

# MINING & CONSTRUCTION

MECHANIZED ROCK EXCAVATION WITH ATLAS COPCO – NO 3 / 2011

## Golden touch

New life for Canadian mine

Drilling in the footsteps of dinosaurs

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The art of making loose rock stable

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Operators get the red carpet treatment

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*Atlas Copco*

## EDITORIAL



Looking through this issue of M&C you will be interested to see how we are investing in application know-how (page 14). This signifies one of the strongest trends in the market today and confirms my own beliefs about the importance of value added solutions.

It is gratifying to note that more mining and construction companies are now engaging us in conversations about TCO—Total Cost of Ownership—rather than the cost of equipment. At the same time, it is understandable that some become blinded by price, especially in these tough economic times.

There is certainly no lack of low-cost producers in the market today, all eager to sell products far below what it costs for us to make them. And that's fine, as long as buyers are aware that these low-cost producers might not possess the necessary service and logistics networks, technical support or application knowledge and have no possibility to invest in the future.

Atlas Copco has been in business since 1873. We think long term. We work together as a long term partner with our customers and constantly strive to generate opportunities for them. At the end of the day, we can help our customers to save or make fortunes.

Application know-how creates value added solutions. It's about safety, availability and utilization. It's about how much it will cost to put a tonne of rock on the ground, or how much more can be achieved by using the same equipment for different tasks.

We also talk about "application integrity". It means focusing on what is needed, not on what is requested.

**DON KING**  
Vice President, Marketing  
Underground Rock Excavation

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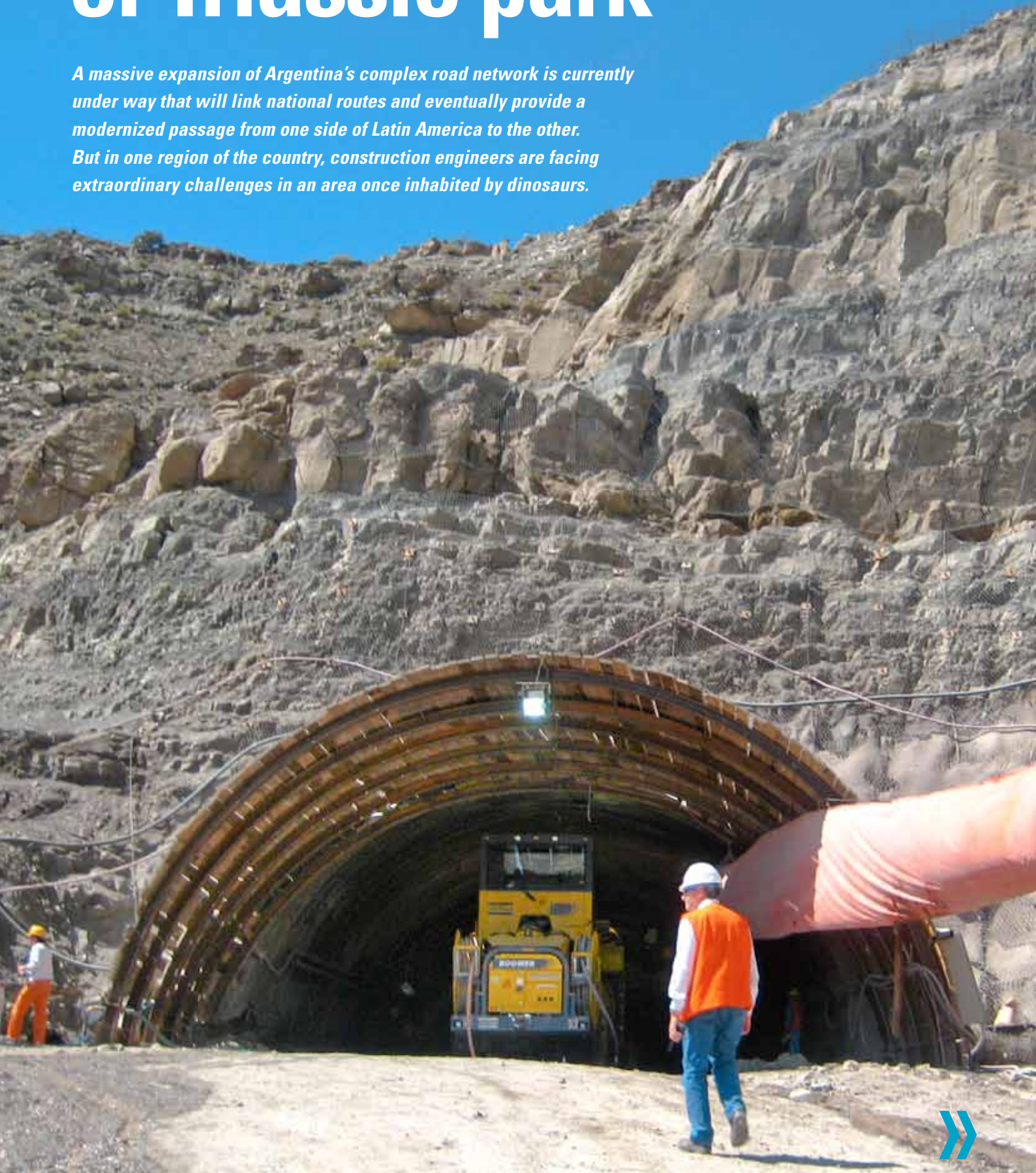
### SAFETY FIRST

Atlas Copco is committed to comply with or exceed all global or local safety rules and regulations for personal safety. However, some photographs in this magazine may show circumstances that are beyond our control. All users of Atlas Copco equipment are urged to think safety first and always use proper ear, eye, head and other protection as required to minimize the risk of personal injury.

**Atlas Copco**

# The yellow giants of Triassic park

*A massive expansion of Argentina's complex road network is currently under way that will link national routes and eventually provide a modernized passage from one side of Latin America to the other. But in one region of the country, construction engineers are facing extraordinary challenges in an area once inhabited by dinosaurs.*





Modern technology for a difficult task: The first Atlas Copco Boomer XE3 C rig in Argentina with the Atlas Copco Rig Control System (RCS) drilling blast holes in the mountains of northwestern Argentina.

Jose Cartellone Construcciones Civiles (JCCC) of Argentina is currently driving road tunnels in a location famous for its hostile climate, difficult drilling conditions – and a precious collection of dinosaur remains.

» **T**he mountains of Ischigualasto in Argentina's northern province of San Juan, boast the world's largest collection of dinosaur remains from the Triassic period (195–225 million years ago). But there's nothing prehistoric about the yellow giants that are now making their way through the rock.

