction in the 1980s, the Swellex rock bolting system has gained wide recognition in mining and tunnelling. This unique bolt is made of a welded tube folded on itself and sealed at one end. This enables a strong anchorage to be achieved through a combination of friction from radial pressure and mechanical interlocking from profile deformation. The bolts are expanded with high pressured water (300 bar).

For St. Peter's Church, 3 m and 3.6 m plastic coated Pm24 Swellex rock bolts were chosen. This model starts to elongate at a pressure of 20 t and is fully load bearing after 24 t.

Mount Starius consists of limestone formations with large fissures between rock sections and the plastic coated Swellex bolts were chosen to help reduce the rate of corrosion generated by the acidic effect of underground water flows.

ST PETER'S – A TURKISH NATIONAL TREASURE

The cave Church of St. Peter is considered a national treasure in Turkey and includes pieces of floor mosaics, and traces of frescoes on the right side of the altar. It is thought that a tunnel which opens to the mountainside enabled the early Christians to escape in the event of sudden raids and attacks. Water that seeps from the nearby rocks was gathered inside for drinking purposes, and was also used for baptisms. Today the water, which visitors drank and gave to the sick, believing that it had healing characteristics, has lessened as a result of earthquakes.

Crusaders of the First Crusade, who captured Antakya (Antioch) in 1098, lengthened the church by

a few meters and connected it with two arches to the facade, which they constructed. This facade was rebuilt in 1863 by the Capuchin Friars who restored the church on the orders of Pope Pius IX. French Emperor Napoleon III also contributed to the restoration. The remains on the left side of the church entrance are colonnades that formerly stood in front of the church facade. On top of the stone altar located in the middle of the church is a stonework platform that was placed there in memory of the Saint Peter's Platform Holiday which is celebrated every 21 February. A marble statue of Saint Peter, on top of the altar, was placed there in 1932.



Korea's new

OLYMPIC CHAMPION



Raiseborer stars in major tunnel project for Winter Games 2018

As the winter Olympics in Sochi came to its spectacular close, athletes and sports fans alike were already setting their sights on the next Olympian challenge – and so were the engineers and ventilation specialists at SungPoong Construction.

The Winter Olympics 2018 are to be held in PyeongChang, South Korea, and a new super highway will enable the world's sports fans to travel to and from the venue quickly and safely.

One of the key elements of the project is the construction of the Inje Tunnel, which at 10.9 km long will be the longest road tunnel in the country.

According to the plan, the super highway which runs from Seoul, the capital, to Yang Yang in the east, will dramatically reduce the time it takes to drive to PyeongChang from 4 h to just 1.5 h.

Situated in the northern province of Inje in the mountainous region of Kangwondo, the Inje Tunnel is on track to be completed in 2015. Excavation is by drill and blast using NATM (New Austrian Tunneling Method), and while this is a major challenge in itself, the job of installing the necessary ventilation system has been nothing less than an Olympian achievement.

Top-of-the-line equipment

SungPoong Construction, Korea's leading company in ventilation and shaft applications, was awarded the contract to install the ventilation which comprises of two shafts, 212 m and 307 m long, spaced 4 km apart. The shafts are 3.1 m in diameter and will

later be enlarged to 10 m in diameter.

For this job, SungPoong Construction has used what is probably the most sophisticated raiseboring equipment in the world. This consisted of:

- an Atlas Copco Robbins 73RVF C medium-sized raise drill ranging from 1.5–3.5 m (5–10 ft) in diameter
- an Atlas Copco Secoroc Mini Super Base System (for modular reamer assembly) with 3.1 m inner and outer extensions
- Atlas Copco Secoroc Magnum cutters
- 12¼ inch flanged stinger and 12¼ inch pilot bit.

Variable speed drive

The Robbins 73RVF C is the most energy efficient raiseborer in the Atlas Copco range. Its RCS control system provides total control of speed and torque, and built-in break resistors eliminate the risk of backspin.

The compressive strength of the rock at this site varies from 200 to 350 Mpa with less than competent formations. However, the variable speed drive on the raiseborer optimizes the operating performance irrespective of the rock conditions. This means that the machine's drillstring always utilizes its full torque capability.

The Magnum cutter, which made its Korean debut at the Inje Tunnel, features

the roller-ball-roller bearing system, large, carburized bearing races and an optimal cutting structure for long cutter life.

When M&C visited the site, both shafts had been completed. For the 307 m shaft, one Magnum cutter set of 16 cutters had been used and 40% of their service life remained. For the 212 m shaft, a new set of cutters had been used and 70% of their service life was still intact.

Kimman Cho, Project Manager for SungPoong Construction, was clearly pleased with the results. "I think the Magnum cutter is amazing," he says. "It has a three to four times longer service life than any cutter I have ever used before."

After working round the clock to complete the shafts, SungPoong's engineers filed the following work report:

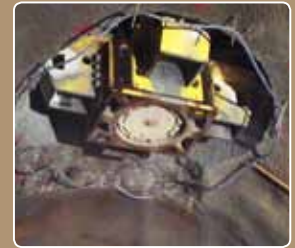
- Pilot hole: 37 days (average 14 m/day)
- Reaming hole: 47 days (average 11m/day)
- Total drilling days: 84
- Total project period, including site preparation and transportation: 145 days

Project Manager Cho explained that these positive figures were achieved thanks to very few breakdowns, thereby keeping downtime to a minimum.

Mattias Calleberg, Atlas Copco Service Engineer, takes up the story. "The site preparation on this project is the most impressive I have ever seen," he says. "Generally speaking, SungPoong Construction has



Above the tunnel: Engineers at SungPoong Construction adjust the settings on the Atlas Copco Robbins raisebore.



Inside the tunnel: The reamer head starts to ream up the hole to a diameter of 3.1 m after completion of the 12 ¼ inch pilot hole.



High quality and long life: Left, Magnum cutter G and Magnum cutter N (right) after reaming the 307 m shaft.

An Olympian achievement: High above the Inje Tunnel in the mountains of Kangwondo, South Korea, the Robbins 73 RVFC raisebore was used to bore two ventilation shafts, 212 m and 307 m in length, each with a diameter of 3.1 m, later to be enlarged to 10 m in diameter using the drill and blast method.

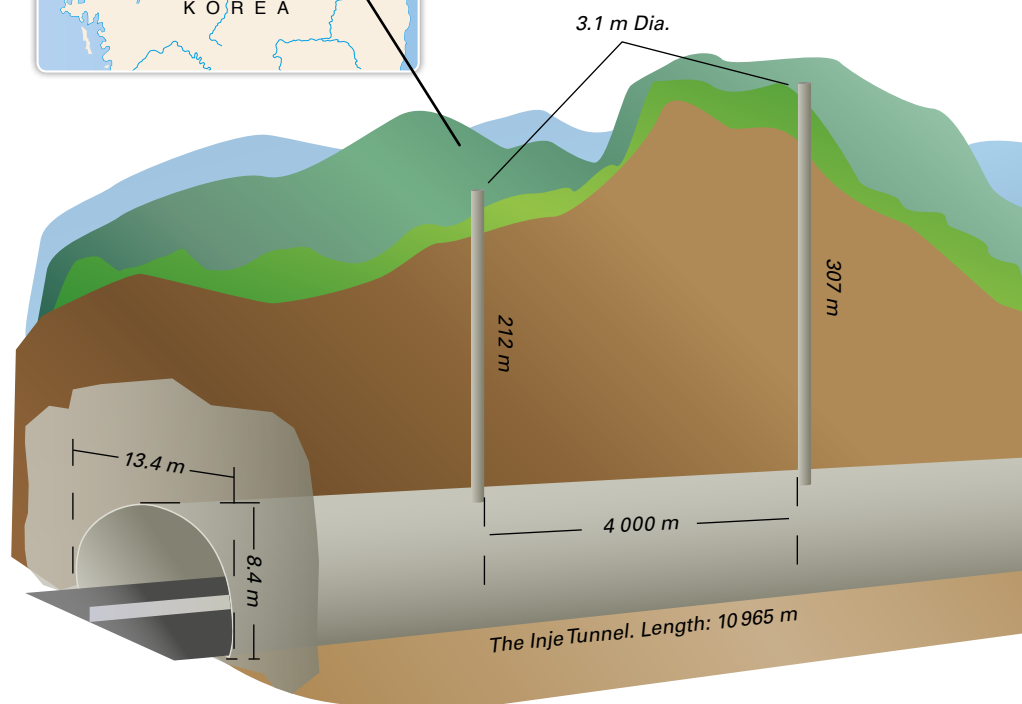
successfully completed two very accurate holes at the Inje Tunnel with good penetration rates and very little downtime. This was in spite of dirty water caused by clay between two layers of granite that has affected the bailing pump, and several rock bolts that had been left in the tunnel roof. Normally it is no problem to cut through anchor bolts, but one of these had an anchor plate that we were unable to drill through, so it had to be removed. After that, everything went smoothly.”

Expressing his satisfaction with the result, Jinpyo Kim, Purchasing Manager of SungPoong Construction, concluded: “Our team was able to finish this tough job with optimum drilling conditions, despite non-competent and hard rock. This was largely due to the speed and torque control system of the drive motor on the 73RVF C, which also relieved the burden on the drillstring. Furthermore, the machine was easy to set up and troubleshoot, and this also contributed to increasing the uptime.”

Footnote: Since it was founded in 1989, SungPoong Construction has specialized in vertical tunnel and ventilation shaft collar applications and has carried out a number of infrastructure construction and civil works projects. The company is headquartered in Jechon, in the center of eastern Korea.



PyeongChang, the venue for the 2018 Winter Games, is located about 180 km east of Seoul. Motorists will travel on the new super highway to YangYang and turn off at an interchange, shortly after emerging from the Inje Tunnel, to head southwards for PyeongChang.



China moving on... ...from pneumatics to hydraulics



In the ancient city of Suizhou, many things have stayed the same for thousands of years, but not the way the local drillers operate. These days, hydraulics is getting the better of pneumatics.

Atlas Copco's PowerROC T25 DC drill rig, made in Japan, is convincing Chinese customers of the wisdom of making the transition from pneumatic to hydraulically controlled equipment.

The city of Suizhou in China's northern province of Hubei, is well known as the hometown of the ancient Chinese emperors Yandi-Shennong and Huangi. It is also the home of China's famous chime bells which have been used as percussion instruments for thousands of years.

Nowadays, however, the city also functions as an important hub for East-West business development and a transition to more modern technology. A typical example is the current move by local contractors away from pneumatic towards hydraulically-driven drilling equipment.


One of these is the company now helping China Railway's 12th Bureau Group to build a 665 km highway from Macheng

to Zhuxi, using an Atlas Copco PowerROC T25 DC surface drill rig. This topammer rig, manufactured at Atlas Copco's plant in Yokohama, Japan, is used to drill holes of 89 mm in a quarry to provide aggregate for the new road. In these hard granite conditions, the penetration rate is 30 m/h.

The contractor is small, cost conscious and used to operating locally made pneumatic drill rigs, but recently switched to the PowerROC T25 DC which gives a much lower fuel consumption of just 0.3–0.35 liters per minute. PowerROC T25 DC is equipped with the 12 kW COP 1240 rock drill and R32, T38 and T45 rods for drilling 58–89 mm holes to a maximum depth of 21 m. "It was not easy to persuade this company to buy the PowerROC

T25 DC so they had extremely high expectations on the rig's performance," says Chi Zeng, Account Manager at the Atlas Copco dealer, Wuhan Zhongnan.

