



# MINING & CONSTRUCTION

MECHANIZED ROCK EXCAVATION WITH ATLAS COPCO - NO. 2/ 2010

## Cluster drill increases productivity



Symmetrix system bridges gap in coastal highway project

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Advanced methods used to expand open pit mine

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Atlas Copco builds new assembly plant in U.S.

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*Atlas Copco*

## EDITORIAL



I want to introduce myself to those who I have not yet met; I'm the new Business Line Manager for Atlas Copco's Geotechnical Drilling and Exploration products division. It is with great pride that I add these GDE products and special drilling applications to my current oil and gas drilling responsibilities.

As a specialty drill and tool manufacturer there is not an aspect of infrastructure, mining or oil and gas drilling that we do not touch. From the rig at the surface or face, to the tool at the bottom of the hole, Atlas Copco has something for your drilling application. We want our business to be as diverse as you need us to be.

Atlas Copco's specialty with its products doesn't end with the hardware or machine; it's the expertise that we offer in the field that really makes us special. The employees of Atlas Copco are passionate about their areas of responsibility. All around the world, our people are at work developing new products, working with customers to use equipment in the best way, and providing parts and service like no other.

So while my colleagues and I are proud of what Atlas Copco sells, I hope you, our customers, are just as proud to carry our equipment in your fleet. I wish you the best – and hope to meet face to face in the future.

**Scott Slater**  
Business Line Manager  
Geotechnical Drilling & Exploration  
and Atlas Copco Drilling Solutions

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# THOR

## FINDS A HOME IN CALIFORNIA

»



## Foundation driller increases productivity with cluster drill that the crew calls “Thor”

» Anderson Drilling is a respected and experienced foundation contractor known for tackling big foundation jobs in California. Anderson operates a high quality and well maintained fleet of foundation drills, cranes and the traditional tooling capable of completing these often monumental projects. In order to be more efficient in the recent downturn in the construction economy, Anderson looked at newer technology, specifically Atlas Copco’s 48-inch cluster drill, as a way to speed up the foundation drilling process.

Anderson Drilling’s management, including Sr. Project Manager Mike Kennedy, Director of Business Development Dennis Poland, San Diego area General Superintendent Charlee Bixby and Vice President of Operations Kelly Hawes, got together with Atlas Copco Vista Store personnel Tom Liebl, Area Sales Representative, Service Manager Chris Woods, Ken McClanahan, geotechnical Sales Specialist, and DTH Center Business Development Manager Al Waltry. From the point of discovery through the bid process, the team looked at the project knowing that if the job was successful both would benefit.

Anderson Drilling’s scope of work included the installation of 37 foundation piles to support two new bridge structures over the San Luis Rey River and Ostrich Creek near San Diego, California. The drilled piles varied in size from 60 inches to 108 inches in diameter and ranged from 55 to 80 feet in depth. Each pile was designed with rock sockets that ranged from 48 inches to 96 inches in diameter up to 20 feet in length.

The granitic rock of southern California is known for high strength and with compressive strengths nearing 25,000 psi the rock on this project was no exception. The critical issue facing Anderson Drilling was reducing the drill time within the rock socket zones. The construction process was complicated by loose overburden materials and high groundwater conditions above the hard rock that required the installation of permanent steel casing and use of “wet-hole” construction methods (blind drilling with polymer drill fluids) for pile installation.

Atlas Copco and Anderson Drilling worked together to obtain a scalable solution that included multiple cluster drills to



*Along with the 48-inch cluster drill, three Atlas Copco XAS 1600 CD6 compressors were vital pieces of equipment on this job site.*

chew through the hard rock found in the rock socket zones. As the team contemplated the optimal size for the cluster hammer they considered several things like the frequency of a particular rock socket diameter, tool weight, tool support equipment requirements, and especially their existing rock tool capabilities. This included a wide range of double wall air or water calculating coring tools and other specialized tooling like mini carbide roller cutters and disc type cutters. Ultimately, they determined that a 48-inch tool was the optimal size allowing them to excavate all of the abutment shaft (21 total) rock sockets to their final design diameter, as well as provide a sizable pilot hole at each of the larger 72-inch to 96-inch rock sockets required at the bent pile locations. The pilot holes would be reamed out (enlarged) to the ultimate design diameter utilizing a repertoire of in-house rock tools.

Dating back to the original founders of Anderson Drilling nearly everything in the fleet is christened with a name. Through the setup process, plant manager, Rick Watson and his team came up with a name for the 48-inch cluster drill. ...It was affectionately called “Thor” after the Norse, hammer-

wielding god of thunder.