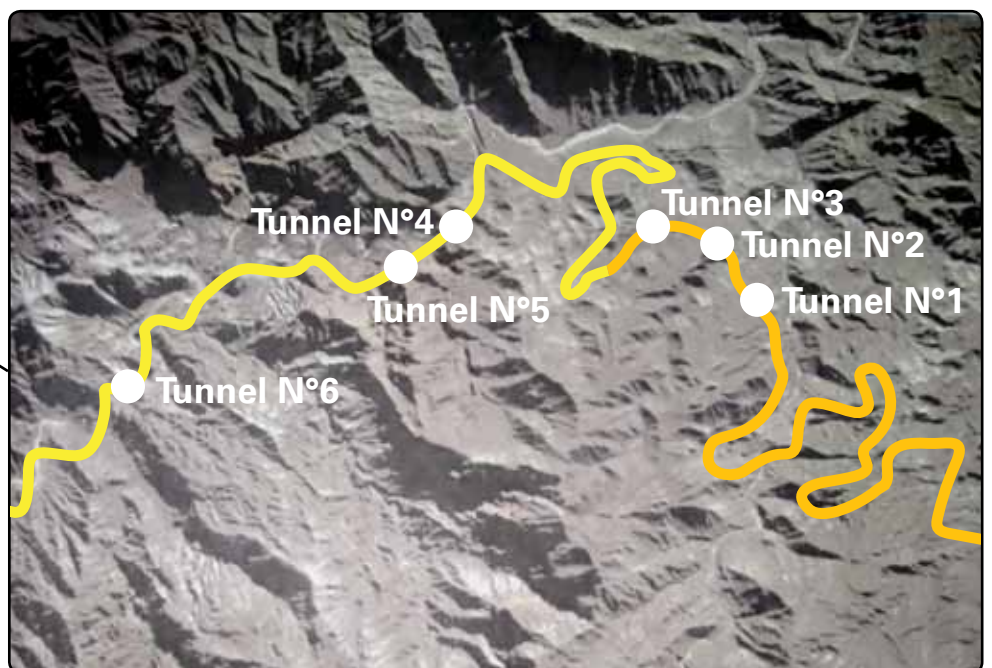
These are Atlas Copco drill rigs – a Boomer E2 C and a Boomer XE3 C, the first of its kind in Argentina – that are being used to drive a series of six road tunnels along Route 150 near the Chilean border.

When the project is complete in 2013, the tunnels will help to link up the complex national road network of

Argentina and will also eventually provide a modern road system stretching across the entire continent from the Atlantic to the Pacific.

**Extreme challenges**

Route 150 runs through a section of the Ischigualasto mountains with geological



A better route: The tunnel building and road improvement project at San Juan in northern Argentina will eventually make it possible to drive straight across the continent from the Atlantic coast of Brazil to the Pacific coast of Chile, a distance of approximately 2 000 km.



*The lonely road: In this Argentinian desert, 300 km from the nearest town, JCCC is working on a turnkey contract to provide 24 km of new road with six tunnels and five bridges.*

formations older than the Andes. Once a fertile paradise for the dinosaurs that roamed the land, it is now a hostile desert with temperatures ranging from  $-10^{\circ}$  to  $+45^{\circ}$ , just a few days of rain per year and winds that blow every afternoon at 20–40 km per hour. The occasional “zonda” wind from the west, which blows even harder, increases the heat to an unbearable level.

The fact that the people working for Jose Cartellone Construcciones Civiles (JCCC) are also 300 km from the nearest town, does not make things any easier. As Daniel Castro, Road Construction and Mining Manager says: “We are very isolated and that makes it very difficult to get personnel, equipment and other resources we need to survive and work here.”

On top of that, the tunnel sites are in a preservation area created to protect the fossils which dictates not only the direction that the roads and tunnels are permitted to take but also their characteristics.

### Difficult geology

The tunnels are located 1 600 to 1 700 m above sea level and have a total length of 2 400 m, the longest being 500 m, and they all have cross sections of 95 m<sup>2</sup>.

When M&C visited the area at the end of September, five of them had been excavated and the sixth was well under way. A Boomer XE3 C was working in the final opening of Tunnel 1 while a Boomer E2 C was carrying out limited blasthole drilling and scaling in Tunnel 3.

Due to the difficult geology – mostly consolidated sandstone formations and heavily fractured shale – some of the original plans had to be changed.

Fausto Cervini, Tunnel Production Manager, who has extensive international tunneling experience, explains: “In twenty to thirty per cent of the excavations we found rock of medium difficulty which we call Type 3, and difficult to very difficult rock, Type 4 and 5, in the rest. In tunnel six we even found pure sand that demanded a lot of support work in the initial stage.”

### Trouble-free drilling

Cervini continues: “The problem is that the rock is very heterogeneous and very mixed. We have hard and extremely hard limestone embedded in completely loose material, particularly in Tunnel 3. This makes it difficult to install grouted bolts and we have to re-drill three or four times.

“In most of the tunnels the Boomer rigs drilled the blast holes without any problems but Tunnel 3 is special. Here, 90 per cent of the work has been done mechanically with hydraulic hammers and cutters of different sizes. Most of the drilling has been for high precision smooth blasting to minimize over-break.”

Cervini has been familiar with Atlas Copco technology for most of his career. JCCC employs Atlas Copco low profile loaders, compressors and generators and has a number of Boomer rigs in mines. When the Route 150 was tendered, it was

## ANCIENT FOOTPRINTS



Ischigualasto Park in the northwestern part of Argentina, on the Chilean border, is an area of roughly 600 square kilometres. Located 1 300 m above sea level it is

characterized by typical desert vegetation – a hot and hostile environment.

But what makes it a treasure is that the rock contains the world’s largest known collection of dinosaur remains from the Triassic period 195–225 million years ago. Here, almost all of the Triassic period is represented in an undisturbed sequence of rock deposits, allowing researchers to study the transition of dinosaurs to ancient mammals.

Another major attraction for tourists is “El Valle de la Luna” (Moon Valley), where the water and the wind has eroded rock formations into unique shapes and colours.

In 2000, Ischigualasto Park was designed a World Heritage site by UNESCO.



» his recommendation that the latest Atlas Copco rigs be used.

In February when simultaneous excavation of the tunnels was in full process, there were more than 600 workers at the site. Today there are 480. Drilling crews work 14-day shifts with seven days off while ground engineering and civil construction teams work 11 day-shifts and three days off.

JCCC has a turnkey contract to deliver a new 24 km stretch of road complete with six tunnels and five bridges and is responsible for all civil works.

### Pioneering spirit

Founded 90 years ago by José Cartellone, JCCC was the first company in the Argentine mining industry. Today, it has extensive activities in heavy engineering, tunnels, hydroelectric plants and road construction with operations in almost all Latin American countries as well as in Saudi Arabia.

Mario Laudani, of Atlas Copco Argentina, comments: "Cartellone is a company with a prestigious past and a very interesting future. Its commitment to quality, safety, and the environment has put them in an outstanding position and the fact that it is now the first company to use this Boomer XE3 C in Argentina is no coincidence."