"When introducing them to the rig, we provided them with a calculation showing how much they could save in relation to a pneumatic rig and how much more they would benefit from the PowerROC T25 DC. In the past few months, they have been running the rig with high frequency and the efficiency is so impressive that sometimes they have to stop drilling to wait for the downstream process to catch up."

The contractor says it is satisfied with the rig's high reliability, performance, mobility and low fuel consumption. Concludes Zeng: "We are always very happy when a customer discovers the advantages of hydraulics, especially if the customer has been used to using the locally branded pneumatic machines." 



GOOD ENERGY FOR COLOMBIA'S FUTURE



Constructing the dam at Ituango.

It's been over 30 years since it was first planned, but once in operation, the Ituango hydroelectric plant will be the largest in Colombia, generating 2 400 MW or around 17 percent of the country's energy needs. A large and diverse fleet of equipment, strengthened by onsite service maintenance and drill steel supply, is helping this project to finally become a reality.





Heading up a world class fleet: The Atlas Copco three-boom drill rig, Boomer XE3 C, at work in the 240 m long powerhouse cavern where some 270 000 m³ of rock is to be excavated. It is one of seven Boomer rigs being used on the project.

» **P**hase I of the Ituango hydropower project consisted of preliminary construction work including an access road to the site, a river diversion and an access tunnel to the underground area. Phase II comprises the main civil engineering works being handled by CCC Ituango, a consortium formed by Brazil's Camargo Correa and Colombian firms Constructora Concreto and Coninsa Ramon H.

The consortium was awarded the contract, valued at USD 1 billion, in August 2012 and just three months later placed an order with Atlas Copco for the necessary equipment.

CCC Ituango is by no means new to the world of energy; the same companies worked together in 2010 on the construction of Porce III, another EPM hydroelectric project in the Antioquia region, about 90 km north east of Medellin.

"This is the second time we have worked together," confirms Commercial Director Rafael Borgo. "The main advantage is not just that we know each other and the way we work, but also the confidence that we now have between the individual companies."

He adds that Porce III, which started commercial operations in 2010, is also owned by the utility EPM and was finished and handed over on time.

Says Borgo: "We are expected to do the same here so to be able to meet this commitment in a project of this magnitude we need to work with reliable manufacturers and equipment; machines we already know and a company that can provide us with the after sales service we need; that's why we've decided to use Atlas Copco."

The project is located between Toledo, Briceño and Ituango about 170 km north of Medellin, the capital of the Antioquia region,

and is being built along the Cauca River. Here, at an area known as the Cauca Canyon, the 1 350 km long river flows between steep banks and descends almost 800 m.

The dam will be located some 8 km downstream from the Pescadero Bridge, and immediately upstream from the discharge of the Ituango River into the Cauca River. At this spot, the powerful waters have an average flow of 1 010 m³/s.

The project area is accessed via two main roads, including the 38 km road which was part of the preliminary construction work; this runs along the left bank of the Cauca River and building it was no easy task.

"The mountainous topography is a big challenge as it makes access very complicated," says Rogerio Beloni, CCC Ituango Maintenance Director. "Although some roads are now paved, they're very narrow and have lots of bends and to make them



TAMING THE WATERS OF THE CAUCA CANYON

RUGGED GREEN PEAKS AND STUNNING views in every direction. This is the first impression that hits any visitor to Colombia's north-western Antioquia region where construction of the Ituango Hydroelectric Project is now in full swing.

Colombia currently has 14 000 MW of installed electricity generating capacity and when it comes on stream in 2020, the new Ituango plant will add a further 2 400 MW to the grid.

"This project is a huge responsibility for everyone involved and is expected to provide enough energy to meet the growth in demand for at least the next fifty to sixty years," says Rafael Borgo, Commercial Director of CCC Ituango, the consortium in charge of the main phase of construction.

At the end of 2012, Atlas Copco Colombia won a major order to supply equipment for this phase. It comprised 32 drill rigs for surface and underground work and geological investigations, as well as loaders, compressors, lighting towers and other auxiliary equipment. In addition, there are two service contracts in place; one for service maintenance and parts supply, the other for rock drilling tools supply and bit grinding.

It was the largest order ever received by Atlas Copco Colombia in its 28 years of operation, confirming the company's ability to meet the demand in this increasingly important market for world class infrastructure and civil engineering projects.

The first feasibility study was carried out in the early 1980s but was later shelved due to the global economic crisis. It was not until 2010 that the Antioquia administration, together with the multi-utility company EPM (Empresas Públicas de Medellín), got the ball rolling once again. In 2011 they formed the Joint Venture EPM Ituango to finance, build and operate the project which is estimated to cost USD 5.5 billion.

EPM is a Colombian business group with an international presence in Latin America, the United States and Europe. The group's services focus on power generation, transmission and distribution, wastewater treatment, aqueducts and telecommunications. It generates 15 000 direct and 25 000 indirect jobs. EPM was chosen as the best company in Colombia in the 20th Century.

wider, the earthmoving work required would be huge and costly." He adds that it was difficult to transport the large equipment and some items even had to be taken apart and then re-assembled on site.

At present, another road is being built from Valdivia Port to Ituango in order to transport the largest items such as the turbines and generators that will arrive when the project is nearly finished and enters its third phase.

Varying ground conditions

The ground is generally a mixture of rock and soil and the conditions at each worksite are classified on a scale of 1 to 5, where 1 is the optimum and 5 is poor. Beloni says: "There are areas that are not very stable, especially in the inclines, which can be prone to landslides in the winter months. Although they're not major

ones, we have to take this into account in our planning." In addition, some geological faults have been found underground in some of the caverns which can make excavation difficult.

An important step in the project was the temporary diversion of the Cauca River which was achieved in February this year using two parallel horseshoe-shaped tunnels located on the right bank of the river. These tunnels are 1 090 and 1 215 m long, 14 m in height and 14 m wide.

Dam, reservoir and powerhouse

The current phase of the project includes construction of the dam, spillways, reservoir, power stations and all other related civil works.

The 225 m high dam will be an ECRD-type construction (earth and clay fill) featuring a 550 m long crest and a total volume

of 20.1 million m³. It will have a controlled, open flow channel spillway with a discharge capacity of 22 600 m³/s.

Featuring five radial gates and an intermediate discharge tunnel to control the filling of the reservoir, the spillway has a total length of 405 m, a canal width of 70–95 m and is built on a 12.5% slope. There will also be four cofferdams – two downstream and two upstream. The 79 km long reservoir will have a flood area of 3 800 ha and an active capacity of 980 million m³.

Located underground and accessed by a 950 m long tunnel, are four main caverns: one for the powerhouse which will house eight Francis-type 300 MW turbines, one to house 25 transformers, and two surge chambers equipped with four generators each (see diagram below).

The main cavern is 240 m long, 23 m wide and 49 m high, representing an



On site: An XAS 375 portable compressor and (right) a QLT M10 lighting tower.



On the surface: FlexiROCT35 rigs work both above and below ground.



Prepared for mucking: Scooptram ST2G takes a break during blasting operations.

excavation of approximately 270 000 m³.

After passing through the turbines, the water will flow downstream to the surge chambers and then discharge into the Cauca River via four tailrace tunnels, two from each surge chamber about 1 400 m downstream from the intake site.

New drilling fleet

The new Atlas Copco fleet at Ituango includes seven Boomer drill rigs of various models with one, two or three-booms; 15 FlexiROC T35 drill rigs; four Diamec 262 (now Diamec U6) core drilling rigs, three Scooptram ST2G loaders; four GA 132 and two GA 160 electric compressors; four XAS 375 JD, two XAS 750 JD diesel compressors and a number of QLT M10 lighting towers. In addition, Atlas Copco provides training for the

drill rig operators to complement the contractors' own training programs.

Beloni says: "We have people here who worked in Porco III and have experience with some of the equipment but also people without experience at all who are being trained here. This way they learn at work and acquire a new skill."

The Boomer rigs (Boomer XE3 C, XL3 C, E2 C, L2 C, L2 D, S1 D and T1 D) are all working underground. "I've been drilling all over the caverns with this machine," says Luis Alfonso Rodriguez, operator of a Boomer XE3 C. A local from Antioquia, Rodriguez has seven years of experience as an operator, some of which he gained at Porco III. There he experienced the Rig Control System (RCS), which allows several levels of automation – Basic, Regular, and Total. The rigs on the

site are equipped for the Total level.

"It was easy to understand and to explain to the trainee operator – he got it straight-away," says Rodriguez, referring to Jorge Andres Flores, the trainee now under his wing and who is also from the local area.

The machine is currently drilling 4 m blastholes with 51 mm drill bits, and according to Rodriguez, it takes about an hour to drill and blast one round as the rock conditions at the site are Type 4 (quite poor). But he is happy with the equipment. "This is a great, powerful machine, better than the previous one I worked with," he says. "What I like the most is the visibility from the cabin so I can really see what I'm doing."

A variety of support methods are employed including steel arches, shotcrete, mesh and rock bolting and some of the Boomer rigs are being used for the installation of 12 m long resin rock bolts.

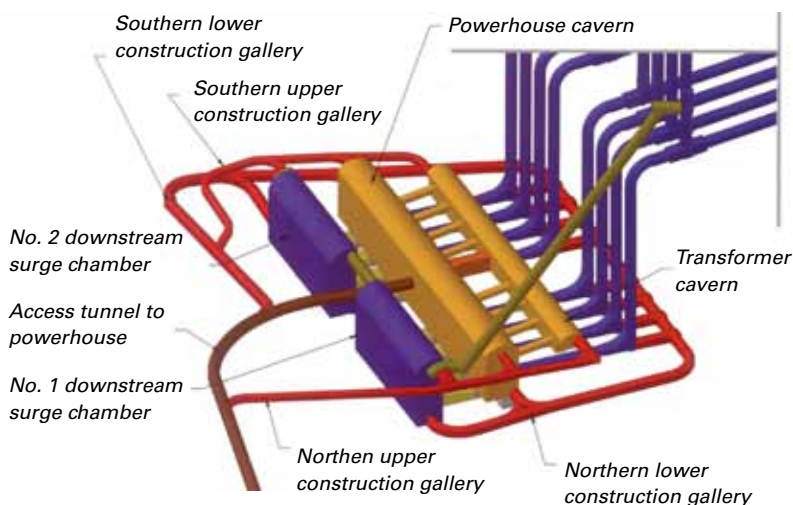
Mario Restrepo, CCC Ituango's Underground Excavation Manager, comments: "As a direct user of Atlas Copco underground equipment I can say that these efficient machines are at the forefront of underground technology. I think this confirms the general perception of excellence that is associated with the Atlas Copco brand."

Full on for FlexiROC

The FlexiROC T35 (formerly ROC D7) tophammer surface drill rigs, which are designed for high performance in demanding construction applications, are also being put through their paces. "In the surface area we are currently excavating about 12 000 m³ of rock per day in two 12-hour shifts," says Jose Paulo Fernandes, CCC Ituango's Production Coordinator, Surface.