“A number of things came together to make this the perfect situation for us to utilize this cluster drill,” said Senior Project Manager Mike Kennedy. He pointed out some of the key detail that were taken into consideration for the project. “The project is located just 10 minutes away from Atlas Copco’s Vista store. This would mean nearly immediate support in the event it was needed. To try something new requires purchasing equipment, which is hard to justify in a tough economic environment. But most importantly a new process would require a steep learning curve until the crew was efficient at the new drilling method.”

Poland agreed, “[In the past] we would always run a cost analysis between using existing tools and getting a cluster drill, and there had not been a big advantage to purchase a complete set up until this project.”

As mentioned earlier, the driving factors for deciding on the 48-inch drill was the number of holes on this project that required a final diameter of 48 inches in the 25,000 psi of the rock, as well as factors such as working under water and removal of full diameter rock cores. These are time



Decorating the front of Anderson Drilling's headquarters is the two-story core taken from a previous foundation project. They still use the coring method, but look to cluster drills as the future in large diameter projects. From left, Mike Kennedy, Senior Project Manager; Dan Cadenhead, President, and Dennis Poland, Director of Business Development.



Cuttings are dumped from the Calyx basket, which collects cuttings during the drilling process.

consuming endeavors that tipped the scale in favor of trying something new.

Speaking for the Anderson team, Kennedy said, "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," said Kennedy.

### Hard foundations

The project can be described in two parts. The first includes 20 bore holes for the 1,000-foot bridge over the San Luis Rey River requiring four bridge abutment holes and 16 bent holes that run parallel, supporting the length of the bridge. The second part includes a total of 17 abutments shafts that support the bridge spanning over the 50-foot wide Ostrich Creek. The subsurface is comprised of sand and unconsolidated rock overburden in the river beds to approximately 60 feet in depth, with a weathered rock transition into solid granite rock.

To meet the earthquake regulations for the state of California the piles have been engineered to provide bridge foundation support capable of withstanding an 8.0 magnitude earthquake event.

"Really it's not the depth of the hole that engineers are looking for; the driving factor is the skin friction of the caisson in competent ground. The support value and shear

strength comes from the rock socket at the bottom of the caisson," said Kennedy.

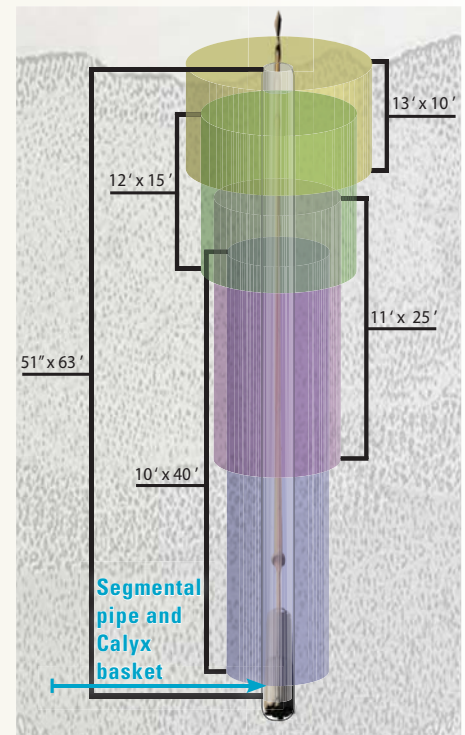
To reach the desired depth and diameter the hole needs to be completed in a series of steps. The cluster drill isn't utilized until solid granite bedrock is reached. Bedrock contact is achieved by installing a series of casings through the overburden soils. Each new casing installed is slightly smaller in diameter and longer than the previous casing providing a "telescoping" effect. The overburden material within each casing is drilled out using an auger tool under a polymer fluid head used to control bottom heave. (See illustration.)

The final piece of casing installed was a 51-inch (ID) segmental pipe. This pipe is "seated" into the bedrock and provides an airtight annulus for the cluster drill. The segmental pipe also assisted in maintaining the drilled shaft alignment.

In the hole photographed, the segmental pipe is 63 feet long, extending nearly 60 feet below ground surface. The rock socket will be nearly 20 feet deeper into the bedrock. The cluster drill is being used to drill a pilot hole for our core barrel tool that will follow resulting in a final rock socket diameter of 96-inch.