Daniel Castro says he is impressed with the performance of the rigs. "We are very proud to be the first to get this three-boom jumbo. It is the new generation Boomer with the RCS control system and a laser-guided function that allows the driller to select the coordinates x, y and z and a program that defines the exact position for each hole.

"We use the rig in the ABC Regular mode and I think it is excellent. The performance is high, even for our high safety and quality standards. The driller works in a comfortable and protected environment – the way everybody should work in a modern company."

He continues: "We tested the new rigs against older rigs of a different brand in similar conditions, and the benefits that the

Atlas Copco rigs bring to our fleet and to the Ruta 150 project were clear.

"The cost is substantial but in my opinion it is worth it. And the same goes for our



Boomer E2 C, which has the same technology but with only two booms and which is being used in the shorter tunnels."

The rigs are equipped with raiseable, high-reach cabins, heavy-duty hydraulic booms BUT 45 and COP 1838 rock drills. Working round the clock, the rigs drill blastholes 45 mm in diameter and 4 m long. The average penetration rate in hard rock is 1–1.5 m/min. Eighty holes are drilled for each round and the tunnel is advanced at the rate of 6 m per day. Bolt holes 51 mm in diameter are also drilled.

### Training and service

Atlas Copco delivered the Boomer E2 C to the site in 2010 and the three-boom rig in February this year and also provided training.

Castro continues: "The best thing with these rigs is that they are not complicated. When the rigs arrived, two Atlas Copco technicians from Sweden came and trained our drillers, who were then able to train other

drillers, and they also trained our service and maintenance technicians within the context of a three-month support contract. "This meant that the crews were able to

operate the rigs very quickly and since then they have been operating continuously. The value of this training is that we have not had a single breakdown caused by misuse or incorrect operation."

Castro adds that if tunnelling is to be efficient, it must operate "like an industry". "I believe that drilling, blasting and mucking should be one continuous process. Continuity is the key factor and the service schedule has to be followed very closely. If something stops working, advance is impossible."

### Comfort and safety

For the drillers the Boomer XE3 C represents a big improvement and has helped them to overcome the difficult geology and and harsh conditions. "One of the best aspects is the extra comfort," says operator Diego Molina, "that and the rig's drilling power."

Diego and his brother Luis, both from Ecuador, operate the rig in different shifts and both have previous experience of computerized rigs which Diego Molina says made it easier for them to adapt to the Boomer XE3 C.

"It's a very modern and advanced machine," he adds, "and I particularly like the high-reach cab and the 360-degree visibility. It gives you complete control. You can be sure that there is no-one near the rig when it is in operation and that there are no problems with any hoses. This makes it a really safe rig to handle."

“The performance of this three-boom rig is very good, even for our high standards.”



Daniel Castro, Manager Road Construction and Mining, JCCC.



*Modern technology rules where the dinosaurs roamed: Far left, the Boomer E2 C carrying out rock support work in the especially difficult Tunnel 3. Left, Fausto Cervini , Tunnel Production Manager with the three-boom Boomer XE3 C in Tunnel 1.*



“ JCCC’s commitment to quality, safety and the environment has given them an outstanding position.

**Mario Laudani**, Business Line Manager, Underground Excavation, Atlas Copco.



# GOOD NEWS



Location of the Canadian Malartic mine in the heart of the Abitibi Gold Belt of Quebec.



*Canadian Malartic Mine in Quebec has been revived after 30 years and is prospering once again thanks in part to Pit Viper drilling technology.*

Operations at the Malartic gold mine in northern Quebec demonstrate a broad consideration for the environment and the local community.

Osisko Mining Corporation purchased the Canadian Malartic mine in Northern Quebec in 2005 and started major exploration drilling. Official production started in May 2011 on the property, which is 40 km west of Val d'Or in the Abitibi Gold Belt.

The placement of the new working mine is unique because it sits within the community of Malartic. So much so, that during exploration, core rigs were set up in people's yards.

Almost 200 homes needed to be purchased or moved before push-back could begin. Osisko Director of Communications H el ene Thibault recalls

knocking on people's doors to let them know when they could expect drilling in their lawns.

Today the mine is producing 150 000 tons of rock daily with projections to increase that number to 250 000 tons at the beginning of 2012.

Moving all that rock created noise, so an earth berm was built to separate the town from the mine. Starting out, sound and dust were a problem, but the berm helped solve that.

Of the mine's 500 employees, 45 percent are from the community. Thibault says: "The employees are our ambassadors to the community. They take the message home

with them daily so the community knows what we are doing."

## Adapting the drilling

The mine has made a number of concessions and adaptations to mining practices to ensure the mining method works for the community. One of the biggest is the size of drilling equipment used.

Mine Manager Fran ois Vezina knows the many drill options available and says although he would have liked to have fewer drills with bigger holes, it was not practical.

The mine chose the newest Atlas Copco Pit Viper model available, the PV-235. Producing an 8.5-inch hole, the blast pattern has smaller holes closer together to ensure less impact on the environment. "The idea



# HBOORS

Smaller holes and sound retention benefits environment at Canadian Malartic.



*The Pit Viper 235 is used for single pass drilling of 12 m deep holes for the 10 m high benches.*

is to have no dust or vibration outside the mine,” says Vezina.

The mine has purchased 300 blast mats and expects to purchase 100 more to use when blasting close to the berm.

Vezina likes the automation and precision advantages that come with the RCS system on the rig. “This is intelligent equipment. You just push a button and let it drill,” he says. The auto-drilling system starts off slower when collaring the hole, which also reduces ambient noise.

The technicians also prefer the service advantages with the PV-235 says Maintenance Superintendent Bob Hamilton.

## Monitoring the wind

Planning each day starts with the weather forecast, especially wind direction. The

mine cannot have dust carried into town, yet the crusher needs to be fed. “Here we need to plan farther out because we could have unfavorable wind five days in a row,” says Vezina.

The miners also have to plan for sound because of the wind. Wind direction affects the sound attenuation and can transport sound farther than expected, but the PV-235 size advantages reduces this problem.

Vezina explains: “People find our blast boring to watch because you don’t see a lot of rock flying around and don’t feel the ground vibrating too much. But this is what we want to achieve.”

In the first quarter of 2011, the mine blasted 150 000 tons per day. Osisko operates with a 2:1 waste to ore ratio. The mine is expected to produce 250 000 ounces

of gold in 2011 and over 700 000 in 2012.

The pit is projected to be approximately 3 km x 10 km with a depth of 400 m. To assist in controlling the blast, the pattern is 6 m x 6m x 9.7 m The goal is to create the smallest rock possible.