He explains that they initially used three FlexiROC T35 rigs that came from Porco III. These rigs worked at Ituango for about a year. Now, of the 15 new FlexiROC rigs, 12 are working on the excavation of the

Ituango Main Caverns and Construction Galleries



The underground layout at Ituango: The drawing shows the main powerhouse cavern in the center, the smaller transformer cavern upstream (at right), the two surge chambers downstream (at left) and the access tunnels that lead to the various excavation points.



Paving the way for more energy: A two-boom Boomer E2 C drill rig from the Atlas Copco fleet excavating the tunnels and caverns at Ituango which will ultimately increase Colombia's electricity generating capacity by a further 2 400 MW.

spillway area drilling blastholes, bolt holes and holes for drainage, two are working underground and one is on standby.

“Right now I’m drilling 9 m bolt holes and can install 30 to 40 bolts in one shift,” says Mariano de Jesus Gomez Atehortua, one of the operators working in the spillway area. Due to the mixed quality of the rock it takes him about 20 minutes per bolt.

He previously operated a ROC D7 rig and is now being trained on the FlexiROC. “The FlexiROC is more modern, but I had no problem learning all the controls,” he says. “I prefer this one though, it makes me feel safe. Also, it’s powerful, bigger and much more comfortable.”

Controlled excavation

Fernandes confirms that all of the machines are working well. “We had planned to excavate a total of 336 000 m³ during March and that’s what we achieved.”

The other two FlexiROC rigs are working underground in the powerhouse and surge chamber. “It’s as if they were drilling on the surface, only it is inside a cavern,” says Fernandes, explaining that

excavation is less as it is more controlled.

“We do between 1 500 and 1 700 m³ per day. Blasting underground is also easier as we don’t have any interference problems like in surface drilling where we have to cordon off an area and wait for it to be clear.”

The four Diamec rigs in the fleet are being used for geological investigations. These compact rigs make them ideal for underground core drilling and the modularized system of rig, power unit, flushing pumps and control panel means that they can be used in surface applications as well as underground.

“They’re good machines,” says Beloni. “We’ve already used them inside the caverns and outside in the spillway area, and right now they’re working in the adduction channel above the spillway.”

Along with the drill rigs, Atlas Copco compressors and lighting towers help to keep the operations running smoothly. The QLT H40 lighting towers feature a metallic enclosure with an electrical cubicle for control and protection; a hydraulically raised mast that extends vertically up to 9.2 m in 15 seconds and rotates 350°, stabilization legs and brakes.

The towers and diesel compressors are

“The machines are working well and we are achieving what we planned.”



Jose Paulo Fernandes CCC Ituango Production Coordinator Surface



Keeping the production ball rolling: Above, Rogerio Beloni, Maintenance Director and Rafael Borgo, Commercial Director of CCC Ituango, the operating consortium.

used everywhere there is no fixed electric power. Beloni says: “Now that we’ve built the fixed compressed air facilities, we only use them sporadically, but at the beginning of the project when we had no energy points, we used them a lot.”

Maintenance and technical support

CCC Ituango has a Maintenance & Parts Contract in place whereby Atlas Copco supports the project’s own maintenance department with all of the drilling, loading and exploration equipment.

“We provide constant onsite technical support, with both preventative and corrective maintenance service, and help with the sourcing and installation of original parts

when required,” explains Darwin Cruz, Atlas Copco Service Agreement Manager. For the maintenance of the rest of the fleet, such as compressors and lighting towers, the site is supported by Atlas Copco technicians in Medellin or Bogota.

Cruz’s team for Ituango includes 13 service technicians plus support staff. In each of the two shifts at the project there are always six technicians on the site where they have offices, containers for storage of key spare parts and one used as a workshop for maintenance of the rigs.

Cruz explains that due to the high utilization in such a demanding application, it is the FlexiROC T35 rigs that need more attention. As for the equipment working

underground, he notes that the booms on two of the Boomers have been affected by rock falls in a few areas inside some of the tunnels. “But that’s why we’re here 24 hours a day with our technicians and expertise,” he says. “Our job is to provide a speedy and effective maintenance service for any need that comes up during the construction of this challenging and exciting project.”

Rock tools and grinding

Atlas Copco supplies all the drill steel for the entire equipment fleet as well as a grinding service for all of the rock drilling tools. This is headed up by Drilling Tools Supply and Grinding Manager



Good equipment for a big challenge: From left, operators Luis Rodriguez, Mariano de Jesus Gomez Atehortua and Jorge Flores.



The power of the Cauca River: View of the tunnel portals of the temporary diversion intake tunnels.



Continuity is No 1 says Damian Saldarriaga, who manages rock tools supply and grinding services.

Damian Saldarriaga. The team has four containers on site, one used as an office, two for storage of rock tools and another as a grinding center.

There are two grinding technicians, one per shift, using Secoroc's Grind Matic BQ03, a machine specially designed for threaded and tapered bits with spherical and ballistic buttons. Grinding goes hand in hand with production both on the surface and underground.

"Every day we grind about 600 bits," says Saldarriaga. "We also have small, portable grinding machines available as back-up. Our job is to guarantee the continuity of the service at all costs."

Each rock drilling tool delivered is identified according to a specific code which helps to follow the performance of each individual tool. Explains Saldarriaga: "For instance, if a machine is reaching low productivity levels, we go to the field, inspect it and analyse what factors are influencing the lifespan of the tool. We can then give accurate feedback to our client about meters drilled and the reason for replacement. The final objective is to help improve our client's productivity so that they get the lowest cost per meter drilled."

Service and interaction

Monitoring the performance of each individual tool is possible due to a special software developed in Colombia and used

at Porce III. This was later improved and developed into a cost-per-drillmeter contract in the first phase at Ituango. "The results were good so we developed this newer version to achieve better service for the client," says Julio Cobos, Atlas Copco product manager for rock drilling tools. This kind of service is very important to CCC Ituango's managers who value fast maintenance responses, communication, and interaction.

"We are talking a lot with both the maintenance and drilling tools teams and their performance has improved considerably,"

says Fernandes. "We believe these contracts, apart from supplying parts and tools, should also be about teaching people, looking at how the equipment is performing and how we're working. The biggest cost is explosives and drilling tools. If we don't manage them well, we're dead!"

"For us it was a matter of reliability in the equipment," concludes Beloni. "We work with other brands too, but we always try to work with a reliable manufacturer. Atlas Copco is a well known brand, has reliable equipment and good after sales support, and that is very, very important for us." ☉



Darwin Cruz (left), Service Agreement Manager, with members of the technical support team.

Cutting a fine line

Turkish marble supplier Karmersan strikes the perfect balance with SpeedCut



Speed and safety, as in many industries, are essential to the production of fine marble. In Turkey, leading supplier Karmersan gets the perfect balance.

In the marble industry, speed and safety are key issues. On the one hand, companies increase their production in order not to fall behind their competition. On the other, they have to prioritize safety and quality.

In this sense, the cutting speed and quality of wire saw cutting machines in the quarries are significant factors in helping to minimize production costs.

Turkey is the world's fourth largest exporter of natural stone and Karmersan is a leading supplier. Established in 1993, the company owns and operates several quarries and plants across the country. These include the Harmankaya quarry, near the town of Burdur, which has been in operation since 1997, and the Sütçüler quarry in the southern region of Isparta, which has been operating since 2010.

Machine preferences

During a recent visit to the Sütçüler quarry, Salih Kaya, Executive Board Chairman of Karmersan, explained that the beige marble produced here is in high demand, especially in China.

The Karmersan quarries employ

400–500 people, depending on its needs, and have a production capacity of 1.2 million m². At the time of writing, the company operated a fleet of some 50 machines, including 12 SpeedCut wire cutting machines from Atlas Copco which have the biggest influence on productivity and production costs.

The SpeedCut machine was introduced to Karmersan about two years ago and has since had a major impact on the success of the business. Kaya explained that speed and safety were the two most important reasons for choosing the SpeedCut and that it soon proved to have many other benefits, too.

“It's easy to handle, it can make parallel cuts with a distance of two meters without repositioning, it has an aesthetic and functional design and it is easy to set up as the tracks can be lifted together with the machine,” he said. Another important advantage, says Kaya, is that the operation menu on the SpeedCut's remote control unit has a Turkish language selection, making it easier for the operators.

The machine's rotation torque also makes the work easy. “With conventional cutting machines it is often necessary to stand

on the wire in order to get it moving,” he explains. “This isn't necessary at all with the SpeedCut due to its excellent rotation torque. Added to this, the sensors recognize when the wire is broken and the machine automatically stops in order to protect itself and the workers, and when it reaches the end of the track it automatically stops again.”

Production up, costs down

The SpeedCut quickly proved that it could work three times as fast as any other cutting machine on the site. It cuts an average of 25–30 m²/h in cuts of 150–200 m², and in two years has helped to increase the quarry's production from 1 500 to about 10 000 tonnes per month.

Although the initial investment was a little higher than for similar machines on the market, Kaya says he is convinced that the payback time will be short. “This machine has increased our production and also reduced the cost of items such as labor, electricity and water, as we do more work with fewer machines,” he says. In addition, cuts that previously took 28 hours, now take 8–9 hours to complete.

Continues Kaya: “I was certain that it would be a good investment, so I followed up personally and saw that on average it does three times more work than any other machine we have used before.

“Not only has production increased, but so has the quality of our product because the SpeedCut achieves consistently clean and smooth surfaces. We now do almost all of our stone cutting with the SpeedCut, and I believe that many other quarries in Turkey will also start using these machines soon.”

From the safety perspective, Kaya says the SpeedCut is “well equipped”, noting that the air filters keep the inside of the machine clean. “It's important in the quarry

“The SpeedCut does three times the work of any other machine we have used before.”



Salih Kaya Executive Board Chairman, Karmersan



Above: The fast and safety-conscious SpeedCut being operated by remote control.

Left: The popular beige marble of the Sütçüler quarry in the southern region of Isparta, with finely cut blocks in the foreground.

Below: The machine is easy to set up and the tracks can be lifted together with the machine.



to keep the electronic equipment dust-free, and SpeedCut does that by itself.”

With conventional machines, cavitation, or so-called “dishing”, may occur due wire sagging, particularly with large-size, horizontal cuts. This requires extra cutting, and also disrupts the working edge of the lever-type chain cutters.

Kaya continues: “The biggest problem is wire breaking, but the SpeedCut’s system is protected against this. Since it works depending on the load on the wire, it automatically stops if there is a risk.”

Atlas Copco Stonetec products’ Eagean

dealer, Esisan Company, is providing the service and maintenance and also trains the operators. Kaya says he is satisfied with Esisan’s work, adding: “It’s important that the operators know the machine well, and training is not just carried out once. Esisan comes and trains us whenever we ask for it.”

Gürkan Burak Buyurgan, Atlas Copco’s Surface and Exploration Drilling Business Line Manager, notes that Turkey has almost 40 percent of the world’s reserves and that the quarrying of marble, travertine and granite is a major industry.

“Modern equipment is essential in this business,” he says. “In addition to our SpeedCut wire saw machine and the new SpeedROC drilling machine, which is specially developed for marble quarries, we aim to provide our customers with the lowest total cost of ownership in the industry as well as maintain the highest level of customer satisfaction.”

Based on an article originally prepared by APA Publishing Company.

NEW HAMMER ROCKS!

COP 66 shines after extensive tests in Swedish iron mine



A perfect match: The new COP 66 is designed for superior performance on all Atlas Copco drill rigs but is specially optimized in combination with the SmartROC D65.

