

MINING & CONSTRUCTION

MECHANIZED ROCK EXCAVATION WITH ATLAS COPCO – NO 3 / 2010



TOP DRILLING TECHNOLOGY

at Europe's biggest copper mine

Unique solution for midnight piling

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Crushers and screeners now available

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Service is key in Southeast Asia

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Atlas Copco

EDITORIAL



Safety in the mining industry is in focus more than ever and especially since the spectacular rescue of the Chilean miners that captured TV audiences around the world.

However, at Atlas Copco, safety has always been a major concern and we have used our know-how to continuously develop new, innovative products that make the working environment as safe as possible. As we point out on page 18, the cab is the safest place to be, and it is a fact that most accidents occur when an operator is outside of this safe zone, performing an unscheduled task. That's why when we talk about safety, I think we should see it in the context of equipment availability.

Good availability is achieved through planned and professional service and maintenance, and equipment that is properly maintained reduces the need for unplanned intervention by the operator.

It is precisely these unplanned interventions that put the miner at risk, so the longer we can keep him or her in the cab during the shift – in the safe zone – the better it is for all concerned. We clearly have a long way to go before we can put an end to accidents, injuries and unplanned downtime – but we are well on the way. Atlas Copco is committed to this task and will continue to identify the risks and improve safety through our product designs. I believe that by continuing to work with our customers we can achieve this common goal to reduce accidents and increase availability.

BOB FASSL
President,
Atlas Copco Drilling Solutions

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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



After midnight...

Ground engineering specialists put Elemex to work on Sweden's biggest construction project

The new City Line railway now under way in Stockholm, Sweden is constantly in the spotlight. But under the cover of darkness, far from the media glare, some contractors are making a contribution that gets less than its fair share of recognition. >>



Drilling without disturbance: Above, engineers at work in the small hours; top right, Site Engineer Johan Blumfalk with the Elemex drilling system; far right, the shields that will protect the existing railway while a new railway bridge is built for the City Line trains.

» **E**veryone's talking about City Line, the prestigious new railway system now being built in the heart of Stockholm, the Swedish capital. And it is not surprising. This major rail extension scheme is the biggest transport project ever in the history of the country and will make a major improvement to commuter transport.

M&C readers may already be familiar with the City Line project and with the contribution being made by Atlas Copco in driving the planned six kilometers of new tunnels (see *M&C No 3, 2009*). Less known, however is the contribution being made by specialist contractors on the surface.

Ground engineering expert Hercules Grundläggning (a part of the NCC Group) and drilling contractor Terramek are cooperating to strengthen a 250 m long stretch of difficult ground at Västberga, on the south side of the city, at a point where the new

City Line will run on a 1.4 km bridge above an existing track.

The contract involves the installation of piles for giant protective shields across the existing track to protect it when construction of the new railway bridge gets under way.

However, the project authorities stipulated that under no circumstances could the reinforcement work be allowed to disturb the stability of the sensitive ground surrounding the existing tracks.

Enter Elemex

The answer was Elemex, a unique type of overburden drilling system from Atlas Copco that has successfully been used by the contractors to sink the vertical piles through the soft clay, mud and moraine.

The cutting action of Elemex is achieved by rotating the drill string within the casing which, in turn, rotates both the pilot bit and the ring bit. Additionally, percussion

is supplied by a hammer placed behind the bit. This is the new Atlas Copco Terranox 8 DTH hammer (see facing page) which is able to operate efficiently at lower air pressures, further minimizing the risk of ground disturbance.

"We are using Elemex because it is simpler and works better than anything else in these difficult conditions," explains Site Engineer Johan Blumfalk. "We tried a water powered system, which also worked pretty well but involved a lot more equipment and extra work.

"When Atlas Copco demonstrated the Elemex system we knew it was the right solution. We are still using compressed air but the design of the pilot bit ensures that no pressurized air enters the ground."

The pilot bit rotates freely inside a drill pipe sleeve which is itself fitted with a welded ring bit. Thanks to the design of the pilot bit's air channels, all of the air as well as

ALLEYES



Major advancement: Drill rigs such as these using the same control system platform greatly simplifies the integration of operations.

ON AITIK

Drilling technology in focus as Europe's biggest open pit copper mine enjoys expansion success

Pioneering drilling technology, a major investment and the skill and dedication of Swedish miners is behind the successful expansion of Boliden's Aitik mine. M&C reports on the progress being made to make Europe's biggest open pit copper mine even bigger.



One of the four Pit Viper 351E drill rigs at the Aitik Mine: The Atlas Copco Rig Control System (RCS) offers a wide range of features for automation, safety and communications.





Peter Palo, Boliden's Production and Service Superintendent "We came to the conclusion that these are the most advanced drill rigs of their kind on the market."

» **A**t three kilometers long, 430 m deep and more than one kilometer from rim to rim, the Aitik mine in Northern Sweden is impressive, to say the least.

But it is not the sheer size and depth of the pit, which is deep enough to contain the Empire State Building, that impresses the most. It is the miners' ability to make the operation financially viable despite the low copper-to-ore content of just 0.25 percent.

Each tonne of ore mined here clearly confirms that the combination of large-scale production and super-efficient mining equipment is the key to success.

The Aitik mine (pronounced "Eye-tick") which is located outside the Lappland town of Gällivare, has its sights firmly set on doubling its annual production of 18 million tonnes of copper, silver and gold bearing ore to 36 M/t by 2014. And it is moving full speed ahead to meet this target.

Bold decision

Boliden's bold decision in 2006 to go ahead with the expansion despite the world economic slump, is paying off. With a massive budget of EUR 600 million (USD 845 m), the company has invested heavily in state-of-the-art equipment. This includes the latest and most advanced rotary and DTH drill rigs from Atlas Copco as well as huge 345-tonne mine trucks and in addition it has also built a new concentrator plant.

The mine will also get a boost in the near future with the opening of a new, smaller pit – "Salmijärvi" – about one 1 km south

of Aitik where excavation is already under way using the same drill rig fleet.

The fleet is comprised of four Pit Viper PV-351E rotary drill rigs, owned and operated by Boliden, and a SmartROC D65 and ROC L8, owned and operated by mining contractor NCC. And with drilling now being conducted in three areas – at the 430 m level in the main pit, on pushbacks and in the new pit – the need for efficiency and mobility is paramount.

The four Pit Viper rigs handle the production drilling while the ROC L8 and SmartROC handle the presplit drilling with their down-the-hole hammers.

The Pit Viper PV-351E rigs drill 17–20 m deep, 311 mm blast holes on 15 m benches and benefit from advanced communication and automation technology.

Operator's choice

Peter Palo, Boliden's Production and Service Superintendent says: "There were two main reasons for choosing the Pit Viper rigs over competing models. Firstly we got the chance to visit Atlas Copco in the US and take our operators there to try the rigs out. The feedback from the operators was clear – they favoured the ergonomics of the Pit Viper. Secondly, with features such as GPS, autotramming and wireless communication, we came to the conclusion that these were the most advanced rigs of their kind on the market."

Some of the advanced features used at the mine today include GPS and Hole

Navigation which shows the rigs' exact position in relation to the drill plan, as well as wireless transfer of the mine's drill plan directly to the rigs.