## Rebirth of a town

The opening of the Malartic mine has been a boon to the small community. Although the town is on the main road leading to Montreal, it was just a town to drive by. With the investment from the mine of new neighborhoods and a USD 16 million elementary school construction, the town of 3 000 is now growing again.

Thibault says: “We consider ourselves guests, and we want to leave the town better off. Originally the budget was USD 15



*At Malartic, the Pit Viper 235 drills 216 mm (8.5") vertical holes.*

» million for the school, but because the architect said USD 16 million would give us so much more, we spent USD 16 million. These are our future miners. We want to give the kids the best quality of life and education.”

The mine also committed USD 50 000 yearly to the school as an overall improvement fund for the next generation. “We don’t think of this as buying the community’s appreciation,” says Thibault, “but we want the community to win from the gold found here, too.”

Safety was also a long-term consideration. Once a sinking neighborhood because of

abandoned underground workings, homes were moved to accommodate the new mine workings. The homes are now in a brand new, family-friendly neighborhood close to the school with new parks.

It was going to cost the city USD 29 million to fix the old infrastructure, but the mine’s new development eliminated that expense.

At one time 1 200 construction workers from all over Quebec were working in Malartic.

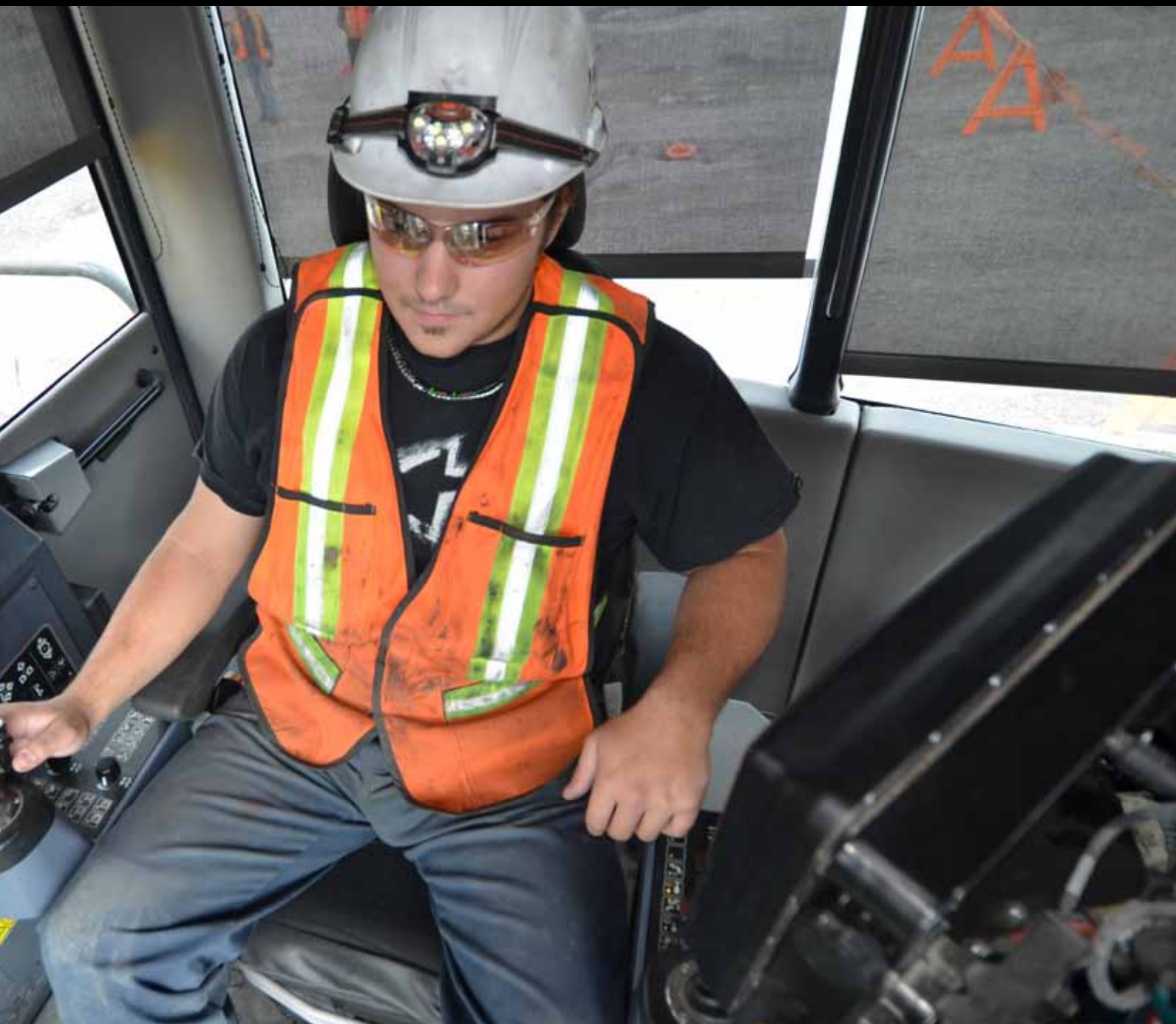
Many businesses see the opportunity here, too. Since the mine’s rebirth, a new theatre has opened, an IGA grocery store

has been built, a Subway restaurant has opened and a McDonald’s will open soon.

The old abandoned tailings pond was becoming an issue, too. To remedy the situation, Osisko is investing USD 12 million to cap the old pond and install a new environmentally friendly drainage system.

Bob Hamilton says it’s a win-win for the mine and the community. “This is a management issue driven from the top down,” he says. “It’s Osisko’s philosophy to respect the people and the environment.”

To understand the community’s level of awareness and satisfaction with the mine, a survey is conducted every two years to look



*The Pit Viper's Rig Control System (RCS) makes life easier for operators like Mathew Leeker, above.*

at the overall situation. Thibault says the most recent survey found that 85 percent of the community was happy with the mine, 10 percent were not affected and only 5 percent didn't like it. She says: "I don't think we can ever make everyone happy, but we will continue to respond to their needs and communicate with them."

#### **Equipment decision**

When looking at equipment, there was one focus in mind – to choose technology for the future. "We knew we were taking a chance with new-model equipment, but we are in this for the long term and going with

Atlas Copco's experience was important to us," says Vezina.


He adds: "We wanted the right structure. We needed the best rigs for where we want to be tomorrow and the training to get us there. Operating is one thing, operating efficiently and safely is another."

#### **Mine life and exploration**

In total there are nine drills working onsite, with many exploration drills doing reverse-circulation and core drilling. It is estimated that the mine has a 16-year life, but the exploration is continuing and there is hope that it will go further.

Adding to the PV-235 rigs already working, the mine has purchased three additional rigs.

Vezina has signed a three-year service contract for Atlas Copco to maintain the drills. "Those Atlas Copco service techs really do a good job and know what they are doing," he says.