The latest down-the-hole hammer from Atlas Copco Secoroc – COP 66 – has proved its worth in hard rock conditions in Northern Sweden prior to its worldwide launch.

The Svappavaara region, in the far north of Sweden, is mining company LKAB's newest and fastest growing mining area. Located above the Arctic Circle, Svappavaara has three open pit mines – Mertainen, Leveäniemi and Gruvberget – with Gruvberget as the cornerstone of a plan to increase deliveries of iron ore pellets to 37 Mt/y by 2015.

Its mission is to produce two million tonnes of magnetite and hematite ore annually, giving it an approximate life span of eight years, although geologists say that it may be possible to continue mining here beyond 2018.

In its efforts to reach the goal, Gruvberget uses Atlas Copco equipment for all its drilling and blasting, including drill rigs for both topammer and down-the-hole work with DTH hammers, with all rock drilling tools supplied by Atlas Copco Secoroc.

The mine's iron ore is a tough challenge and the equipment is subjected to

constant wear and tear. However, things have improved considerably over the past year with the arrival on site of a brand new type of DTH hammer – the COP 66. It is Secoroc's newest addition to the COP family and is the successor to the well established and widely used COP 64 Gold.

COP 64 Gold has a solid reputation for speed, reliability and productivity, which has made it a firm favorite for more than a decade. It was therefore not without some scepticism that the drillers at Gruvberget put the newest addition to the test.

Iron ore challenge

COP 66 was introduced as “a new innovation in platform design – faster, lighter and more economical”. It is designed for drilling 165–171 mm holes with a drill bit equipped with 16 or 19 mm buttons, without a center flushing hole, and operates with air pressures up to 30 bar.

The drillers at Gruvberget wanted to see

for themselves if the hammer could live up to its description in their mine environment where the compressive strength of the rock reaches 300 MPa.

In order to reach the iron ore, a substantial amount of waste rock has to be removed – approximately 9 Mt annually. This is achieved by a fleet of three Atlas Copco SmartROC D65 drill rigs, three FlexiROC F9 rigs and one FlexiROC D9.

Leif Kemi, Production Manager and Senior Advisor at Gruvberget, explained that the ore contains high concentrations of iron, up to 65%, and that the mine has been relying more on DTH rather than topammer drilling simply because in these conditions DTH tends to be more efficient.

Kemi explains: “After using the COP 64 Gold for many years we were not sure what to expect from the COP 66, but it has made a big difference. It's lighter and shorter which makes it much easier for the guys to handle, but above all it is much faster. This has enabled us to increase our productivity most likely by 15 to 20 percent – and that's a lot of money saved.”



- COP 66 IN A NUTSHELL**
- ▶ Solid bit with no center flushing hole
 - ▶ 15 % faster penetration than its predecessor, COP 64 Gold
 - ▶ Easier to adjust for feed force and rotation
 - ▶ Unique new design and leaner air consumption
 - ▶ Less wear and tear on the hammer gives longer service life
 - ▶ Fewer parts makes it 30% shorter and lighter
 - ▶ More reliable and economical to run

Driller Jonas Selberg says: "At first we were not very impressed, but then we got used to it and everything improved."

Although Gruvberget sees distinct improvements in the new COP 66, Kemi emphasizes the value of drill steel management, and not least, bit grinding. "It is very important that the guys who sit in the rigs know what they are doing and don't run the bits down to scrap level," he says. "There are a lot of costs involved in these tools and if we can save money through better drill steel management it's important that we do it."

"I think the message that good drill steel management is absolutely vital has to be repeated over and over."

Everything improved

Besides excessive wear on the drill bits, Kemi also notes that hammers have often been dropped on the site and consequently damaged, but that this rarely happens now with the shorter, lighter COP 66.


Driller Jonas Selberg, agrees. He says: "At 69 kilos, the COP 66 is about 25 kilos lighter than the COP 64 standard, or COP 64 Gold, which makes it a lot easier to deal with. At first we were not very impressed. We didn't think the hammer was

all that powerful. There was also more noise and vibration in the cabin and the penetration rate was less than good. But after a while, when we got used to using it and controlling it in the right way, everything improved.

"Now we don't have to change the hammer or the bit as often as we used to. We can drill about 5 000 meters before it's necessary to change them. But of course there is always a risk when you are drilling in this hard material."

Selberg adds that the COP 66 is "not as sensitive" with drill settings as other

hammers. "You just set it up for waste rock drilling and off it goes. We experience a big improvement in penetration rate, too. Whenever I'm operating a different rig and my pal is using the COP 66, he is almost always half a rod ahead on each hole."

At the time of M&C's visit, the COP 66 had not yet been launched on the market. Selberg commented: "If it had been available I'm sure we would have changed all our hammers by now for the simple reason that it is easier to use and because our bosses want more drillmeters." 

“ It's lighter and shorter which makes it much easier for the guys to handle. But above all, it's faster.



Leif Kemi Production Manager and Senior Advisor, Gruvberget Mine



Insight On **LATIN AMERICA**

Our report from the Ituango hydropower project in Colombia in this issue is a clear reminder that economic growth and prosperity in the countries of Latin and Central America is deeply rooted in their natural resources. Here, **Jon Torpy**, a man with close ties to the region, shares his impressions.

Q: How do you see the region today?

A: Having grown up in Peru during the first half of my life, it is amazing to see the changes that have taken place over the past decade. The Peru of today, with its larger middle and upper middle class, is certainly not the Peru I grew up in during the eighties. People have some disposable income now and they want the opportunity to buy nice things, have nice homes, take nice vacations and provide a better life for their kids. They can now realize these opportunities within their own country.

Q: Do you see the same trend across the whole region?

A: Yes, I think the same sort of economic confidence can be seen almost everywhere. Take Colombia, for instance. I remember traveling there eight or nine years ago and I had to carefully plan the itinerary based on U.S. State Department recommendations due to the activities of the FARC guerillas. Since then, the country has really focused on fighting terrorism and that has contributed to the economy, which is thriving. A few years ago, nobody would have dreamt of going to Colombia on vacation, but today it is growing in popularity and it's a beautiful country.

Q: Will this economic growth continue?

A: Yes, no doubt about it. I think NAFTA was probably one of the catalysts for some of the growth, and that concept can now be seen in The Pacific Alliance which includes

Chile, Peru, Colombia, and Mexico. The Pacific Alliance will enable more growth to take place and many of the countries will further diversify their exports. With agreements like these, the countries and people can work closer together. The boom in China has also helped to accelerate growth in the region.

Q: How noticeable are these changes?

A: Well, take air travel for one thing. It's better than ever. The large number of available flights represents a big change. When I grew up in Peru, a plane was considered on time if it left on the day it was supposed to leave. Today, with investments in infrastructure related to air travel, they are better at departing on time than the flights I take in the U.S. these days, and I may have two or three airlines to choose from, whereas before I had one.

Q: What about Atlas Copco's reputation in Latin and Central America?

A: My experience is that we enjoy very strong recognition and respect throughout the region. We are seen as a company that customers trust, and that's very important. The fact that Atlas Copco has been in these countries through good times and bad – in some cases, very bad – helps to demonstrate that we are there to stay.

Q: How do you see the construction sector developing?

A: It seems there is a lot of investment


pretty much everywhere. I have been told that there are something like 700 approved hydroelectric projects in Latin America. The roads have gotten much better and, as I said, flying has become much easier with investments in airports. When I was in Brazil last year, I think every airport I spent time in had a huge construction project under way associated with the upcoming World Cup and the Olympics.

Q: What role does mining play here?

A: Mining has always been an important part of the region's economy and for the past decade it's been booming. When it comes to mining, Latin America has a bit of everything and if you throw oil and gas into the definition it becomes even more important. Brazil is a key world supplier of iron ore, Chile is the global leader in copper production, Peru has copper and gold, and Mexico has silver, copper, and gold. Colombia and Venezuela have coal. For these countries, mining and mineral exports play an important role in the economy.

Q: How is Atlas Copco supporting these customers at this time?

A: It is important that we continue to be present and invest in our capabilities to support the region. We need to be actively working with our customers, understanding their businesses, and offering solutions where we have expertise. There is a lot of talk about cutting costs and we need to listen to our customers and partner with them to ensure they are successful. Cutting costs is not all about lower prices. That may be part of it, but our customers will pay for innovative solutions that help to reduce operating costs, which is something we excel at. We must also provide great after sales support. With our



Jon Torpy is Vice President, Marketing - Blasthole Drills, at Atlas Copco Drilling Solutions, in the USA.

rotary drills it's not unusual to accumulate as much as 6 000 hours of runtime in one year. That doesn't leave much room for unplanned downtime. Also, having capable service teams in place that can respond quickly when needed is key to making sure we continue to be first in mind and first in choice.

Q: What about remanufacturing?

A: Remanufacturing is important in helping companies to manage their Total Cost of Operation (TCO). Having a reman part that can perform and live as long as a new part, but at 70 to 80 percent of the new price, can make a big impact on running costs. We have taken some steps to develop this service in Latin America but there is still a lot of opportunity for expansion.

Q: What are the main challenges and opportunities going forward?

A: For the mining industry, the direction of

China will be important and, as it appears now, a challenge, as their consumption of raw materials slows. With lower mineral prices, mining companies are working hard to make their businesses more efficient to ensure they can weather the storm. Government and currency stability will continue to be important. Countries with efficient mines and government policies favorable to mining will continue to see opportunities in this sector.


Q: Is the concept of sustainable productivity alive in the region?

A: Yes, in most countries, but not necessarily to the high standard we set at Atlas Copco. There is definitely progress being made in most areas. We are dealing with global companies and many of them have adopted policies where they will not compromise their standards of safety or sustainable productivity, just because local laws give them the flexibility to do

so. Instead, they have decided they will use the same high standards as they use in other operations. These commitments flow over to their suppliers who then instill the same types of policies, helping to raise the bar for the whole industry.

Q: What will the next 10 years bring?

A: I think many of the countries have the opportunity to be successful over the next decade, and even with slips in mining there are other sectors that will continue to develop, including oil and gas, industrial manufacturing, agriculture and tourism.

In Chile, for example, mining continues to be the top export, but they are seeing strong growth in other segments too such as agriculture, forestry, and fishing. And Brazil has established itself as a key exporter of industrial products such as airplanes and automobiles as well as agricultural products. 



Good combination: Atlas Copco crushers (top right) and screener (above) work in tandem at the Prospectini quarry in Hunedoara.



POWERCRUNSHER the benchmark in Romania

Leading quarrying company Prospectini of Romania, recently invested in modern stone crushing equipment to increase its aggregates business. The result was a new benchmark for the industry.

New infrastructure projects launched in Romania at the end of 2012 gave local quarrying companies new opportunities. One of these is Prospectini, a leader in geophysical and geological services.

With 60 years of experience and operations in Europe and North and West Africa, Prospectini wanted to develop its aggregates quarry in Hunedoara in central Romania which required investing in new equipment.

The company decided to purchase a Powercrusher PC6 jaw crusher, a Powercrusher PC21 cone crusher and

two HCS 5515 screeners, all supplied by Atlas Copco.

The hard basalt in this quarry tends to produce flacky material which is difficult to control. The local Atlas Copco team began to work together with Prospectini to find a solution that would ensure that the end product, as well as the productivity level, lived up to the quarry owner's expectations.