Another feature of these rotary rigs that is contributing to productivity is the ability to lower the drill tower in just five minutes. "It used to take a full shift to do this with the older rigs we had before," says Palo. "But the Pit Viper can go from drilling to tramming in just five minutes."

This level of mobility is important as the Pit Viper rigs move regularly between benches. The mine operates 8-hour shifts Monday to Friday with 12-h shifts at weekends, a total of 19 shifts per week. The typical hole spacing used drilling vertical holes is 7 x 9 m in waste rock and 6.5 x 8.5 in ore.

Says Palo: "We had an initial goal of averaging 27 metres per hour with these rigs but we are already beyond that with a net penetration rate of 33 m per hour or 144 m per 8-h shift."

As well as GPS, hole navigation and auto leveling, Aitik has also successfully tested autotramming, a feature that allows the rigs to tram independently between holes.

95 percent availability

The availability in October was 95 percent with service being carried out every 250 hours. The maintenance work is carried out by Boliden's personnel with assistance from an Atlas Copco service supervisor on-site during the day. In addition, Atlas Copco has carried out the training »



Pit Viper operator Hanna Wikman: "I thought it seemed pretty complicated at first but I soon got the hang of it."



» of mechanics, electricians as well as operators.

Hanna Wikman is a typical example. After training and just a few months' experience, she is able to handle one of the giant Pit Viper rigs working on pushback at the rim of the mine.

"I thought it seemed pretty complicated at first," says Wikman, "but I soon got the hang of it. The controls are well placed and the screen shows all the drilling data you need. I can quickly see engine hours, drill speed, rpm, pull down pressure, and so on.

"I use the GPS to locate my position in relation to the drill plan that is sent wirelessly from the mine's control center. I also use the auto de-leveling feature, though I prefer to do the leveling manually."

PARD - a major breakthrough

In addition to the established technology that is being successfully applied with the Pit Viper rigs, a new innovation is being tested that is destined to have a major impact on rotary drilling performance.

PARD (Percussion Assisted Rotary Drill-

ing) was recently pioneered by Atlas Copco Secoroc, combining the benefit of percussive drilling with rotary drilling technology.

PARD consists of a lightweight, high-frequency hammer coupled with specially designed Secoroc tricone bits. Dual airflow channels power both the hammer and remove cuttings while the system requires no more pressure than is used in a conventional rotary drilling set up, typically 3.5–6.9 bar (50–100 psi).

This combination of low impact percussion and rotational force increases pen-



Secoroc bits after grinding: These Secoroc GrindMatic grinding machines make bit grinding easy and efficient in the Aitik workshop.



drilling and in November were due to be joined by a second SmartROC D65.

The rigs drill 140 and 165 mm holes using Secoroc DTH hammers COP 54 (5") and COP 64 (6") and spherical button bits to depths of 33–35 m. The standard spacing for these presplit holes is 1–1.8 m.

NCC has been using the SmartROC D65 at Aitik for about a year. Site Manager Stig Fredriksson says: "The main motivation for choosing the SmartROC was that it has all the benefits of RCS, the Atlas Copco Rig Control System, as well as the HNS hole navigation system.

"This particular SmartROC was being tested at the mine and worked so well that we bought it. It has produced around 5 500 to 7 000 drilled meters per month working two shifts per day. Availability has also been high, currently around 90 percent."

NCC's own personnel maintain the rig and the company's onsite workshop has two Secoroc Grindmatic machines for regrinding the bits. The bits typically drill around 60 m before regrinding with 10 regrinds per bit. This equates to 600 m per bit.

Extreme conditions

Up in the cabin, operator Johan Karlsson says that the environment inside is very comfortable, even during the extreme temperatures that are experienced at the pit during winter. Located 60 km inside the Arctic Circle, it is not uncommon for the temperature to remain at –35° centigrade for several weeks.

"All of the controls I need are within reach," says Karlsson. "This reduces fatigue and makes it much easier to operate

etration rates. At Aitik, field tests of the PARD system increased drilling rates by 48 percent and extended bit life by more than 100 percent.

Commenting on the tests, Peter Palo is enthusiastic. He says: "I think it is the biggest advance in rotary drilling for the last two decades." (*Read more about PARD in Products & Progress, page 13*).

DTH workhorses

The down-the-hole SmartROC D65 and ROC L8 rigs are used by NCC for pre-split

»

Pit Viper power

The Pit Viper 351E is capable of drilling holes in the 270 mm – 406 mm range and has a single pass drilling capacity of 19.8 m (65 ft). The advanced RCS-control system, used on the Pit Viper and SmartROC D65 rigs, offer a range of automation, safety and communications systems.

FEATURES INCLUDE

- an autodrill capability that reduces component wear and assists new drillers.
- a communication interface that allows the mine office to communicate with the rig and vice versa. This allows the exchange of data such as drill plans etc.
- a remote control unit that offers increased safety when the rig is used close to the edge of a bench.
- GPS and hole navigation capabilities that allow precise positioning of the drill rig in relation to the electronic drill plan.

To find out more visit
www.atlascopco.com/blastholedrills



Pre-splitting on the Aitik benches: This SmartROC D65 is a highly productive and comfortable rig to operate in these harsh conditions where temperatures can drop to -35 degrees in winter. Together with a ROC L8 it drills 140 and 165 mm holes to depths of 33–35 m.



NCC Site Manager Stig Fredriksson: "We chose the SmartROC because it has all the benefits of the RCS Rig Control System."

» the rig over a full shift. I also really like the control screen. It's large and easy to navigate with simple, easy-to-read menus."


Automatic hole depth calculation is another of the rig's features that Karlsson likes and uses, as is the hole navigation system. However, at this position in the mine, some 430 m below the surface, the rig cannot "see" enough sky to get a reliable GPS signal, although work is under way to resolve this.

The second SmartROC D65 destined for Aitik will be the latest in the SmartROC range and benefits from a number of improvements suggested by NCC to make serviceability easier.

And with the SmartROC D65 and the

Pit Viper 351E using the same control system platform, other mining companies around the world will also find it much easier to integrate and improve their activities through well documented drill and blast operations.

Betting on the future

Boliden is well on track to meet its short and long term goals. Ore production and throughput at the new concentrator have increased substantially and the lifespan of the mine has been extended to 2029, after which the entire area will be returned to nature. The Aitik pit will be filled with water to ultimately create Sweden's deepest lake. 

COMPLETING THE

Now mobile crushers and screeners available from Atlas Copco

Atlas Copco has long been a leading supplier of surface drill rigs and related services to the quarrying, construction and demolition industries worldwide. Now these industries can also benefit from a complete range of Atlas Copco equipment for crushing, screening and recycling.

The news that Atlas Copco can now also supply crushing, screening and recycling equipment has been warmly welcomed around the world.

Not only will it be easier and more cost effective to source the complete package of equipment from Atlas Copco, it will also enable service and maintainance to be co-ordinated across the entire equipment fleet.

This range of crushers and screeners is based on the top-of-the-line Powercrusher products manufactured by the Austrian specialist Hartl Anlagenbau

which was acquired by Atlas Copco in September this year.

This operation, renamed Atlas Copco Powercrusher, is now an integral part of the Atlas Copco Surface Drilling Equipment division.

Comments Björn Rosengren, President of the Atlas Copco business area Construction & Mining Technique: "The global demand for mobile crushing and screening units is increasing and this addition makes us a more complete partner for our customers."