The commitment from Osisko is not just for 16 years, though. "This is a partnership," says Vezina. "I think we need to have a partnership philosophy with suppliers and the community. We learn from our partners. I'm proud of what we are doing here. And we are going to have a lot of fun." 

The raise boring machine to the right of this picture looks exactly like an Atlas Copco Robbins 73R, but that's where the similarity ends. This machine has extraordinary torque which will soon be put to the test at the Sedrina limestone mine in Italy.



Getting ready for the Sedrina project: Edilmac's raiseboring team with the upgraded Atlas Copco raiseborer. From left, Marcello Fornoni, Giancarlo Dossena, Andrea Pellegrinon (Raisebore Operators), Sergio Moioli (Raisebore Foreman), Manuel Carli (Raisebore Engineer) and Adriano Facchinetti (Raisebore Divisional Manager).

## The Robbins that raises the bar

The latest generation of Atlas Copco Robbins raiseborer is helping Italian specialist contractor Edilmac to tackle demanding raise, pass and shaft tasks with increased confidence.


Atlas Copco and Edilmac technical staff got together with component suppliers to create an upgrade package for the company's existing 73R to give it more control, power and torque to tackle tough conditions previously only possible with larger machines.

The upgrade involved close cooperation with the manufacturer of the new compact, water-cooled, electric motor in Austria. Johnny Lyly, Atlas Copco Product Manager for raiseborers, reports: "We carried out tests with the powerpack and motor over

two days including stalling, backspin and fluctuating load to simulate all the conditions that might occur with a raiseborer. The results were very good, meaning we could go ahead with the retrofit work."

Meanwhile, Edilmac was fitting a new gearbox, supplied by Atlas Copco, to suit the new variable frequency electric motor drive. "One result was a big increase in torque to 250kNm," says Lyly. "The rig could then be designated as an Atlas Copco Robbins 73RVF C."

The new 73RVF C raisebore package also includes a new hydraulic powerpack, electrical transformer and switchgear unit, a special cooling unit that caters for all requirements and a compact operator control panel.

After the first raise reaming task – a ventilation shaft for an irrigation aqueduct in Val Fabbrica, near Perugia in central Italy – Adriano Facchinetti, Edilmac's Raisebore Divisional Manager, commented: "With the high power of 450 kVA instead of 350kVA we are very happy with the new rig. The new 280 kW VF motor gives a maximum torque of 250kNm instead of the previous 180kNm and the new console is a big improvement. The operators like it a lot." 

*The Robbins 73RVF C is now working on its second assignment, a slot raise for Unicalce's Sedrina limestone mine.*



Technical solutions aimed at increasing productivity in underground operations are constantly being developed. Know-how, on the other hand, is a resource that can be hard to find.

# Know-how at your service

## New Applications Team offers solid underground competence

As more mining and construction companies realize the benefits of a total solution approach to their operations, the technical expertise required to put those solutions into practice in the most cost-effective way is not always readily available.

In the fast moving “heat” of the working day in underground excavation, driven by production commitments and economic targets, there is often little time for a broad-based overview of operational efficiency and cost effectiveness.

That’s where Atlas Copco’s Applications Team comes in, the company’s group of technical advisors, which was recently strengthened with the addition of four new members.

The new members are:

**ANDERS ÖSTBERG:** tunneling specialist, most recently Plant and Machine Management with Veidekke, the Scandinavian construction company.

**ANDY NDULUBILA:** mining specialist, responsible for Africa. Ndulubila is also Marketing Manager at Atlas Copco in Zambia.

**JOHANNES HANSSON:** tunneling specialist, most recently at Ramböll Sweden, part of the leading international design and engineering consultancy.

**ÅKE KRUKKA,** mining specialist, most recently Manager New Technologies Mining at the iron ore mining company LKAB.

Together with Senior Advisors Lars Bergkvist (mining) and Gunnar Nord (tunneling), the team now offers more than 100 years of collective knowledge in underground methods, equipment, technology and solutions.

The team operates within the company’s department for Global Projects Marketing based at the division Underground Rock Excavation in Örebro, Sweden. In time, regional advisors may also be appointed, depending on demand.

### Broad-based approach

Bergkvist explains the motive for this boost in technical competence: “We have identified a growing demand from mining companies and civil engineers working underground for broad-based advisory services that go above and beyond individual product purchasing and price negotiations.

“These are customers who are beginning to look at the total efficiency of their operations and they want a speaking partner who understands the need for increased productivity in combination with lower overall costs, and who can make proposals for this without getting bogged down in product-related issues.

“Obviously, as a leading global supplier, we can offer a huge variety of cutting-edge technical solutions. But what matters is how to optimize these solutions in order to achieve the best possible overall result.

That’s why we have built a team with different competences acquired from the real-life, down-to-earth world of underground rock excavation – in short, people with dirt under their nails. There are not many guys around in the world who have their experience and we are proud to have them on board.”

Gunnar Nord, a senior advisor to Atlas Copco customers on tunneling technique, adds: “There is greater awareness today of total efficiency where the total running cost of equipment is more important than the cost of each individual unit.

“This is a growing trend. More customers are interested in our views on this and we know that they prefer to talk to people who can speak their language, know their business and problems and are not just focused on selling. This group will help to speed up that process. In addition, with customers all over the world, we are also able to take cultural and linguistic differences into account.”

Against this background, what do the new members of the team have to offer Atlas Copco’s customers?

Anders Östberg: “I am interested in machines and production and this

“I aim to show that Atlas Copco understands and is prepared to listen to ideas.”



Åke Kruukka, Application Specialist, Atlas Copco



The advisors: From left, Johannes Hansson, Lars Bergkvist, Gunnar Nord, Anders Östberg and Andy Ndulubila. The team also includes Åke Kruukka, facing page.

combination has followed me throughout my career. I focus on how to manage people and optimize the work that they do, and having been an Atlas Copco customer I understand how the customer thinks and can speak the same language. I also have the knowledge to discuss detailed technical issues for a civil works project for example, which is not so easy for a salesman. The most advanced system can cause problems if you don't know what it is or how to use it. My philosophy is to be as efficient as possible."

### New opportunities

Andy Ndulubila: The mines are getting wiser and more cost-conscious and we can help them in this process. Technology is now making it possible to mine marginal orebodies – gold, copper, platinum – and to do it at a good profit. I can contribute by helping the customer achieve more tasks with the same equipment in the same application. For example, the drill rig Boomer T1 D, which replaces the Boomer 104 used in narrow vein mining, is now capable of doing two jobs. It drills in the normal


way but by using our long-hole kit it can also be converted to do the same job as the Simba 157.

"Another example is the FlexiROC T 15 which has a roll-over boom, enabling it to drill upwards as well as downwards and can also be used underground. These possibilities are very interesting for many mines as a way of optimizing their operations." (Read more on FlexiROC T 15, page 23).