The most efficient solution, both technically and costwise, was to supplement the system with a tertiary impact crusher. But before submitting this alternative for consideration,

Atlas Copco proposed that a test be conducted with a Powercrusher PC 1060 I unit that could shape the end product. Equipped with two worn and two new hammers, this crusher proved its worth by contributing to the production of high qualitative final products. The low wear costs and good fuel consumption along with the innovative technical advantages and compact design were also deciding factors.

After a successful test, Prospectini added a Powercrusher PC3 crusher to its fleet, which was the right size of machine for the production volume.

Artur Hajer, Atlas Copco Romania's Country Manager, says: "Our team's constant involvement and customer support helped to uphold our brand promise of sustainable productivity." ◉



also streamline servicing. Multiple services such as water, fuel and visual inspection will be performed at once, more efficiently. Combined with the decreased downtime at shift changes, automation promotes greater Pit Viper utilization.

Penn emphasizes that transitioning to automation requires unified dedication from all management groups at a mine, from senior management to IT and human resources departments, to drilling, planning and blasting. Then the mine has to integrate with the supplier. Penn's customers set up cross-functional teams to work with Atlas Copco as they incorporate automation into the mine's operations.

The rewards make the integration process worth it, he says, resulting in predictable productivity that will help the mine accurately calculate capital from its drilling and blasting plans. Penn adds that automation also brings a greater level of equipment reliability, making fewer mistakes than human operators, and that everyone is happy from management to investors.

Commonality and dynamic integration



TYLER BERENS, Atlas Copco's Product Line Manager for automation products on surface drills, says: "Automation isn't about having a good day or a bad day. It's about having a predictable and repeatable day." He says that kind of consistency

arises from two points about Pit Viper automation. First, the automated features are based on the RCS system which is familiar to all drillers who have operated Atlas Copco RCS-equipped rigs. Therefore, commonality of the operating system, similar ergonomics and drill functions reduce training time as drillers adjust to auto-modes. Secondly, if a mine wants to add drills to its mine plan, multiple Pit Viper rigs can be operated by the same operator or by multiple operators, in the safety and comfort of the teleremote control center. Dynamic integration is part of Atlas Copco's Automation DNA.

"Upkeep of the automation was meant to be simple, as well," adds Jon Torpy, Atlas Copco Drilling Solutions VP of Marketing for Blasthole Drills. "We train existing technicians on Pit Viper maintenance, and we stand behind it. As you can see, we have the capacity to support this product around the world. The result is predictable, reliable and efficient productivity, shift after shift."

“ Automation is all about having a predictable and repeatable day.

And with Pit Viper drills, monitoring and supervising is a remote feature that can be done as easily in the cab as back in the office, at the mine or anywhere in the world. Berens gives an example of putting technology to work at a coal mine running two PV-275 rigs. One PV-275 uses RCS electronic control while the mine's newest PV-275 has received automation upgrades that include auto rod changing and teleremote operation.

Auto Rod Change, smooth and consistent



BRYAN SCOGGIN, one of Atlas Copco's drillmasters, commissioned the PV-275. Scoggin, who has years of experience of rotary drilling in just about every type of material, says when he commissioned the first Auto Rod Change system for this operation, he was "blown away" by its performance. "I have plenty of experience with changing pipe in multi-pass operations, and while I may beat the system over a couple of holes, it usually beats me over the course of a few hours of drilling. The Auto Rod Change is one of the smoothest most consistent automations that





I have had the opportunity to work with.” Berens adds that the mine concerned prides itself on its world-class productivity and looks to use automation to eliminate variances from shift to shift and driller to driller. As the auto rod changing feature demonstrates, automation helps newer drillers reach the productivity of experienced drillers faster. Atlas Copco has seen consistent per-

“ The Auto Rod Change is one of the smoothest systems I have ever had the opportunity to work with.

formance from the PV-275 with automated systems in line with some of the mine’s better operators. Berens explains: “While it can’t out-drill the best operators yet, it is able to keep up with and out-drill many of them consistently, shift after shift, day after day – and that’s the real payback you get from the RCS technology.”

He continues: “The operators at this mine told us in the beginning that they had their doubts, but they regularly comment now on how impressed they are with how well the technology works. In the end, that’s what’s important, that we have a reliable, mine-ready product that has a real impact on the overall performance of the mining operation.”

This same coal mine has recently put teleremote operation to use. Scoggin pointed out how easy it was for the operators to make the transition from drilling on board their drill to running it teleremotely. “They already had one RCS-equipped PV-275. The two run the same, so the drillers knew what to expect,” he says. “Several operators told Bryan that they couldn’t believe how simple it was and that in the future they couldn’t imagine who would want to go back on a rig after sitting in the comfort of the teleremote station.”

A matter of comfort and safety

CHRIS GRAVES, Sales Support Manager for Atlas Copco Drilling Solutions in Canada, says the first mine to use teleremote in his country had approached Atlas Copco for a solution to overcome two major safety concerns. One, the region is plagued seasonally by severe electrical storms. Lightning detectors placed well beyond the mine’s periphery give it sufficient lead time to safely recall drillers from their rigs who sit exposed to the storm on open pit benches. The drillers take shelter in a building to wait out the storm. During such storms, which can be daily occurrences, the mine had been losing two to three hours of drilling. Two, the mine also wanted to extend its surface pit over a historical network of underground workings. Remote operation removes any concern for the driller’s wellbeing over a previously worked property.

Atlas Copco upgraded the Canadian mine’s PV-235 with a teleremote kit. That first drill was operated from a protected operator station installed on the bed of a pickup truck. It was so successful that the mine ordered another conversion, this time mounting a PV-235 cab on a trailer, which can be relocated by a wheeled truck or tracked vehicle. The cab is compact enough to move easily about the mine yet gives the operator the same room and comfort of the rig itself, without any of the noise or dust.

The remote control station does not need to be within sight of the rig, since every gauge and display on the rig is cloned within the station. In principle, the only limitation for how far the remote

control facility can be from the rig is the capability of the network used for remote communication. The customer has the choice of running teleremote on the customer’s own wireless network or on a separate radio network set up by Atlas Copco.

Berens says user-friendliness was a design feature of the automation products. “Atlas Copco automation is meant to be easy, intuitive and simple.” This ease of use supports operation of multiple rigs from a single operator’s station.

Graves points out that the Canadian mine has been successfully controlling two PV-235 drill rigs simultaneously. “From a single remote operating station, the driller moves one drill over its hole and starts the auto-drilling process, and then moves the second drill over its hole and begins its auto drilling process.” He adds that the mine may choose to have a single driller controlling more machines, but sees sufficient benefit in just being able to cover for a driller who is sick or has taken time off, or being able to add drills without waiting to add new drillers.

As robust as the operating platforms



JON TORPY, Atlas Copco’s VP Marketing for blasthole drills, describes the development and release of Atlas Copco technology systems. “As a former mining engineer who has worked in open pit mining, I feel very strongly that we need to release mining-ready technology. The technology on the Pit Viper has to be as tough as the Pit Viper drill itself, and we have now demonstrated that we can do that with technology running in multiple types of mining environments around the world. Developing the technology to be efficient is just one piece of making it successful. Designing it to be robust and to fit within the existing maintenance infrastructure of our customers is the other piece.”

“ The technology we put on the Pit Viper has to be as tough as the Pit Viper drill itself.

Berens emphasizes that Atlas Copco subjected all technology to the most extreme conditions it could find. This was to ensure that the automation products would be at least as robust as the operating platforms of the Pit Viper family. Pit Viper drills have been subjected to years of use in the dust and extreme heat of the USA’s desert copper mines in Arizona, as well as in the extreme subarctic cold of interior Canada and Northern Europe. Teleremote operation of a PV-235 in the Canada mine, for instance, was unaffected during this past winter even in temperatures that fell below –40°C (40°F). The Chilean copper and molybdenum mine’s PV-351 rigs have no trouble operating at an elevation of over 3 500 m (11 400 ft).

Both Torpy and Berens say that 2014 is going to be an exciting year with “much more to come in the way of technology”. Multi-rig remote control is the first in a series of high-tech advancements that are planned for launch in 2014, with fully autonomous drilling now a realizable target in the not-too-distant future.

Scooping up the praise



New Scooptram ST18 passes tough Swedish test

Loading operations on the steep ramps and tight bends of Sweden's Kristineberg Mine are known to push most types of underground LHDs to the limit. Atlas Copco's new Scooptram ST18 took the challenge in its stride.

The Kristineberg Mine is the oldest mine in what is today known as the Boliden Area near Skellefteå in the far north of Sweden. Opened in 1940, it has been producing zinc, copper lead, gold and silver ever since.

The ores, which consist of many separate formations, are located in two parallel veins, 500–800 m apart. Nowadays, cut-and-fill mining takes place at a depth of 1 350 m and the steep ramps and tight bends here are a tough challenge for all types of loading equipment, often stretching loading and haulage vehicles to the limits of their capacity.

That's one of the main reasons why Atlas Copco chose the Kristineberg mine as the testing ground for the latest addition to its LHD range – the new Scooptram ST18.

This is a high performance, 18 tonne capacity underground loader for large scale operations, including development work and production mining. It is designed for both the optimal loading cycle and highest uptime as well as maximum support and protection for the operator. In addition, it is the perfect companion to Atlas Copco's range of underground Minetruck trucks.

When the Scooptram ST18 arrived at the mine it was put through its paces for seven

months, and according to Patrik Olsson, Production Manager, the results were "beyond expectation".

"I think the test went much better than we had imagined," he told M&C. "To start with, the machine caused very little disturbance to our operations, which was a good thing, and we also maintained a high level of production the whole time, which I was personally very satisfied with."

Impressive newcomer

From a performance point view, operators Magnus Lindblom and Hans Sandström both describe the newcomer as "impressive". Lindblom says: "It's smooth, flexible, and very easy to drive. The hydraulics are great and it trams nicely and gently when fully loaded. But the best thing about it compared to competitors' machines is the

*Inside the Kristineberg Mine:
The new Scooptram ST18 is
put through its paces.*



Easy to drive and less tiring: Operators Hans Sandström (left) and Magnus Lindblom (right), agree that the Scooptram ST18 made a big difference to their working day.



Better than expected: Erik Hedström, Maintenance Planner (left) and Patrik Olsson, Production Manager (right) gave the Scooptram ST18 full marks for serviceability.

sitting position and the Atlas Copco footbox which enables you to have your legs in front of you. This means you don't get so tired, you can work longer shifts and it makes a big difference to how you feel at the end of the day."

Strong and stable

Sandström, who operated the Scooptram ST18 from the first day of the trials, added that he was impressed with the loader's stability as he trammed at speed on the steep ramps and maneuvered a full load round the restricted corners and bends.

"It's very strong and stable, which means you can keep up a good speed all the time and the turning radius is fantastic," he says.

"The machine is pretty wide but you don't get a sense of that when you're driving. There's no swaying around at all and it stays very stable even if you drive over a boulder. This makes the work cycles fast." Sandström also notes the vehicle's braking

system which he says is "like driving a car, only bigger".


Overall comfort and the low noise level also get full marks from both operators.

Erik Hedström, Maintenance Planner at Kristineberg, says he was surprised by the low level of faults during the test. "Considering it was a prototype, the ST18 proved to be very robust. "The guys in the workshop were particularly pleased with the trunion cap joint on the bucket system which made it quick and easy to dismantle and reassemble, and we found that all the service points were easily accessible."