Alexander Hartl, Operations Manager at Atlas Copco Powercrusher adds: "Thanks to our broad product range and unique technical concepts we are able to provide our worldwide customers with optimized solutions for quarrying, demolition as well as recycling applications.

"With Atlas Copco's global sales and service network, we aim to continue to establish Atlas Copco Powercrusher as the market leader and to lead the crushing and screening industry into the future." 

The HCS 3715: This machine is being fed by an Atlas Copco impact crusher to produce accurate aggregate fractions.



PACKAGE



The Atlas Copco PC 6 jaw crusher: This machine is producing cubical products in a gneiss quarry after the blasting process.

85 years of stone and quarry expertise

Hartl Anlagenbau, now Atlas Copco Powercrusher, based in St. Valentin, in Lower Austria, is a leading designer, manufacturer and supplier of high quality mobile equipment for crushing, screening and recycling.


The company was founded in 1925 by Franz Hartl, a demolition expert, quarry owner and transport company manager. During the past 85 years, three generations of the Hartl family have built up a unique knowledge center for stone and stone handling procedures.

The experience gained from its own gravel pit enabled the company to start producing its own crushers and screeners in the 1980s. This combination of application know-how and technical innovation

enabled Hartl Anlagenbau to establish a global position in crushing and screening technology.

The company's 12 000 m² manufacturing plant in St Valentin uses state-of-the-art construction technologies to produce up to 400 units per year to the highest quality standards.

The Powercrusher range will continue to be represented by the Hartl brothers – Alexander Hartl as Operations Manager and Dominik Hartl as Sales Director.

Comments Dominik Hartl: "Our customers and distribution partners now have the possibility to take great advantage of the strong sales, after sales and worldwide parts and service support offered by the Atlas Copco organization." 



Brothers in arms: Alexander and Dominik Hartl aim to establish Atlas Copco Powercrusher as the world leader in crushing and screening.

See "First New Customer", Marketplace, page 31.

A wide range of products for

ONSITE UPTIME

» **A**tlas Copco Powercrusher offers a wide range of track-mounted mobile crushers and screeners for a range of applications. Products include jaw crushers, impact crushers, cone crushers and screeners.

The crushers have a capacity ranging from 200–500 tonnes per hour and screen-

ers have a capacity of 200–400 t/h. Manufactured with cutting edge technology, these high performance machines are compact, strong, user-friendly and reliable.

In addition, the straightforward design makes them easy to service and maintain which leads to high availability.



JAW CRUSHERS have a “quattro movement” which gives the swing jaw a very aggressive motion. This means that compared to other jaw crushers it can handle materials which are 25% larger without blockages in the crusher inlet. The motion of the swing jaw also gives the material a post-crush as it leaves the crushing chamber, producing a consistent and cubically-shaped end product.



IMPACT CRUSHERS are high capacity, robust impactors that can withstand the toughest of conditions. The rotor-swing beam arrangement means that these crushers can be used as the primary unit on the site. They accept large feed sizes and give excellent results in mining and quarrying applications as well as in the recycling of construction and demolition material.



CONE CRUSHERS are ideal for secondary, tertiary and fines crushing of hard and abrasive materials. The Atlas Copco cones are known for their extremely low wearing costs and the quality of the end products. They are able to accept “all-in” feeding, meaning that in some cases pre-screening of the in-feed material is not necessary.



SCREENERS are compact, highly efficient units making them perfect for quarries, mines and contractors. They can be used in combination with crushing plants or fed independently by a loader. They are available with a vibrating grid which allows for an additional fraction by means of an extra mesh situated under the heavy duty reject grid.



The PC 13751 impact crusher: Used here as a primary unit in limestone, producing excellent end product shape with a minimum percentage of oversize.



A wealth of knowledge for a multitude of applications

Powercrusher units bring added value to many different types of companies working in a wide variety of applications in surface rock excavation and rock handling. These include surface drilling, general construction, demolition, road building, concrete recycling and aggregate processing. Global technical support and spare parts availability are two of the key success factors.

As world demands for mobile stone and rock processing machines rapidly increases, M&C asked senior Atlas Copco executives to describe how the new Atlas Copco Powercrusher range will benefit their customers.



Andreas Malmberg, President, Surface Drilling Equipment

“The Powercrusher product line is a great development for our customers. It is an excellent complement to our current product offering and makes us an even more complete partner.

“It means that instead of having to deal with different suppliers, our customers will be able to rely on us to supply them with these great products in addition to our superior surface drill rigs.

“In all projects where rock and stone often has to be processed immediately on site, the methods used for this part of the job often have a direct influence on the type of equipment and methods that should be used for drilling. As we are now able to supply these crushers and screeners too, we can help our customers to optimize the entire process which will lead to increased total productivity.

“The capabilities of these products fit very well with the benefits we offer our drill rig customers in terms of straightforward design, user friendliness and long-term, reliable performance. For example, the jaw crushers’ unique quattromovement results in end materials that are optimally-sized.”



Henk Brouwer, President, Construction Tools

“We are extremely happy that Atlas Copco has been able to acquire a company with such a long and successful history in the demolition business. Our customers who work in this area will appreciate that and also that it is a natural fit with the Atlas Copco products they are using such as multi-grapples and our range of silent demolition tools.

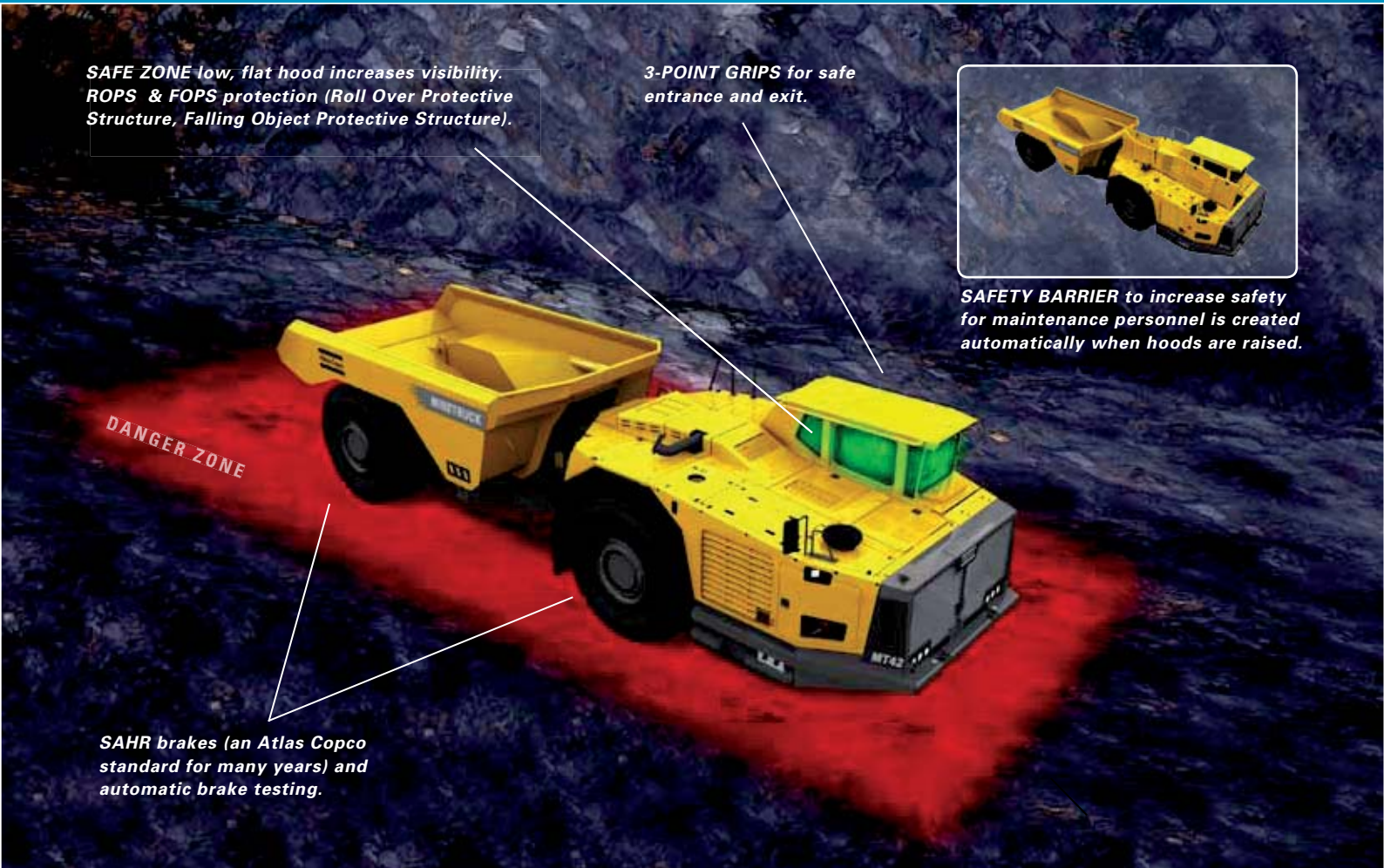
“Here we see that there are strong synergies that will lead to significant benefits for our customers, particularly in view of new environmental regulations that are expected to be introduced in the near future which specify that recycling has to be done at the worksite.”