Johannes Hansson: "One of my main tasks will be to help tunneling customers to optimize their processes. Calculating and designing tunnels often takes a disproportionate amount of time in relation to the project itself. I plan to use my knowledge to help tunnelers reduce the time it takes from planning to implementation. This is the first step towards optimizing the work."

Åke Kruukka: "I aim to expand Atlas Copco's contacts within the global mining industry. I want to demonstrate that we really understand the mining business and that we are always prepared to listen and respond to the customer's ideas. After 22 years at LKAB in a variety of mining-related areas,

and especially the past nine years working directly with mining equipment technology, I believe that my experiences will be valuable for Atlas Copco's customers. In addition, my knowledge of geology, rock transport systems and other fields has given me a good all-round picture of what's involved in running a mining operation."

Lars Bergkvist concludes that the Applications Team will strengthen the role that Atlas Copco already plays in its customers' businesses. "The focus is shifting from productivity to optimization and the goal is how to achieve smooth operations with no disturbance," he says. "But this is not going to happen overnight. It is a long term project based on global teamwork." 

### CONTACT THE TEAM

The Atlas Copco Applications Team can be contacted via all Atlas Copco Customer Centers worldwide.





# Make way for Boomer M1 L

## New single boom rig for a rough, tough world



*Low and robust: The new Boomer M1 L is specially designed for room and pillar mines with roof heights of 2.2 – 2.5 m. Strength and ease of service are two clear plus points.*

A new single boom face drilling rig from Atlas Copco for low-to-medium height mines combines extreme robustness with operator comfort.

**T**he Boomer M1 L has been specially designed for development and production applications in low seam mines with roof heights of 2.2–2.5 m.

The rig itself has a height of 1.8 m and is believed to be the most robust of its kind on the market featuring a stronger carrier and oversized wheels compared to similar rigs in this range.

Peter Bray, Product Manager, explains: “This is the perfect machine for the rough and tough environment of room and pillar mining and especially where there are long distances to be covered, typically six to twelve kilometers per day.


“It is very strong with components that can withstand all the wear and tear of tramming on rough roadways, but it also makes life much easier and more comfortable for the operator.”

The Boomer M1 L is spacious and visibility is excellent from the fully enclosed air conditioned cabin, providing extra safety and comfort.

Bray explains that the Atlas Copco designers have “married together” existing components and systems from drill rigs such as the Boomer S1 L and the Boomer T1 D in order to meet demands for a stronger workhorse in low roof applications.

The rig has an improved flexible boom, simple controls (Direct Control System 2, DCS 2,) and a choice of rock drills – COP 1638 or COP 1838. It is also designed to be extremely easy to service as a means of keeping downtime to a minimum.

In addition, the improved environment inside the cabin is matched by the low emission Deutz TCD2012 L04 80kW Tier 3 engine.

The prototype was successfully tested by the Polish mining company KGHM in the Rudna Mine after which KGHM placed orders for several Boomer M1 L rigs. 

**Footnote:** See the new Boomer M1 L in action on YouTube, [www.youtube.com/AtlasCopcoUG](http://www.youtube.com/AtlasCopcoUG)

# UNDER THE SPA



# NISH UMBRELLA

Pipe roofing system helps stabilize Torrebaso tunnel



“ We have installed hundreds of meters of pipe roofing around the country and this is my favorite method.



Borja Del Palacio, Geotunnel

When engineers working on a new rail tunnel in Spain found that the ground needed to be stabilized the solution was close at hand – they simply put up a pipe roof umbrella.

**T**he new Torrebaso tunnel which is currently being constructed on the Bilbao to San Sebastian railway line, is moving ahead according to plan.

This 150 m long, twin-track tunnel will allow trains to pass through Amorebieta, in the Basque region, non-stop in both directions.

One of the biggest challenges for the engineers, however, is the poor ground conditions, but contractor Geotunnel

did not have to look very far to find a solution. The company was already using an Atlas Copco Boomer L2 C drill rig to drill and blast the tunnel and was able to use the same equipment for pipe roofing work together with the Atlas Copco Symmetrix system.

This method involves steel pipes or casings installed in an umbrella pattern in the crown of the tunnel, providing support ahead of drilling and blasting.



Reinforcing the Torrebaso tunnel: So far, five pipe roofing umbrellas have been installed providing quick and effective support ahead of the excavation. Eight more umbrellas are planned, 9 m in length, to support a further 50 m of the tunnel.

The Symmetrix solution has been successfully used in similar ground conditions around the world and in Spain it is one of Geotunnel's specialities.

Borja Del Palacio of Geotunnel, says: "We have installed hundreds of meters of pipe roofing around the country and I have to say Symmetrix is my favorite method.

"It is fast, reliable and economical and the quality of the bits and tubes we get from Atlas Copco is very good. Also, as we can use the same rig for pipe roofing as for drill and blast, it is not necessary to sub-contract this work to a specialized pipe roofing company."

Andoni Bonaechea, Technical Office and Purchasing Manager, who decided to adopt the method at this site, is especially pleased with the way the work has progressed. He says: "Pipe roofing using the Symmetrix system is by far the fastest and most economical way of stabilizing unfavourable rock conditions in tunneling and we have proved it at Torrebaso."

It is estimated that more than 5 200 m<sup>3</sup> of rock and soil will be excavated here and that

the necessary stabilization and reinforcement work will require the installation of 1 824 m of steel pipes and 35 000 kg of cement.

For pre-support before each advance, the Boomer has installed five umbrellas with an average of 30 pipes per umbrella, each 12 m long. A starter pipe fitted with the standard Symmetrix ring bit set is used followed by extension pipes – in this case, 89 mm pipes with a 7.1 mm wall thickness using the Symmetrix P89 system.

#### Fast installation

The pipes are installed at an angle of 4° and spaced 30–50 cm apart. Once installed, they are grouted in place to form a strong umbrella or canopy around the upper part of the tunnel profile.


Net drilling time for a 12 m pipe averaged 10 minutes and the total time for installation was 30–40 minutes per pipe, depending on the condition of the rock and other operational factors. As a rule, each installation was perfectly straight.

Atlas Copco's Area Manager Jorge Diaz says: "Geotunnel has long experience of

Symmetrix-based pipe roofing and the company chooses to work with us because of the features and quality of the Symmetrix system and the service that we provide."

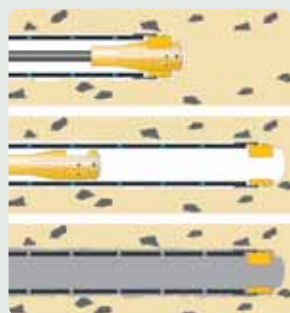
#### Sole supplier

In addition to Spain, pipe roofing using the Symmetrix system has been successfully carried out in many other countries including Portugal, France, Sweden, Kazakhstan, India and the Czech Republic.