Other key features and benefits of the new Scooptram ST18 include:

- Optimized bucket and unique boom design with load sensing hydraulics and variable displacement pumps which increase capacity and speed.
- Computerized Atlas Copco Rig Control System (RCS), which monitors, supports and controls all aspects of the operation.

- The operator sits in a FOPS/ROPS approved cabin with air conditioning and extra leg room.
- Many standard safety features including protection guards, three-point access system, safety latches, boom lock-up, fire suppression systems, automatic brake test and a machine protection system monitoring the engine, transmission and hydraulics.

The Scooptram ST18 can also be equipped to run semi-autonomously or by radio remote control. 

FOOTNOTE: Kristineberg mine became world famous in 1946 when the effect of a blast at a depth of 90 m left a remarkable image on the rock wall that many believe represents Jesus Christ. As a result, the ecumenical church of Saint Anna – the patron saint of miners – was founded at this spot and is the only underground church of its kind in a mine.



The Easer way: This new, highly mobile raiseborer from Atlas Copco, is specially designed for creating small-to-medium sized opening holes in orebodies ahead of production drilling and blasting.

INTRODUCING EASER

– a better way to create opening holes in underground mining

Atlas Copco has launched a new type of raiseboring rig that is specifically designed for creating so-called opening holes in underground orebodies. Compared to conventional raiseboring equipment, the new mobile unit, slashes the time it takes to do the job.

Large scale mining is a growing trend featuring variations of both caving and stopping methods. Using these methods, the first blast is always the trickiest and the technique used has to be well matched to local conditions.

In the caving method, the first blast is always a blind, upward raise, while in stopping methods both upwards and downwards drilling are commonly used.

Raises produced by drilling parallel holes, and large holes produced by raiseboring, are the two most common ways of creating openings. Both techniques use drill and blast, but in different ways, and both take a disproportionate amount of time and can often give less than satisfactory results.

Now there's a better and faster solution when it comes to the raiseboring technique

with the introduction of Easer – a highly versatile and mobile raiseborer, specifically designed for producing small-to-medium sized openings.

The Easer rig bores opening holes of 750 mm in diameter and up to 60 m in length, using standard 203 mm (8-in) pipe and a 228 mm (9-in) pilot drill bit. Apart from electricity and water connections, no other site preparation is necessary and all equipment, except for the drill rods, are part of the carrier. In addition, and perhaps most importantly, the Easer is wheel-bound, making it exceptionally easy to move to wherever it is needed in the mine.

The machine drills both upwards and downwards (other raiseborers are designed to do either one or the other) so that it can

perform downreaming and conventional raiseboring as well as boxhole boring.

In the standard raiseboring mode, the Easer can bore raises up to 1200 mm in diameter. To switch from boxhole boring (upward) to downreaming (downward), the machine's gearbox is rotated 180 degrees, a simple operation which can be carried out in the underground workshop.

During tests in Sweden, Easer proved that it can significantly reduce the working cycle for opening holes, compared to conventional raiseborers, mainly due to the rapid setup and takedown time.

Read more about opening holes in Technically Speaking, page 32.

For more on Easer, see YouTube and the Atlas Copco page on Facebook.

Footnote:

The name Easer is derived from the expression "ease off", meaning to release pressure in the rock mass.

The OREalyzer value

– a new technique for pinpointing ore in the bench

Atlas Copco plans to offer a device later this year for bench drilling that enables open pit mines to track and analyze valuable minerals while drilling is in progress.

Production drilling and blasting in open pit mines has one mission – to separate the valuable minerals from the waste rock. Now these operations can be made significantly more efficient with a new device that keeps a track of the contents of the bench in real time.

Called OREalyzer, the device, which is integrated into the SmartROC D65 drill rig, pinpoints the location of the ore, analyzes its quality and identifies waste boundaries while drilling is in progress.

Olav Kvist, Product Portfolio Manager at Atlas Copco, says: “By knowing exactly where the ore is located, the mine can potentially get far better ore recovery. This means that mines can extract more value from the blasted material and increase the amount of sellable material in the bench.”

Furthermore, by processing more ore and less waste, the throughput time in the mill is

increased. This saves energy and water and reduces the environmental footprint due to less loading and haulage per tonne. Log files are sent automatically to the mine office through the RRA (Rig Remote Access) option, enabling early decision-making on blast design as well as loading priorities. In addition, the OREalyzer reduces the need for personnel to collect and handle samples on the bench which increases safety.

The OREalyzer can be used with both DTH as well as RC drilling (Reverse Circulation) and integrates with “acQUIRE” production databases.

The OREalyzer will be available in two different versions, covering both production drilling and in-pit grade. Kvist continues: “The product strategy is one of empowering the local geologist with a new tool, turning the drill rig into a sensor. This will revolutionize the way mines create value.”



What's in the bench? The OREalyzer, fitted here on the SmartROC D65 (insert), provides answers while drilling is in progress.

New remote station for surface drillers

Atlas Copco has pushed the boundaries of automation forward in surface mining applications with the introduction of a unique remote control station for all SmartROC D65 operators.

Bench drillers no longer have to sit in the cabins of their drill rigs to operate them in hazardous environments – they can do their job from a safe distance.

That's the basic concept behind BenchREMOTE, a new operator station designed by Atlas Copco for bench drilling at drilling sites where benches may be unstable or steep and precarious.

Using a closed network video camera system, the operator is able to drill closer to the bench wall without having to take risks. The station can be used up to 100 m from the drilling area and 30 m above the rig, on condition that the operator has a direct line of sight with the drill rig doing the work.



Available from mid-2014: The BenchREMOTE station allows the surface drill rig operator at a potentially hazardous worksite to control the rig from a safe distance of up to 100 m.

And it is not only a question of safety. Mattias Hjerpe, Product Manager says: “The BenchREMOTE can handle up to three SmartROC D65 rigs in parallel. This multiplies the operator efficiency and was made possible by the full drill cycle automation.”

Communication, including machine control and safety functions is via a closed WiFi network making the product totally

independent of local network infrastructure.

The station is designed to be installed in a vehicle, trailer or container and all controls and screens are the same as in the real rig cabin. A prerequisite is that the rig is equipped with the Atlas Copco Hole Navigation System (HNS).

All SmartROC D65 drill rigs can be upgraded for BenchREMOTE operation.

A NEW OPENING

to save time and money

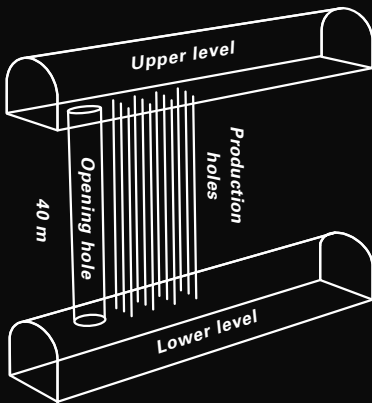


Fig 1. The start of production, showing the vital opening hole which eases the pressure of the rock mass, allowing the first production hole to be blasted safely and with the required fragmentation.

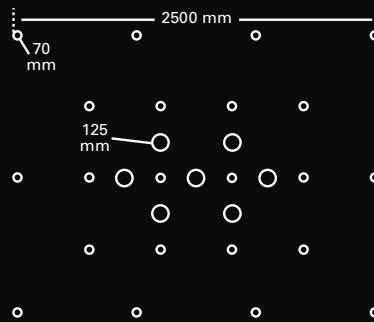


Fig 2. One example of many alternatives for blasting an opening hole using long-hole drill rigs. In this example, 29 holes are drilled with a diameter of 70 mm. The seven empty holes are then reamed to a diameter of 125 mm.

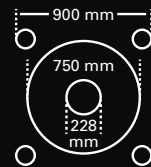


Fig 3. The pattern for an opening hole using the Easer raiseborer. The hole can be produced in one or two steps using a 228 mm diameter pilot hole which is then reamed up to 750 mm, a process that takes considerably less time.

By Johnny Lyly, Product Manager Raiseboring Equipment, Atlas Copco Underground Rock Excavation.

Before production gets underway in an underground mine, the technology has to be chosen for creating the opening raise for production blasting. The opening hole is the limiting factor, especially in large scale mining methods, and large diameter opening holes also open opportunities for mine planners to save time and money.

When it comes to productivity in underground mining, most of the attention is focused on long hole production drilling. However, to become truly efficient, it is important to review every stage in the production chain.

One example is the technology used for creating vertical opening holes in the orebody before production blasting begins. In stoping methods, the opening hole often connects two levels, while in caving it is drilled as a blind raise from the lower level upwards to the cave.

To succeed with the blasting of the opening hole it is of the utmost importance not to disturb or totally block the next steps in the production.

Different techniques are applied to create

the opening holes. Long parallel holes, or slot drilling for blasting of a raise, can be drilled with topammer drill rigs such as a Simba. The risk of hole deviations limits the length of the raise, especially in fractured rock formations where blasting can also be complicated.

What mine planners prefer

DTH hammers and cluster drills can create larger hole diameters with less deviation, but the compressed air requirement and energy cost are very high. The raiseclimber method produces a large opening and is still used by some mines, but the working environment for the drillers is unfavorable and unacceptable in some countries.

What mine planners really prefer is a

long, straight, large diameter opening hole since this will require only a few surrounding blast holes to give the best output, using less explosives as well as minimizing the risk of failure.

A long opening hole without deviation makes it possible for the mine planners to increase the distance between the levels, which provides for huge savings in mine development costs. Also, the time and costs for production drilling and blasting will be reduced when larger volumes of ore can be blasted and excavated in each stope.

The raiseboring technique has the advantage of producing long and large diameter holes with optimum precision and a minimum of deviation. But conventional raiseboring is quite time consuming – sometimes taking as much as 2 to 3 days, including setup and takedown, and may involve a crew of 3 operators. In addition, conventional raiseboring machines require a concrete base to stand on and have to be fixed with tie-down bolts for stability. They



The Easer in action: A new, mobile raiseborer specially designed for fast and easy production of small-to-medium sized opening holes. Note the cylinder stingers that stabilize the rig, four up and four down.

are also heavy and difficult machines to move around.

Considering that many mines produce about 50 opening holes per month, and some as many as 70 per month, this is clearly an area where significant improvements can be made. Several of our mining customers recently challenged us to come up with a better solution which is why we have now introduced a new type of raiseborer – Easer.

Easer is a highly mobile unit, specially designed for creating opening holes of 750 mm in diameter and up to 60 m long. Moreover, Easer can be used for boxhole boring and downreaming as well as conventional raiseboring. In upwards boxhole boring, the job can commonly be done in one step. A 300 mm tricone pilot bit is mounted about 1 m ahead of the reamer which has three Magnum conical roller cutters. In some cases, the reaming has to be done after completion of the pilot hole, i.e. a two-step operation.


Compared to the drill and blast method, using several smaller holes or a slot of several smaller holes, the large empty hole

will only require a few, small, surrounding blastholes (Fig 2 and 3). With a swell factor of 50–60% after blasting, the mine planner can rest assured that the large empty hole will always provide for successful blasting of the opening hole, even when extending the length and the distance between the levels. Furthermore, as Easer is a raiseborer on wheels, there is no special site preparation required and the machine can be easily and quickly moved to different locations.

In developing Easer, our mission was simple: to reduce the time for orebody openings. During tests we found that the total working time for a 40 m long opening hole, from setup to take down, could be considerably reduced compared to conventional raiseboring. Consequently, this concept has the potential to generate significant savings for mines around the world.