Claes Ehrengart, President, Atlas Copco Road Construction Equipment

“Mobile crushing and screening is clearly an important part of the road building process and the high quality product offering from Atlas Copco Powercrusher is a great addition to our Dynapac range of rollers, pavers and milling equipment.

“It opens up new opportunities for us to expand our offering to our customers in the road construction segment. For example, we are now able to help our customers take care of concrete recycling anywhere on the worksite.”



SAFE ZONE low, flat hood increases visibility. ROPS & FOPS protection (Roll Over Protective Structure, Falling Object Protective Structure).

3-POINT GRIPS for safe entrance and exit.

DANGER ZONE

SAHR brakes (an Atlas Copco standard for many years) and automatic brake testing.



SAFETY BARRIER to increase safety for maintenance personnel is created automatically when hoods are raised.

ERROR

surface mining in the US alone has declined since the 1970s by nearly 90 percent.

Despite these achievements, however, we still have a long way to go to eliminate the risk of human error altogether. In the mining industry, the obvious way to do this is to try and make all operations as autonomous as possible. In other words, to remove as many people as we can from the mining area and make sure that those who are left are equipped with the very best tools.

But even with the best autonomous operation there will still be a need for people to perform preventive maintenance and service. That implies that we need to intensify our efforts to deal with issues such as incorrect handling, electric shocks, fluid leakage, accidental dropping of heavy items, and so on.

For drillers and drivers, the safest place to be is the cabin of the drill rig, loader or truck. Our equipment has many built-in fea-

tures that help to increase operator safety such as ROPS and FOPS protection. Moreover, today's cabins are all designed with smooth edges and without protruding components that could conceivably injure an operator who omits to wear a helmet. But the fact is, the moment the operator steps outside, he or she is immediately exposed to danger.

With a drill rig, it is mainly the area in front of the booms during drilling that poses a threat along with falling rock, but what about the ground below the steps where broken rock or other debris might cause an operator to trip and fall? With loaders or mine trucks, it is when these vehicles are on the move that the danger is greatest.


Small things count

In the quest for total safety, it is often the small things that count. On our Boomer rigs we have installed a light that illuminates the ground below the steps. On both Boomer and underground trucks, warning signals on the ignition switch alert people who may be nearby when an operator is about to start the engine.

All rigs being used in the automatic mode have light curtains on both sides that will detect anyone walking into the

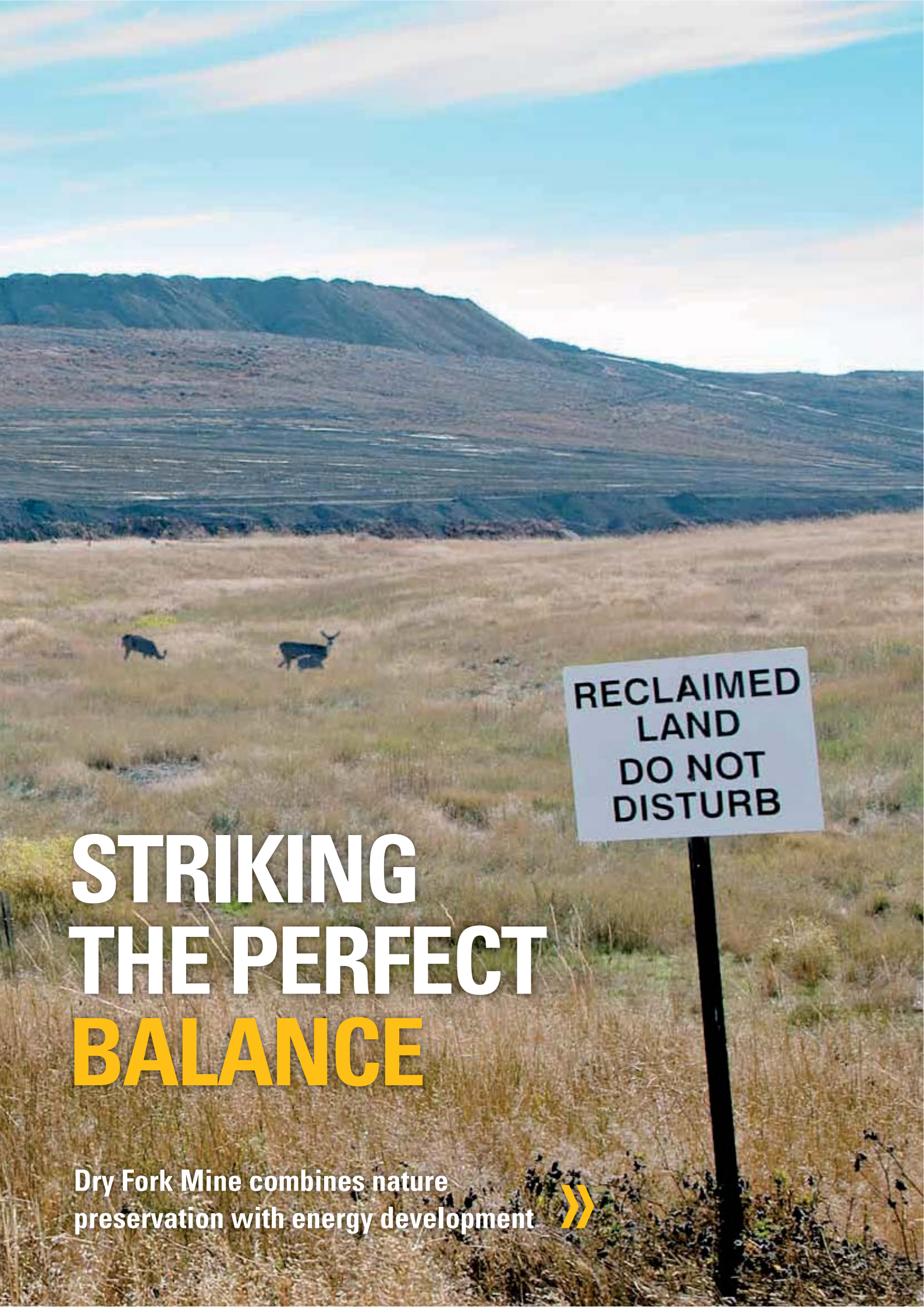
danger zone and will automatically shut the machine down. Key service points on the rigs as well as the underground loaders and trucks are placed on the engines' cool side and these are also accessible from the ground, removing the need for the operator to climb or stand on a ladder.