Furthermore, Atlas Copco is currently the only supplier in the world to offer a complete package of equipment for this technology – Boomer drill rigs, Symmetrix Casing Advancement System together with pipes, Secoroc drill rods and Unigrout grouting equipment. (See facing page). 

#### FOOTNOTE:

At the Torrebaso tunnel project, Geotunnel operates as a subcontractor within the consortium Corsan Corviam/Balzola. The client is Ute Euba-lurreta and the project has been commissioned by E.T.S. (Euskal Trenbide Sarea), the housing, transport and public works authority of the Basque administration.



#### DEALING WITH DIFFICULT GROUND

The Symmetrix Casing Advancement System is based on the rotary-percussion drilling method and consists of a pilot bit and a ring bit.

The pilot bit is attached to the ring bit with a bayonet locking mechanism. Together they drill the hole which is large enough to allow the casing to advance simultaneously as the hole is being drilled in loose and collapsing ground conditions. During drilling, the pipe itself does not rotate so there is no need for high torque on the drill rig. A special feature of the system is that flushing is carried out through the annulus between the casing pipe and

drill pipe, ensuring high efficiency with minimal damage to the adjacent formation.

When the hole is complete, the pilot bit is unlocked from the ring bit and withdrawn through the casing pipe together with the drill pipe. The casing pipe (and ring bit) can be permanently left in the ground or retrieved from the hole.

Symmetrix is designed for installing casings with a diameter of 76.2 to 1 220 mm (3–48 inches). It offers a highly efficient method with great productivity and is used worldwide for a variety of applications in, for example, tunneling, foundation drilling and well drilling.



*They came, they saw, they liked:  
Scandinavian drillers queued up for a chance  
to try out the SmartROC.*

Drill rig operators got the VIP treatment when they attended a recent demonstration in Sweden of the SmartROC surface drill rig. For them, and drilling companies everywhere, the message was clear... a new era in the drilling industry had begun.



# ROLLING OUT THE RED C

About 50 Scandinavian drilling contractors converged on the Atle quarry near Örebro, Sweden to get up-close-and-personal with the SmartROC surface drill rig, arguably one of the most technically advanced drill rigs available.

With a strong focus on working life for the professional driller, the audience was informed that the era of the dinosaurs (read: manual rigs with no “intelligence”) is coming to a close, and that the SmartROC is the foremost example of “the new era”.

Presenting the rig for a packed audience, Olav Kvist, Product Line Manager for Atlas Copco’s surface drilling equipment, explained the reason why. He began by

pointing out that the rig is superior to all other comparable drill rigs on the market in terms of advanced computer control, performance and environmental friendliness.

But he quickly turned the spotlight on the operators: “You are the guys who matter most,” he told them. “You are the ones who sit in these machines every, sometimes for very long shifts. That’s why we are rolling out the red carpet for you by offering improvements that have a substantial affect on the operator’s life.

“For example, the cabin is designed for maximum comfort. The controls are ergonomically designed and very easy on the arms – just two joysticks, some simple

pushbuttons and an input device with a scroll-and-click wheel instead of using touch-screens. All this built-in functionality is extremely labour-saving, reducing physical effort to a minimum.”

The drillers were then able to see these characteristics in action via a live video link transmitted from a SmartROC working in the quarry. Here, an Atlas Copco instructor put the rig through its paces, methodically describing each function and operation in turn, while the results of his actions were made simultaneously visible on an enlarged picture of the rig’s display screen.

Kvist followed up with a few examples of the many upgrades that come with the



# ARPET FOR OPERATORS

latest SmartROC version. These included a lightweight, easy-to-use radio remote control unit, an updated, more user-friendly version of the rig software ROC Manager and a new type of circuit board that eliminates the conventional fuse box and is more durable and easier to see and manage.

## Fuel costs cut by half

Equally impressive was the effect of SmartROC technology on fuel consumption. According to Mats Birkestål, Product Manager, it can cut fuel costs by up to 50 per cent – a claim that has been proven by drillers in five countries who report an

average fuel consumption of around 15 liters of diesel per hour.

“This is possible due to a combination of contributing factors,” he said. “For example, we are able to regulate and fine-tune functions like compressed air and water mist, the dust collector fan and so on, so that only the minimum amount of power is required from the engine. The compressor can even be closed down when it is not needed which causes the engine revs to drop immediately, saving fuel. We have also reduced the amount of hydraulic oil required by 65 per cent. In other words, we only generate the energy that we need.”

Based on an average working cycle and the price of diesel fuel in Europe today,

Birkestål said he had calculated that the SmartROC, compared to its predecessors, was able to return a saving of approximately 17 000 euros per year.

Per Olofsson of Parts & Services continued the theme by pointing out that further savings can be realized through less downtime thanks to the upgraded service programs such as ROC Care, COP Care and Crush Care (if crushing is involved), service contracts and operator training using simulators provided by the Atlas Copco Master Driller program.

During the event the operators got the chance to try out the rigs for themselves and their opinions were unanimous. »

# What the operators say

## » Matthias Sjökvist, Berg & Byggt teknik AB, Sweden



“I have been in this business about 20 years and we have about 14 rigs in our fleet. I have to say Atlas Copco has done a pretty good job with this SmartROC. We were asked what sort of improvements we would like to see and today it’s great to see that they have listened to us. This rig meets a lot of our demands and overall I think the solutions are quite impressive. The low fuel consumption and plenty of space for servicing is all good.

“A big plus for me is that you can now adjust the display screen vertically. This makes it much easier to get the screen in exactly the right position. I also like the possibility of radio remote control. A lot of the time you want to be outside the rig, especially in difficult terrain, so it’s pretty good to have that choice. If there’s anything else I would like to see the SmartROC get in the future it would be a bigger dust collector.”

## Tom Erik Janerud, Kjell Fors AS, Norway



“My company has ordered three of these rigs and I am very excited about that. At the moment we have seven ROC D7 C rigs and the SmartROC will make a big difference. I’m really glad I came here today. It gave me a really good feeling for what this new rig is all about. I think it’s amazing – a revolutionary solution. I’m looking forward to getting in that comfortable seat and starting it up. The added comfort alone will be a big improvement for us, especially when working the long shifts. And of course you can’t ignore the fuel saving. That’s a huge plus.”

## Rune Anderssen, Vassbakk og Stål AS, Norway



“I operate a ROC D7 C right now. It’s a good rig, but with this new one Atlas Copco has really given a lot of thought to us operators. I think it’s a big step forward. When I got into the cab, it felt great just to sit at the controls and feel how easy it is to use the joysticks. You feel that you can really relax while you work which makes a big difference for the body, especially when you work long shifts in the same position. My company has bought three of these new SmartROC rigs and I hope to be the first to use one.”