The safety factor

From a safety point of view, Easer is also a better alternative. As shown in Fig 2, the topammer (or DTH) drill and blast method requires several large empty holes to be

drilled and surrounded by many smaller holes which then are charged with explosives and blasted. Long-hole drill rigs are highly effective tools for this task – they can be positioned quickly and offer high penetration – but since their hole diameters are small and deviation is common, this limits the length of the opening holes. Deviation always affects rock fragmentation and may result in the need to carry out secondary blasting. In the worst scenario the opening hole may have to be abandoned altogether, with the added danger of unexploded charges still remaining in some of the drill holes. With Easer, all of these issues are no longer valid and the mine planner gets peace of mind. 



Johnny Lyly is Product Manager, Raiseboring Equipment, at Atlas Copco's Underground Rock Excavation division in Sweden.

Australia's new **GOLD STANDARD**

“ This loader promises performance levels that are up there with the benchmark levels in the industry.

Grant Wells Underground Maintenance Superintendent, Stawell Gold Mine



The Stawell Gold mine in Australia is the first mine in the world to take delivery of the newly launched Scooptram ST18 loader from Atlas Copco. Grant Wells, Underground Maintenance Superintendent, is optimistic about the new member of the fleet and its future contribution to production.

To say Grant Wells has seen a lot of change at the Stawell Gold mine in Victoria, eastern Australia, would be an understatement. One thing he probably

didn't expect to see was a machine that would change his view of the underground loader world.

Wells has been Underground Maintenance Superintendent at Stawell for the past eight years and has worked under five mine owners. Current owner Crocodile Gold, based in Canada, has built a significant Australian gold production base around Stawell and Fosterville in Victoria, and the re-emerging Cosmo gold field in the Northern Territory.

At Stawell, upper-level remnant mining produced 141 126 tonnes at an average grade of 2.49 grams per tonne in the first quarter of this year and site output is about 40 000 ozpa.

Just arrived is the newly launched Scooptram ST18 from Atlas Copco, an

18-tonne LHD that Wells believes will establish a strong profile in the demanding Australian market.

“I see this as a big step in their [Atlas Copco's] loader development,” said the 20-year veteran of mine equipment maintenance, supervisory and management roles.

“This unit promises performance levels that are up there with the benchmark levels in the industry. As far as I am concerned they are miles above where they were [with previous generations of Atlas Copco LHDs]. I think this is really something that is going to compete in the market.”

A first for Crocodile Gold

Stawell is the first to take delivery of the new Scooptram ST18 worldwide, and just ahead of leading underground mining contractor, Byrnegut with the second unit.

Officially launched in Australia at the recent AusIMM 2014 Underground Operators' Conference in Adelaide, the Scooptram ST18 completes Atlas Copco's new generation underground loader range.



In action: The new 18-tonne Scooptram, ready for work at Stawell for its new owner, Crocodile Gold.



The new arrival and a new era: The crew at the Stawell Gold Mine including Atlas Copco technicians and product specialist, proudly pose for a group photo with the new Scooptram ST18.

It was introduced as the most productive LHD in its class, and designed to efficiently load Atlas Copco's market-leading 60-tonne capacity Minetruck MT6020. The two units share many common parts and control system components, which can substantially reduce the total cost of ownership.

The bucket and the unique boom design, combined with variable displacement pumps, provide safe and efficient operations. This, together with the proven Atlas Copco Rig Control System, which monitors, supports and controls all aspects of the operation, results in superior muck pile penetration, less wear and tear on the machine and an overall faster and more productive loading cycle.

Good initial response

Atlas Copco has also been working with Stawell on operator training, with a purpose-built simulator that was on display at the Underground Operators' Conference.

"This machine will be integrated directly into the fleet," Wells said. "Operators will be changing from old loaders [of another

make] to this new one so they must be comfortable enough to be able to change and perform the same operational functions without any issues."

He adds that initial operator exposure to the cabin has been positive. "The first comment that we got from the operators was 'Wow, this is so comfortable to sit in and operate'. That's now got to be converted into a production environment of course, but early responses were good."

A smart machine

The ST18 is a 'smart machine'. Extensive onboard health and operating diagnostics can provide a real-time picture of the unit's performance. An advanced RigScan audit service offers a non-intrusive look at the equipment's running condition and performance, while the Remote Monitoring system can make production and maintenance data available through a user-friendly web interface.

"We'll be doing full downloads on it," Wells said. "We've got a Wi-Fi system in place so all of the information will be

downloaded and displayed on the dashboard for operators and crews to view so that they can see what the machine has actually done for the shift, and previous shifts, how many tonnes it's moved, and what its availability and utilization was. We'll also have a screen in the muster room where that data will be displayed for the operators to look at each day. I think there will be some internal competition for sure!"



Tracy O'Neil, Parts Supervisor, Atlas Copco Burnie branch, demonstrates the size of the bucket prior to delivery of the Scooptram ST18 to Stawell Gold Mine.

THE POWER of QUALITY

Skanska teams up with Atlas Copco in major cable laying project

A plan to safeguard electricity power lines in south-west Sweden is placing high demands on construction equipment such as generators and pumps – and contractor Skanska is leaving nothing to chance.

The electricity grid that supplies the south-western region of Sweden is being upgraded at a cost of more than EUR 750 million (USD 1 bn) and quality all down the line is paramount.

Called SydVästlänken (The South-West Link), the project involves the installation of new cables, both underground as well as above ground, stretching 250 km and some 270 km across open landscape.

Svenska Kraftnät, the Swedish national grid operator, is in charge of the project and has engaged the Swedish contractor Skanska to handle the bulk of the cable-laying work. Skanska, in turn, is using equipment from Atlas Copco to meet the project's demanding specifications.

The package includes high quality Atlas Copco QAS 14 and QAS 20 generators and Atlas Copco WEDA 30 and WEDA 40 submersible dewatering pumps.

"When Skanska was awarded the major part of the underground cable laying work we knew that we would need suppliers that we could rely on to deliver the quality that we needed," explains Magnus Johansson, SydVästlänken Project Manager, Skanska.

"The project takes us into remote areas without electricity and the requirements are demanding. After excavating almost one million cubic meters of rubble, we have to lay the cable. The base of each cable trench must be completely dry and laid with a special gravel of exacting specifications for compaction, drainage and cohesiveness."

Meeting expectations

Johansson continues: "We are happy to report that the WEDA pumps have lived up to our expectations. As well as keeping the excavations completely dry, the lower start torque, and lower current requirements allow us to run more pumps on a single



PHOTO: GUGGE ZELANDER

New power lines below ground with Atlas Copco equipment playing a key role in the project.

generator, improving productivity."

"Atlas Copco portable equipment is made for this kind of difficult project," agrees Abet Cantuba, Product Marketing Manager Pumps for Atlas Copco Portable Energy. "Skanska specifically needed equipment that could operate around the clock in a challenging environment, and that's what we've provided."

"Atlas Copco has delivered the reliability



The right stuff: QAS generators and WEDA pumps are among the products chosen by Skanska for their reliability.

and performance Skanska is counting on for the South-West Link. We have been so impressed with the Atlas Copco equipment we have on site, that we are planning to increase our investment as the project proceeds," concludes Johansson.

The aim of the South-West Link is to increase transmission capacity and robustness and to avoid disruptions in this part of the country when the weather is dry and consumption is low. This has resulted in incidents such as a major power outage in September 2003 that affected southern Sweden and Denmark's Sjælland region.

The South-West Link will tackle these issues by transferring high voltage direct current (HVDC) electricity (300kV) through the 270 km underground cable and high voltage alternating current (HVAC) electricity (400kV) through the 250 km overhead power line.

The project got underway in 2012. It is due to be completed in 2015 and will increase transmission capacity by about 25 percent.

AHEAD OF THE GAME

Mining Contractor Watpac Civil and Mining of Western Australia, believes that a comprehensive understanding of equipment, and of lifecycle costs, is crucial to its future. That's why it is the first company in Australia to introduce the SmartROC T45 drill rig.



With major clients in mining and secondary processing operations in Western Australia, Queensland and Victoria, Watpac Civil & Mining insists on the best tools to build and sustain competitive advantage.

As Brendan Vaughan, Mining Manager, says: "The three cost drivers we have, and that we base our bids on, is the cost of the productivity to be achieved, the cost of the provider and the cost of the people. As a service, we have to be good in those three areas. But we can't necessarily be good at everything, so our focus is to be the best with certain pieces of equipment within our business model.

"We want to be the best in Australia at operating equipment in the 100–200 tonne range, and that means understanding the lifecycle cost of the equipment better than anyone else."

Vaughan says Watpac's decision to expand its fleet of Atlas Copco SmartRig ROC F9 C topammer drill rigs was not only based on the technology, but also on the support provided by Atlas Copco. It was also important that the two companies

were able to work closely together on the application.

"Just because it works in the north of Sweden it doesn't mean it can be started up at Mt Magnet in Western Australia, in the middle of summer, without the full attention of relevant technicians and expert," he adds. "I think my job as a responsible engineer and an officer of Watpac is to make sure we have a strategy that is fully supported from the manufacturer through to what we're doing for our clients nationally, across multiple remote sites.

"We want to be innovative and we want to work with people who are innovative; that's important to us. It's about innovation that works. The SmartROC T45 drill has been an incredible piece of technology to put out there to our clients."

Great fuel efficiency

Watpac has been putting Australia's first SmartROC T45 through its paces at the Mt Magnet gold mine, owned by Ramelius Resources, in WA's Murchison district. After three months on site, it was confirmed that it burns considerably less fuel than its

predecessor, the SmartRig ROC F9 C.

Vaughan explains: "That's highly significant because if we get savings of 30% on fuel – and we are seeing better than this – it means that the engine is wearing out less quickly, and that has a tremendous impact on your lifecycle maintenance strategy for running the drill.

"There is always a big focus on engine life with these track-mounted machines. There is a direct correlation between fuel reduction and frame life, and that's a much bigger saving. The fuel saving is just the tip of the iceberg."

Vaughan says the promise of maintenance cost savings related to the simplified hose and fitting layout of the SmartROC T45 was likely to become evident after 7 000 hours or so of operation. Higher drill penetration rates with the extra 5kW of rockdrill power (now 30kW) were also expected once some early rod changing challenges had been overcome.

"We put the SmartROC T45 in the hardest rocks – basalts and dolerites – and banded iron formations which are essentially the three types of drilling applications faced at



First of its kind in Australia: The SmartROCT45 at the Mt Magnet gold mine in Western Australia.

Mt Magnet,” Vaughan says. “It’s not the granite and gneisses they test these rigs on in Sweden. Basalts and dolerites aren’t for the faint of heart, and BIFs (banded iron formations) tend to be dense and a little bit abrasive, too. It’s a good test application for the technology.”

Vaughan says the benefits of modern technology on board the new generation rigs, such as the Atlas Copco Rig Control System (RCS) and satellite-based hole navigation system (HNS), had been demonstrated with the SmartRig ROC F9 C and that these are now an integral part of Watpac’s productivity push going forward.

The HNS uses data from mine planning software to accurately guide and control setup without operator intervention, while gathering streams of useful information (hole depths, meters, penetration rates) during drilling. In full stride, the ‘autonomous’ drill rig does not require manual pit mark-ups and could ultimately be operated from outside the pit.