On our underground trucks, the low, flat hood design increases visibility. We have spring-applied hydraulic release brakes and automatic brake testing, a safety barrier if there is a need to access components on top of the vehicle, and much more.

These are just a few examples and by no means a comprehensive review of all the safety features we offer. Nonetheless, they represent important steps along the road to minimizing and ultimately eliminating equipment downtime. 




Sverker Hartwig is Technical Director at Atlas Copco AB. He is a leading campaigner for occupational safety and has pioneered many of the safety features that characterize Atlas Copco's products.



RECLAIMED
LAND
DO NOT
DISTURB

STRIKING THE PERFECT BALANCE

Dry Fork Mine combines nature
preservation with energy development 



» ***The Dry Fork surface coal mine in the state of Wyoming, USA, is well known for its ability to successfully combine nature conservation with mining and energy production. The drilling equipment on the site is part of the equation.***

Dry Fork Mine is proud of its environment and safety record – and with good reason. The mine, located near Gillette, in Wyoming’s Powder River Basin, last year celebrated nearly seven consecutive years without a lost time injury and, more recently, it received three prestigious environmental awards.

Opened in 1990, Dry Fork is a 24/7 operation supplying coal to Western Fuels-Wyoming, Inc (WFW) which is owned by a collective of power companies.

The mine is scheduled to produce an estimated 5 to 6 Mt of coal annually, of which 1.5 to 2 Mt will be used in the new Dry Fork Station, a 385 MW power plant located next to the mine.

For blast hole drilling, Dry Fork uses an Atlas Copco DML drill rig with the new Atlas Copco Secoroc Grizzly Paw 10⁵/₈" (270 mm) bit. In the past, the mine drilled 9" holes (229 mm) with an older drill, but today with the DML, it is able to increase the hole size 10⁵/₈" which has allowed the mine to expand its drill pattern by nearly 30 percent.

Every element of the mining area

is included in the mine’s reclamation plan. Animals, trees, surface rocks – all documented in the permitting process. Beth Goodnough, the mine’s Director of Regulatory Affairs and the keeper of the permit says: “It’s a constantly evolving permit. Currently it is 25 volumes long and growing.”

She continues: “We make efforts to replace the wildlife micro habitat that is impacted by mining by replacing shrubs, building rock piles, planting trees and bushes, and installing rock and bluff-type ledges in the reclamation.

“The permit requires us to restore one shrub per square meter on 20 percent of the reclamation. The seed mixes are rather complicated and include the Wyoming big sagebrush, silver sagebrush and a variety of native grasses and forbs.”

Back to nature

Rock outcrops are also replaced where the integrity of the rock makes it possible. Another recently constructed feature is a 1.6 hectare (4-acre) alluvial valley floor that was recreated to look similar to the

one that had been present prior to mining. In another area, the mine has succeeded in establishing a wetlands channel, and has three restored wetlands ponds.

In addition to reclamation, all climate and sub-terrestrial elements are examined and monitored. Explains Goodnough: “Wetlands, hydrology, air quality, climatology, archeology, wildlife – everything is documented and reported monthly or annually. I see different inspectors once or twice a month, federal and state. There are a lot folks with different focuses



The new Atlas Copco Secoroc 5⁵/₈" bit, appropriately named Grizzly Paw.

watching what we do. We are trying to do in 10 years what it took nature hundreds of years of evolution to accomplish.”

The mine manages approximately 4 000 hectares (10 000 acres) of land and nearly 20 percent of disturbed land has been reclaimed to what it was before mining took place. Goodnough says: “We

“We want a one-to-one ratio as we go forward; an acre reclaimed for an acre disturbed.”



Beth Goodnough Director of Regulatory Affairs, Dry Fork Mine

want a one-to-one ratio as we go forward; an acre reclaimed for an acre disturbed.”

The right drill rig

The DML is a new drill rig for Dry Fork and John Barnes, Mine Superintendent, says: “It’s an advantage with the larger diameter hole because we don’t have to shoot daily.”

He says he likes the fact that the driller, Mark Lindsey, can be doing other things and still stay ahead of schedule. Each blast usually requires 35 to 40 holes. When the overburden is less than 9.1 m he drills vertical holes and if it is deeper than 9.1 m he drills at a 20 degree angle.

“The Grizzly Paw bit performs well when drilling through rock,” says Barnes and the penetration rate is typically around 7.5 to 10 m per minute.

Drill operator Mark Lindsey adds: “It didn’t take more than a couple of weeks to get comfortable with the controls on this rig. I like the carousel system and it’s very user-friendly. There are good safety features, too. They keep you from screwing up.

“It has lots of air power and drills fast overall. I wasn’t too sure I’d like the GPS, but now I’m spoiled and I really like it.”


Toward the north end of the Powder River Basin, Dry Fork is producing higher moisture, low sulfur, sub-bituminous coal at 8 000 to 8 200 MJ/kg. The mine has two pits with coal of different properties, which allows loads to be mixed according to a power plant’s specifications.

Coal depth in the region varies which makes reclamation more difficult. Barnes says: “We map everything to ensure post-mining contours coincide with pre-mining elevations. This includes setting topsoil aside during initial excavation so it can be replaced after reclamation. Basically the reclaimed land will look just like it did before, just lower because the coal has been removed.”

The coal has two layers, Anderson and Canyon, and both are mined. The Anderson layer on top, which is about 5.5 m thick, and the lower Canyon

deposit which is generally 17 m thick. A sedimentary rock stratum about 2 m thick separates the two seams.

When drilling in coal, Lindsey says the Grizzly bit drills “like a hot knife in butter. It is easy drilling and it won’t plug up either.”

Dry Fork is just one of several mines in the region that preserve the environment as they extract the coal, and together they aim to ensure that the deer and the antelope will continue to flourish in the Powder River Basin for generations to come. 



In the “cockpit” of the DML drill rig at Dry Fork mine: Operator Mark Lindsey says: “It didn’t take me more than a couple of weeks to get comfortable with the controls.”

THE SEVEN HAM

Cluster drill strikes a blow for productivity in California

A cluster drill named after the hammer-wielding Nordic god Thor, has struck a blow for productivity in California with seven modern hammers in one powerful tool.