The SmartROC has been field tested in several countries, working an average of 40 hours per week for a period of three months. During this time, average fuel consumption per rig has been recorded at 10–14 litres per engine hour. Below, two drillers report on the result of the tests:

## David Rohlén, Rohléns Sprängtjänst, Sweden



“We have used ROC D7 rigs since the 1990s. They have always been good, but the SmartROC T35 is a great improvement. It worked well for the whole test period. Productivity increased from the very first day and there was a dramatic reduction in fuel consumption. A lot of things have been changed and upgraded and I think Atlas Copco has done it in the right way, especially when it comes to the design of the controls which makes this rig much easier to operate.”

## Dennis Stenger, Harald Stenger Drilling, Germany



“My overall impression of it was not just that it was good – it was excellent and far exceeded our expectations. We used a SmartROC T40 in a quarry with a hole depths of 8 to 25 meters in compact rock. The hole diameter was 98 mm and we drilled at an angle of 14 degrees. Net penetration was about 1.10 to 1.20 meters per minute with a top speed of 1.4 m per minute. Refueling was cut by half which resulted in much less downtime for refueling as well as lower diesel costs. The noise level in the cabin is also the lowest I have experienced.”





## Atlas Copco in geothermal research

**USA** Atlas Copco Secoroc is to participate in a unique research project aimed at significantly increasing the speed of drilling deep geothermal wells.

Atlas Copco will cooperate with Sandia National Laboratories which has been awarded a U.S. government grant to develop technology that will reduce the cost of investment in this renewable energy source.


Geothermal energy has great potential as an environmentally friendly source of energy in many parts of the world. However, developments are constrained by the high costs related to drilling deep wells in hard rock and at high temperatures.

Percussive tools, or down-the-hole hammers, are a promising technology for geothermal exploration as they rely on mechanisms that are well suited for the type of rock normally found in geothermal formations.

Compared to conventional geothermal drilling methods, down-the-hole hammers could quadruple the penetration rates.

During the three-year project, Atlas Copco Secoroc will design, develop, and test equipment. Sandia National Laboratories will provide computer models to evaluate hammer performance, materials

and components. Sandia will also develop a high temperature test cell to evaluate hammer prototypes.

The project is one of 32 under way in the U.S. designed to meet the challenge of generating 80 percent of the country's electricity from clean energy sources by 2035. 



*Geothermal drilling in Finland: Atlas Copco already has a range of suitable products and the necessary know-how to make a substantial contribution.*



*Flashback: Atlas Copco has been a supplier of drilling equipment to the Conch Group since 1993. Here, an Atlas Copco CM 760 D rig at the Yingde Conch limestone operation in Guangdong province in 2007.*


## Strategic partnership for global expansion

**CHINA** Atlas Copco has teamed up with Anhui Conch, China's biggest cement producer, to provide drilling equipment and training services as part of the Chinese company's global expansion.

Anhui Conch plans to add 10 million tonnes to its annual capacity by 2012 through a combination of new plants and acquisitions overseas.

Atlas Copco and Anhui Conch have a history of cooperation dating back to 1993.

Robert Fassl, President of the Atlas Copco business area Mining and Rock Excavation Technique, said: "Apart from our modern technology and our edge in the safety perspective, we have a global network in 170 countries and regions. With strong teams in almost every country Atlas Copco can greatly assist Anhui Conch in its go-global strategy."

According to its annual report, Anhui Conch produced 110 million tonnes of cement in China in 2010. 

### IN BRIEF

#### Focus in focus

A new catalog is now available covering the Focus product line from Atlas Copco Secoroc. This is a range of Tricone bits designed to deliver competitive performance on current generation drill rigs.

Focus bits are suited for a wide variety of rotary drilling applications including blasthole, waterwell, HDD and exploration drilling.

They are proven in varied formations including very hard iron ore, hard to medium formations of gold/copper mines and the soft overburden of coal mines.



#### RCS on the web

The Atlas Copco Rig Control System (RCS) is shaping the future of mining and construction and a new website has been launched to explain the advantages of this technology in relation to Pit Viper blasthole drill rigs.

An interactive diagram shows the location of the RCS components on a Pit Viper rig and their functions. There's a tutorial to help operators understand and use the system's display screen as well as videos showing how RCS makes Pit Viper functions more effective.

The site also explores the many add-on features and presents a number of case studies – all in all, a must-see for rotary drilling fans.


Visit [www.RCSPitViper.com](http://www.RCSPitViper.com)



## ACM gets milestone Minetruck

**AUSTRALIA** The 100th Atlas Copco Minetruck MT6020 to be delivered in Australia has gone to ACM (Australian Contract Mining) for its Trident mine in Kalgoorlie. The milestone truck is the 12th Atlas Copco Minetruck in the ACM fleet.

The Minetruck MT6020 has evolved from the Minetruck MT5010 (and the earlier Minetruck MT5000). The prototype was delivered to Stawell Gold Mines in Victoria in 2007 where the original plan was to test the upgraded components and then go on to develop a new truck but the prototype proved so successful it was decided to start producing it.

The first was delivered to Barmingo in May 2008 which now runs a fleet of 36 units. Atlas Copco Minetruck MT6020 trucks are now in operation worldwide, the majority of which have been delivered to Australian mines. 




An Australian success story: The 60-tonne Atlas Copco Minetruck MT6020.

## Fire in the tunnel!

**SWEDEN** Swedish safety experts have embarked on a unique project to study the effects of fire on a conventional commuter train inside a railway tunnel. The aim is to improve the safety of travel, work and rescue in underground transport systems.


Using a series of tests, researchers will investigate how fire develops and the consequences of an explosion. They will also look at gas concentrations, temperatures and velocities as well as smoke and heat release rates.

Project leader Anders Lönnermark said: "Internationally this project is totally unique. It is the first of its kind to involve so many different disciplines, all cooperating at the same time and which will all benefit from the results."

As well as provide vital information for safety experts, the results of the study are expected to have important implications for future tunnel design and construction. 



Burning for knowledge: The first test was carried out recently in a disused 270 km long tunnel in Sweden.

**NOMINATED** Atlas Copco's four-boom drill rig Boomer XE4 C has been nominated for Technical Innovation of the Year in the 2011 International Tunneling Awards to be announced at the Conrad Hotel in Hong Kong on December 1. 

## WHERE TO FIND US

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# Introducing the T-WiZ drilling system



We're not known for dabbling in make-believe. In fact, few things are more real than the benefits that come with our new T-thread. Especially when you consider that large rods require a robust thread system.

The new T-WiZ drill string looks a lot like its predecessor, but that's where the similarities end. We're not about to reveal all our tricks, but you'll be amazed to know that T-WiZ offers up to 30% longer service life. Which means fewer rod changes and more productivity per shift.

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