The happy people

“Some of the happiest people at Mt Magnet are the surveyors,” Vaughan says. “They don’t have to go out and put a hole in the ground anymore. They can be off doing

other things rather than setting up the drill and blast patterns, and our blast crews don’t have to mark the ground either.

“When I hear at our sites that ‘we need to have our ground stations set up to be able to run our smart drill’, it is music to my ears. It means the technology is being used and we are getting the advantages from it.

“I think it is interesting where this technology is taking the industry. It’s made drilling possible for people who are less skilled. So if you add in the more powerful rock drills, and the improved lifecycle cost, and the other benefits, that’s what we’ll be able to pass directly back to our clients.”

Vaughan adds that the Atlas Copco support for the rigs has been first class. “I haven’t heard of any occasion where they haven’t been there ready to respond to our needs, and that’s very important,” he said.

Vaughan said he could not confirm exactly when the SmartROC T45 trials would come to an end. “I don’t think they’re going to get their drill rig back,” he said with a smile. “They’ll have to ask me very nicely.”

“We want to be the best, and that means understanding the lifecycle cost of the equipment better than anyone else.”



Brendan Vaughan Mining Manager at Watpac Civil & Mining.

Construction companies across the globe are demonstrating an increased interest in sustainable solutions in line with the powerful messages projected recently at the 36th CONEXPO-CON/AGG 2014 trade exhibition in Las Vegas.

On the rise for Sustainable solutions

Construction industry mood reflects spirit of U.S. show

More than 130 000 construction professionals from 170 countries attended this year's CONEXPO-CON/AGG show in Las Vegas, and the strong messages projected during the show appear to be having a positive impact. According to reports, the demand for energy-efficient, sustainable products has grown steadily over the past few months, clearly reflecting the interest generated at this premier event.

Among the leading voices was Atlas Copco with a booth that focused squarely on the importance of sustainable productivity and featured a diverse range of innovations. High power coupled with energy efficiency was for many a great source of inspiration.

For M&C readers who may have missed out on the construction event of the year, we present this recap of the main attractions:

Generators, compressors and pumps

Both ends of the generator spectrum have been expanded to include a QAS 50 portable generator (50 kVA), contrasting with the 1 MW QAC 1200. These generators greatly support the rental and general construction segments.

For those who rent or purchase large volume air, the new containerized XATS 1050

compressor has been introduced with a compact size-to-output ratio in a superior engineered package. Free air delivery at 1050 cfm at 10 bar, is easily switched on the control panel to 950 cfm at 13 bar for expanded versatility.

Where Tier 4 Final engine requirements could mean sacrificing packaging size or option, the XATS 1050 is available with either a Caterpillar or John Deere engine. This compressor, which produces 495 000 l/s of air, balances Atlas Copco's many options for foundation tooling or sandblasting on large projects.

The new XAS 400 PE compressor was also introduced and the addition of the 12 m³/min unit with the hardhat canopy will reduce maintenance costs.

WEDA pumps

The release of smaller, electric submersible pumps in the WEDA product lineup means customers can get even more material flow solutions from the same company that supplies and supports so many of the products on their job site. Having a single source supplier for pumps as well as air and electrical power will make purchase or rental easier for those who need these tools.

"Customers want simplicity. Having one company that can support their needs means less work for everyone, from the



shop to accounting," said Mark Taylor, Vice President for Atlas Copco's portable energy business in the U.S. Taylor emphasized: "We want to be a total solution provider for our customers in portable energy. The more we focus on the needs of our customer by supplying quality equipment, the more efficient and profitable he will be running his business."

Rock drilling tools

Rock drilling tools were also a major attraction at the show, from geotechnical core drilling to the many foundation drilling and tooling options for blast hole drill rigs both on the surface and in tunneling.

Gene Mattila, Business Line Manager for Atlas Copco, said: "We have every tool a contractor or driller would need to be more efficient on his project. Our engineers are constantly working on better and faster ways to drill a hole – of any size in any formation. We are a total solution



ConExpo recap: Far left, a giant-sized replica of the T45, threaded rocket bit; Clockwise from top: Discussing the benefits of the poly hood for the portable compressor XAS 185 JD7; Atlas Copco's AI Watry reviews the COP 66 Gold DTH hammer for visiting customers; taking a look at the FlexiROC T45 surface crawler drill rig; assessing the advantages of the breaker range.



source with a support team to back up the products.”

Bigger impact in a condensed package was certainly visible in the rock drilling tools display. One example was the new Secoroc COP 66 down-the-hole hammer which features a complete redesign and greater efficiency. And in the tophammer offering, it was clear that the T-WiZ line has grown with the T60 class, expanding the threaded line up to 152 mm drill bits.

Shorter and lighter than its predecessor, the COP 64 Gold, the new COP 66 penetrates 15 percent faster, resulting in less time over the hole and decreased fuel consumption. The hammer has fewer parts, yet features the ability to be rebuilt twice in its lifetime under normal drilling conditions. All this equates to a lower cost per meter over the life of the product. In addition, the bit design is unique as there is no exhaust tube and no center-flushing hole.

Accompanying the new FlexiROC T45

tophammer crawler drill rig was the TWiZ 60 threaded tooling. With a bit diameter range from 92 to 152 mm, the T60 increases drilling capacity by offering up to 30 percent longer service life and boosts productivity by drilling more holes per shift. The TWiZ product line improves reliability by wearing out before breakage and enhances utilization by reducing rod and shank changes.

Cluster drills

On display for foundation drillers was the 1 220 mm cluster drill and the Secoroc QL 300 down-the-hole hammer. Both tools feature 1 220 mm hole capability. Each is unique in its operation while offering versatility options for the contractor.


The QL 200 hammer with a 600 mm Elemex bit was also on display to show a large diameter foundation solution in a tool that manages air and cutting flow for sensitive formations and drilling conditions.

As contractors look to improve efficiencies in foundation work, these options make difficult projects possible.

Crushing equipment

In addition to the new FlexiROC T45 that boasts major fuel savings for a surface crawler drill rig, Atlas Copco also featured the Powercrusher PC3 impact crusher with the HS1 screener.

This combination was a hit with customers looking for the perfectly-sized crushed material in one unit. Adding less than four tonnes to the PC3's operating weight, which is ideal for crushing recycled material, the HS1 screener sends larger material back to the hopper until it's minimized to the desired size.

All in all, the Atlas Copco display exemplified the increasing demand for highly productive yet sustainable designs and reaffirmed Atlas Copco's leadership in sustainable productivity solutions. 



Strength and reliability: The underground Xauxa marble mine in Barcelona, Spain, has carried out a new rock reinforcement program based on Atlas Copco's Swellex Spartan rock bolts.

Spartan shines in Barcelona marble

SPAIN Atlas Copco's Swellex Spartan rock bolt is proving its worth worldwide for superior strength and reliability. Pull test results recently obtained at the Xauxa marble mine in Spain are a good example.

The Xauxa mine, situated in the Montseny mountains north of Barcelona, is in a new phase of development and needed a safe and reliable rock support solution for certain unstable mining areas.

Marble was earlier extracted from an open pit here but now the mine is an underground room and pillar operation and it is estimated that there will soon be layers affected by faults, blocks or breakages.

"For this reason we wanted to reinforce the walls and roofs of the galleries in areas where the security is not totally


guaranteed," says Lluís García Muñoz, Technical Director, for the owner, Aymar S.A.U. "Previously there was no need for reinforcement as the rooms were very stable.



Good pull: Tests with the Swellex Spartan showed a bolt elongation of 6%.

In selecting which bolts to use, viability and reliability were given top priority, which is why the mine chose the Spartan SP24, in lengths of 3, 4 and 6 m.

Compared to other bolts in the Swellex range, Spartan bolts are designed for environments where the rock mass transfers very little energy into the bolt. In this case, pull tests were conducted in a wall, with and without face plates, and the bolt achieved a minimum elongation of 6%, confirming its suitability and efficiency.

Chris Cranford, Product Line Manager, Rock Reinforcement, says: "This is a case where the Swellex Spartan bolt truly shines, offering a very economical solution to challenging conditions with no compromise in performance or quality." 

Cluster drill solution for Rio bridge

BRAZIL An Atlas Copco cluster drill has solved a difficult problem surrounding the installation of new supporting piles for the Rio Barra bridge project in Rio de Janeiro.


Due to the risk of heavy influx of water and sand into the pile holes, a concrete seal had to be installed at the bottom of each hole. The contractor, EMPA Engineering, a member of the Teixeira Duarte Group, needed a quick solution and there was no time for testing.

Instead, EMPA, a member of the Rio Barra Consortium, got started straight away with the cluster drill, boring holes for 55 piles with a diameter of 1.2 m and

a depth of 31 m. Casing was installed in sandy soil to a depth of 26 m with an extra 5 m drilled into the bedrock.

Besides the influx of water, the cluster drill was hampered by a sloping soil/rock formation. Atlas Copco compressors working at a pressure of 10 bar (750 CFM) were used to power the equipment.

The first hole was completed in 2.5 hours in rock with a compressive strength of 200 MPa. The estimated time for completion was 20 days, compared to an earlier estimate of 80–100 days with other equipment.

Footnote:
Atlas Copco cluster drills consist of several DTH rock drills together in one assembly. 




The cluster drill is lowered into position to start the first hole at the Rio Barra bridge.

Interaction award for RCS 5



Smiles all round: The winning design team, from right: Alex Liebert, Director of the Atlas Copco Design Competence Center; Nirvana Soltani; Ali Dehganpour; Sisimath Sangireddy, Harikishnan Gopalakrishnan and Karin Persson.

USA Atlas Copco has won yet another international design award for the RCS 5.0 rig control system for Boomer underground drill rigs. In 2013, the same product won an award from IDA, as featured in M&C 3, 2013. The Interaction Design Association (IDA) listed Atlas Copco as a finalist in the category "Disrupting" for the RCS 5.0 Boomer. This category represents an existing product or service that is re-imagined by creating new behaviors, usages or markets.


RCS is the primary interface between rig and operator. It assists the user by monitoring and controlling the rig, enabling local or remote control and logging statuses, events and error information for future analysis. 

A SmartROC D65 – in Lego!

SWEDEN A former Swedish miner has built his own radio remote controlled, fully functional SmartROC D65 drill rig – entirely out of Lego. Markus Wahlberg says he has always been fascinated by mining equipment and challenged himself to make a miniature Lego version of an Atlas Copco rig in his spare time. The result is a SmartROC D65, built to a scale of 1:16 and includes details Wahlberg found on the Internet. The radio control system is based on infrared (IR) components. There are two remote controls and four battery-driven electric motors, with each motor handling up to three functions.



Identical in every detail: Wahlberg's SmartROC D65 is a Lego success.

Wahlberg says it has taken him more than 100 hours to build it using drawings and specifications from the Atlas Copco website, as well as a YouTube film of the SmartROC D65 in action. 

NEW MINING BOOK OUT NOW!

A new reference book that takes an in-depth look at the fascinating world of underground mining, has just been released by Atlas Copco. "Underground Mining—A Global Review of Methods and Practices" has 256 pages of technical analyses as well as 19 case studies from around the world, all beautifully illustrated. M&C opinion: This is a "must have" for everyone working in, or thinking of entering, the underground mining industry. Order your copy: miningandconstruction.com



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