Foundation drilling expert, Anderson Drilling, is known in California, USA, for its ability to tackle big, complex foundation jobs, and a project to build new bridges near San Diego was no exception.

The bridges, which will cross the San Luis Rey River and Ostrich Creek, involved the installation of 37 foundation piles in sizes ranging from 60 to 108 inches in diameter and 55 to 80 feet in depth. Each pile was designed with rock sockets, 48 to 96 inches in diameter and up to 20 feet in length.

Anderson operates a fleet of foundation drills, cranes and the traditional tooling capable of completing such an assignment but wanted to find a way to speed up the drilling operation to increase efficiency.

As a result, the company decided to use a cluster of seven Atlas Copco CDS 8-inch hammers in one assembly, each equipped with 10-inch bits. This 48-inch cluster drill, named Thor by the Anderson team, was then put to work in granite with a compressive strength of 170 Mpa (25 000 psi).

Anderson Drilling's main aim was to reduce the drilling time within the rock socket zones, a process that was complicated by up to 60 foot of loose soil and high ground-water conditions above the hard bedrock.

This required the installation of permanent steel casing and use of "wet-hole" construction methods (blind drilling with

polymer drill fluids) for pile installation.

The 48-inch cluster drill was the optimal size for drilling all 21 of the rock sockets to their final design diameter, as well as to provide pilot holes for the larger 72–96 inch sockets which would then be reamed out.

Senior Project Manager Mike Kennedy says: "After five years of on and off renting of this type of tooling we started talking about purchasing a cluster drill. It was the working relationship we had developed over the years along with communication and trust that gave us the confidence to go with Atlas Copco. We have watched others try this with [competitive] drills, but we wanted to go with someone we could trust."

Drilling in steps

The first part of the project includes 20 bore holes for the 1 000 ft bridge over the San Luis Rey River. This requires four bridge abutment holes and 16 bent holes that run parallel, supporting the length of the bridge. The second part includes 17 abutment holes that will support the bridge over the 50 ft wide Ostrich Creek.

To reach the desired depth and diameter, the holes are completed in a series of steps and the cluster drill isn't utilized until the bedrock is reached.

This is achieved by installing a series of casings through the overburden using an

auger drill. Each new casing installed is slightly smaller in diameter and longer than the one before, providing a "telescopic" effect.

The final casing tube is a 63 ft, 51 inch pipe which is "seated" into the bedrock to provide an airtight annulus for the cluster drill.

The rock socket will be nearly 20 feet deeper into the bedrock. In this case, the cluster drill is used to drill a pilot hole for the core barrel tool that will follow, resulting in a final rock socket diameter of 96 inches.

Easy and efficient

Anderson has been drilling foundations for many years with large diameter core barrels and other rock tools. The cluster drill approaches the rock in a different way, essentially pulverizing the rock mass into sand and gravel-sized pieces, making cuttings removal easy and efficient.

During drilling, the cuttings are forced upward by compressed air and collect in what is called a Calyx basket. The driller monitors the drill advancement by markings on the drill string. In this case, when the drill has advanced approximately 4 ft, it is time to retrieve it and empty it. A forklift is used to help raise the basket allowing the cuttings to fall away.

Anderson paired the cluster drill with one of its newest, heavy drill units. Operator Ronnie Nourse, who has been drilling for Anderson for 15 years, commented on



Operator Ronnie Nourse: "Once we got the sweet spot for rotation the cluster drill has gone great."



Emptying the Calyx basket: It takes about 20 minutes to lift the drill, remove the cuttings and return the drill to the hole.



Thor's configuration: A cluster of seven Atlas Copco Secoroc CDS 8-inch hammers equipped with 10-inch bits.

HAMMERS OF THOR




the speed of the cluster drill. He says it takes 45–50 minutes to drill the 4-ft depth and another 20 minutes to remove the cuttings and get the drill back in the hole.

“Using a core barrel it would take much longer and, then the core has to be removed and hopefully it breaks off clean, which is not always so easy when you’re underwater. Drilling with the cluster drill makes the job work very smoothly,” he adds. It takes approximately a week and a half to complete one hole.

The sweet spot

When the cluster drill arrived, Atlas Copco’s Chris Woods stayed on site for the first few days. Nourse says: “Chris assisted us on site to make sure we got it right, had the correct down pressure, rotation speed etcetera. Then, once we got the sweet spot for rotation, it has gone great.”

For example, when the cluster drill was set at 2 rpm, the hammers were regrinding the rock. Nourse found that 4 rpm with 150 psi of air, worked well. The 50 000 pound weight of the drill stem is all the pressure needed on the bit. Three Atlas Copco XAS 1600 CD6 compressors put out the required 4 800 cfm of compressed air. Thanks to the success of “Thor” on this job, Anderson Drilling is now looking to acquire even larger cluster drill models. 



Service makes the difference

IN VIETNAM



Graduation day for service technicians in Southeast Asia: From left, David Anderson (General Manager), Pham Van Toan, Dang Ngoc Tuan, Antonio Recardo, (teacher), Nguyen Van Tuan, Bui The Ngu, Nguyen Xuan Son, Tran Quoc Vu, Lok Weng Peng, Pham Dinh Quan, Mohd Kamil Harun, Chew Chee Siong and Pham Hong Phuoc.



Serving the Quang Ninh province: From left, Pham Dinh Quan, Pham Van Toan, Dang Ngoc Tuan, Nguyen Van Tuan and Bui Ming Cuong.

As Vietnam's economy continues to thrive, the country's mining and construction companies have an increasing need of professional services and technical support. Atlas Copco is geared up to meet the demand.

The group of 11 Vietnamese and Malaysian engineers had plenty to smile about as they posed for the camera on graduation day. They had just received certificates confirming their status as fully fledged Atlas Copco service technicians. But beyond the personal achievement of those involved, the event was a triumph for Atlas Copco Vietnam in that it became the first company in the global organization to achieve certification for every member of its service team.

According to Andrew Lyon, Atlas Copco's Regional General Manager, South-



- Coal production at Ha Long
- Hydropower construction at Lai Chau

east Asia, Vietnam's success is significant of the transformation now taking place throughout the region.

"Over the last few months, we have been driving a mission to improve and standardize service and support in the region and to duplicate best practices for customers in each country," he says.

"Our goal is to give our customers better service and technical support by placing product experts throughout the region, making them more easily accessible."

David Anderson, General Manager for Atlas Copco Vietnam, adds: "By getting closer to our customers we have been able to change the traditional culture of 'fix when broken' to a culture of more preventive maintenance. And that's a very important change.

"Today, we offer strategic positioning of fully equipped, on-site workshops and spare parts storage containers, as well as factory trained technician support to meet the fast pace of change and demand from our customers and the industry."

Each country has developed local service teams and parts inventory to provide the best possible support in that country.

Cross training

In Vietnam, Pham Dinh Quan, Atlas Copco's Service Manager, is cross training technicians by moving them around the country and pairing experienced technicians with those needing additional training. Customers benefit from the extent of Atlas Copco's presence.

Andrew Lyon concludes: "We are succeeding in breaking down language and culture barriers and learning to serve the customers by utilizing each country's strengths. But our real strength lies in our people who serve the customer because it is service that makes the difference." ○

Drilling for hydropower in Huoi Quang



Le Tuan Long, Operations Manager for Lung Lo at the Huoi Quang Hydropower project in the cab of an Atlas Copco Boomer L2 D, one of two such rigs being used at the site.

Vietnam's cities are growing to support the country's rapidly expanding manufacturing base – and so too is the need for electricity. M&C visits one of the biggest hydropower projects in the country now being built to help meet demands.

Construction of a 520 MW hydro-power plant is under way at Huoi Quang in northwest Vietnam. Scheduled to come on line in 2014, the plant is expected to produce 1.84 billion kWh of electricity per year.

With ambitious goals for rapid progress, the drill and blast teams have chosen Atlas Copco Boomer rigs to handle the drilling operations.

When commissioned, the new plant will make a significant contribution to Vietnam's increasing need of power. It will be one of the four largest hydropower

facilities in the country along with Son La, Hoa Binh, and Lai Chau.

Huoi Quang is located on the Da River some 450 km northwest of Hanoi, and is initiated and supervised by Vietnam Electricity, the state agency that supplies the country's power. Two main contractors are working on the construction and excavation of the required tunnels – Song Da #10 and Lung Lo Construction Ltd Company.

A 4.2 km headrace tunnel is currently being constructed from three separate portals. Song Da is drilling from opposite ends of the 7.5 x 7.5 m main tunnel while, at the time of M&C's visit, Lung Lo, part of the Vietnamese army, was driving a 6 x 6 m access tunnel to the T-point before continuing in the main tunnel, on two fronts and in opposite directions, to meet Song Da. »

“Atlas Copco makes a quality machine I can depend on.”

Le Tuan Long, Operations Manager, Lung Lo Huoi Quang Hydropower



The way to work: Two Atlas Copco Boomer L2 D drill rigs on the road to the access tunnel site of the Huoi Quang hydropower project in northern Vietnam, some 450 km north west of Hanoi.



Good co-operation: From Left, Le Tuan Long (Operations Manager, Lung Lo) Glenn Chepelsky, Regional Business Line Manager, Underground (Atlas Copco), Tran Viet Trung (Atlas Copco Sales Engineer), Nguyen Van Tien (Vice Director Transportation and Maintenance Operations Manager, Lung Lo).

The 500 m long access tunnel was being excavated at an incline of six degrees on its way to the T-point and more than half of it had been completed. Lung Lo uses two Atlas Copco Boomer L2 D drill rigs, each equipped with COP 2238 rock drills, which provide 22 kW of power, as well Secoroc 45 mm ballistic button bits and T38 drill rods.

To drill each round took 2–2.5 hours and working in three shifts, the teams achieved two, 4 m advances each day including drilling, charging, blasting and mucking out. The crew drilled 190–195 holes per round which it also planned to do in the main tunnel.

The plan for support and lining included wire mesh, rock bolts, sprayed concrete with concrete admixtures and steel arches.

Le Tuan Long, Lung Lo’s Operations Manager, points out that he has worked

with Atlas Copco for many years on various projects and respects the quality of the equipment.

“Atlas Copco makes a quality machine that I can depend on,” he says. He emphasises that Lung Lo is paid bonuses for working faster and that it is important to have equipment that can operate consistently at peak performance.

Nguyen Van Tien, Vice Director of Transport and Maintenance and onsite Operations Manager for Lung Lo, has used drill rigs from various manufacturers over the years but says: “The Atlas Copco rigs drill faster and have the easiest controls.”

Hard rock challenge

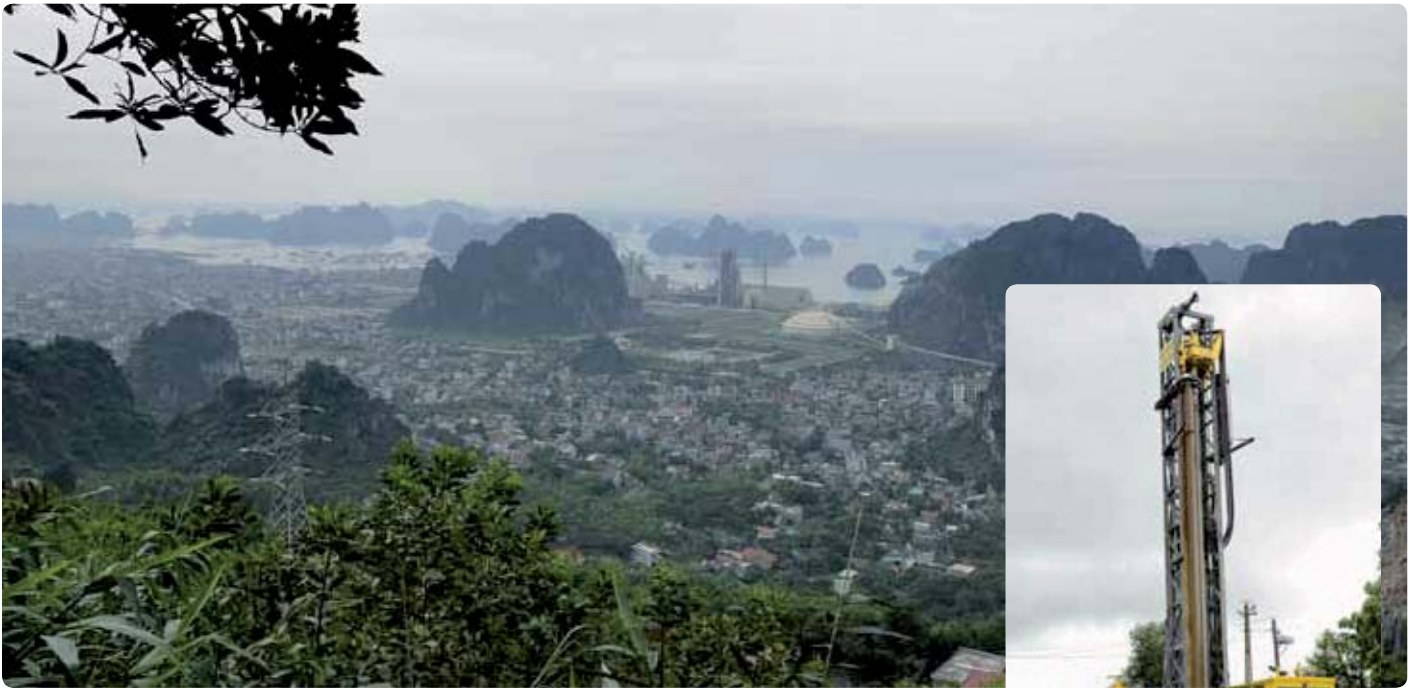
Nguyen Van Tien continues: “The rock is very hard at this site. It is difficult to say

exactly how much faster the Atlas Copco rig can drill because of variations in the rock formation, but taken side by side, I would say Atlas Copco’s penetration rate is about 20 percent greater than with the previous rigs we used.”

Van Tien’s crew has had no problems with the rigs and he is pleased that they enable the company to meet and exceed production requirements.

Tang Van Chuc, Chairman of Military Assembly, a Senior Lt. Colonel in the Vietnamese army and head of Lung Lo’s infrastructure operations, confirms the views of the field crews.

He concludes: “The Boomer L2 D operates faster and is a longer lasting rig which translates to a financial bonus in the overall operation.”



Drilling in the coal fields of Ha Long bay



The Atlas Copco DML 45 at the Nui Beo coal pit.

Coal production is a vital part of the Vietnamese economy and the country's largest field is using modern drilling technology to optimize productivity and efficiency.

The mountainous region overlooking the picturesque bay of Ha Long is the largest coal mining district in the country. With reserves of 2.5 billion tonnes and a production in 2009 of 43 M/t from the collective efforts of about 70 companies, the region produces 90 percent of the country's needs.

Here, in mostly open pits mines, Atlas Copco is at work helping to optimize drilling performance and meet demands for high productivity.

The majority of the drilling is performed by Atlas Copco DML and DM45 blast hole drill rigs together with a variety of smaller surface crawlers including ROC F7, ROC F6 and ROC L7 CR COPROD.

In 2009, Nui Beo Coal Company produced 5.1 M/t of coal and 22 M/t of waste rock using four rigs, two Atlas Copco diesel powered and two Russian-made, electric powered rigs.

Faster penetration rates and better mobility allows the Atlas Copco DM45 and DML rigs to significantly out-drill the other two.

The Atlas Copco rigs achieve 8 500 drilled meters per month, whereas the electric powered rigs drill 3 000 m per month.

Ptham Trung Kien, the mine's technical manager overseeing the fleet says of all the rigs on site he favours the DML. With its Caterpillar engine, he believes it offers more power than the DM45, but admits that both are more productive and efficient than other rigs the company has operated.

Although he has had no major problems with the rigs, he appreciates the local support offered by Atlas Copco.

The DML and DM45 both use 230 mm Secoroc tricone bits and 7 inch rods. The operations are currently 100 m below sea level working 20 m benches. Drilling is carried out at angles of 10 to 20 degrees while the coal seam dip is about three degrees.

Tay Nam Da Mai

The Tay Nam Da Mai Joint Stock Corporation also operates DML rigs and is currently drilling at 40 m above sea level while the coal seam stretches down to about 40 m below sea level. The benches are 16 m high and have a 6 x 5 m pattern which is commonly used in the area.

This mine produces one tonne of coal for every 9 to 10 t of waste and aims to achieve 1.5 M/t by the end of 2010.

At this mine, the DML drills 5 000–6 000 meters per month in hard rock and 8 000 to 9 000 m per month in softer formations. The pit is 1.8 km long by 1.5 km wide and at the current production rate is estimated to have another 15 years of life.

Vu Ba Hoa, Deputy Manager, Electrical Mechanical Dept., says: "I like the durability of the Atlas Copco rigs and their ability to drill more meters. Because the electric Russian rigs achieve lower availability and drilling performance it takes them a year to drill as many meters as the DML will drill in three months."



Ptham Trung Kien, Technical Manager for Nui Beo Coal Company, says he appreciates the service support provided by Atlas Copco in the Ha Long area.

The 100th Boomer E2 C goes to Indian road tunnel


INDIA Atlas Copco is celebrating the manufacture of its 100th Boomer E2 C face drilling rig with a major drilling assignment in India.

This popular rig will be used to drive road tunnels for the planned Srinagar-Jammu highway as part of a road improvement scheme that will link the state of Jammu & Kashmir to the rest of India.

The contract has been awarded by India's National Highway Authority (NHAI) to ILFS Ltd, which in turn has awarded a back-to-back contract to Leighton Contractors India (part of Leighton Holdings, Australia's largest project development and contracting group).

The tunnel, called Chenani-Nashri, will get under way in December and is planned for completion in July 2015. It involves the construction of a main tunnel and parallel escape tunnel through the lower Himalayan mountain range. At about 9 km long, it will be one of the longest road tunnels in Asia.

A similar contract has been awarded by NHAI to Navayuga Engineering Company Ltd., which has also invested in E Series Boomer rigs.

The first Boomer E2 C was delivered in 2006 to the Austrian construction company PORR AG and has since been delivered to more than 20 countries. 




First up: Uwe Baelder, General Manager of Schotterwerk Moersdorf, takes delivery of his first Powercrusher 6. He is flanked by Atlas Copco managers Bo-Göran Johansson (left) Klaus Stüber and Eugene Cheng.



Prestigious project: Above, the 100th Boomer E2 C that will help to link Jammu & Kashmir with the rest of India. Left, two of the engineers who built it: Niklas Larsson (left) and Mehmed Begovic. (The rigs will also be fitted with basket booms).

First Powercrusher customer

LUXEMBOURG Just a few weeks after the launch of Atlas Copco Powercrusher's range of crushers and screeners onto the world market, the first unit was sold. Uwe Baelder, General Manager of the Luxembourg road construction company Schotterwerk Moersdorf, became the first to take delivery of a Powercrusher 6. 

See pages 14-17 for the full story on the Powercrusher launch.

IN BRIEF

For the copper of Kazakhstan

A major package of Atlas Copco drill rigs, loaders and trucks, is to be used by Kazakhmys Group in three mines in the Zhezkazgan area. Björn Rosengren, Business Area President of Atlas Copco Construction & Mining Technique, says: "This is a clear sign of the strong relationship we have built up with Kazakhmys."

The Zhezkazgan complex is an important area of Kazakhmys Group. It is the largest copper producer in Kazakhstan and among the top ten producers worldwide.

New Center in Panama...

Atlas Copco has opened a Customer Center in Panama to meet a growing demand from customers in Central America and the Caribbean.

Atlas Copco Central America S. A., will market drill rigs, consumables and parts for both underground and surface operations as well as offer exploration, construction and ground engineering equipment and compressors. One important project in the region is the expansion of the Panama Canal for which Atlas Copco has already delivered drill rigs.

Best face on Facebook?




Atlas Copco has launched a new page on Facebook for all users interested in the world of underground mining and construction, from industry professionals to potential customers, the media or future employees. Here, Facebook fans will be able to take part in discussions surrounding underground equipment and applications.

Go to facebook.com/AtlasCopcoUnderground

Rio Tinto cooperation wins top design award

AUSTRALIA A joint project between the mining company Rio Tinto and Atlas Copco involving a new type of mining machine has won a top award in the Mining Magazine 2110 Awards.

This cooperation has resulted in the Modular Mining Machine (MMM), a horizontal tunneling machine which can excavate mine drifts with preferred profiles. It is also flexible enough for narrow turns and for starting the tunneling of Y-shaped branches and can work on a 1:7 incline or decline.


The award was announced during the Mining Magazine congress in Perth in November and the design is now being finalized. 

A winning concept developed with Rio Tinto: The MMM's patented disc cutting system produces a clean tunnel with a flat floor and roof.



Shanghai has seen the future

CHINA Atlas Copco's futuristic surface drill rig became a major attraction at the recent Shanghai World Expo. ROC X1 represents a concept that offers greatly increased productivity, high mobility, silenced operation and environmental friendliness.

The model rig drew huge crowds and has since stimulated international interest in future drill rig design and surface drilling technology. Mårthen Elgenklöw, Regional Business Manager for Atlas Copco Surface Drilling Equipment, says: "This is what modern society will expect from pro-active suppliers in the not-too-distant future; the ability to be productive, for long hours and close to urban areas." More than 5 000 people visited the Atlas Copco display. 



Fascinating concept: The ROC X1 was unveiled at the World Expo in Shanghai, generating huge interest among the Chinese visitors.

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Sustainable Productivity