### The balance of time

Anderson Drilling has been drilling foundations for years with large diameter core barrels and other rock tools. The process is slow and laborious, but effective. As the large core barrel with cutter teeth rotates, it forms a "curf" or groove leaving a rock core



Each new casing installed is slightly smaller in diameter and longer than the previous casing, providing a "telescoping" effect.

in the center. To cut this core could take days depending on the depth, quality and hardness of the rock. After the initial coring effort, the process of removing and disposing of the core is another major task that requires time, special resources and skills. Fractured or broken rock cores may be augered out; however, large solid cores may require heavy crane lifting capabilities. >>



Left to right: Brad Gilliland, crane oiler; Ernie Richarte, crane operator; John Baker, foundation drill oiler; Ronnie Nourse, foundation drill operator; Paul David, superintendent, and Curtis Smith, operator.

The cluster drill approaches the rock in a different way, essentially pulverizing the rock mass into sand and gravel sized pieces to make cutting removals relatively easy and efficient. During drilling the cuttings rise above the drill tool and settle in what is called a Calyx basket. The driller monitors the tool advancement by markings on the drill string.

In this case, when the tool advanced approximately 4 feet it was time to retrieve the tool to dump the cuttings. A forklift at ground surface assisted in raising the basket, allowing the cuttings to fall away from the tool.

There is something to be said about the right combination of “parts” to make for an efficient operation. Anderson Drilling paired the cluster drill with one of their newest heavy drill units, a SoilMec SR 100 (a 100 Ton Class machine), and an experienced operator in Ronnie Nourse.

Ronnie has been drilling for Anderson for 15 years and is a top operator of the SR 100. “This is Anderson’s baby,” he said, referring to the drill rig with pride. He says its standard depth capacity is 134 feet, with the ability to drill to 205 with an optional feed system. As for drilling with Atlas Copco’s cluster drill Nourse said, “This is one badass 4x4!”

He likes the fact it drills fast, and when

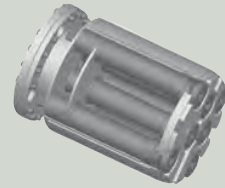
he’s finished with the 4-foot lift, the rock goes with it. It takes 45 to 50 minutes to drill the 4-foot depth and another 20 minutes to remove the cuttings and get back in the hole. Using a core barrel, Nourse said, “It would take much longer and then the core has to be removed. Hopefully it breaks off clean, not always so easy when you’re underwater.”

### Cluster drill process

Once the outer casings and segmental guide casing are in place, Nourse has a special cutter that gives the bottom of the hole a flat surface. Then once the hole is drilled with the cluster drill, the segmental guide casing is removed and the ream process begins to the desired 72-inch or 96-inch diameter. To complete a hole will take approximately a week and a half.

Drilling with the cluster drill makes the job progress very smoothly. When the cluster drill was brought on site Atlas Copco’s Chris Woods stayed with the project for the first few days.

Nourse said, “Chris assisted us on site to make sure we had it right – correct down pressure rotation speed etc. Once we got the sweet spot for rotation, it has gone great.” As an example, when set at 2 RPM the hammers were regrinding the rock. Nourse found that 4 RPM with 150 psi air worked well. The 50,000- pound weight of the drill stem



### THE CLUSTER DRILL COMBINES MULTIPLE DTH HAMMERS INTO A SINGLE CANISTER.

- Custom-engineered drills are manufactured to meet each customer’s needs.
- Features exclusive, patented technology for self-indexing and quick-release bits.
- Drills holes 32 to 70 inches in diameter.
- Short, light weight and compact.

and Kelly bar is all the pressure needed on the bit.

Anderson is using three Atlas Copco XAS 1600 CD6 compressors on the job. Each of the seven Atlas Copco Secoroc CDS 8-inch hammers with a 10-inch bit, requires 527 cfm. Together the units put out the required 4800 cfm for the job.

Oiler John Baker is responsible for the ground work on the job. Quite visibly the hardest working guy on the job, Baker never rests. When he is not monitoring the drilling fluid pumping to maintain the proper consistency in the hole, he is watching the hammer fluids or compressor output.

The compressors have run perfectly and quiet. Because they are running so quiet, he has put yellow tape at the air vent to make sure they are working. “They run so much quieter than other compressors,” he said. They run at 1650 RPM and 150 psi with element temperatures at 204 degrees F. He has little to do with them during the day other than checking and topping off fluids in the morning and monitoring output. “Atlas Copco is taking care of service with the rental agreement. I just get to use them.”

Anderson has found success with the cluster drill and would like to get a bigger one in the future. A 48-inch by 72-inch to pair with “Thor” tops the crew’s wish list, but they would also like a 60- inch by 92-inch pair of cluster drills. For right now, however, the 48-inch drill is the right compromise and a great beginning for what is looking like a great future between Anderson Drilling and Atlas Copco.

# BRIDGING Pitkins Curve



*Workers check to see if the casing is plum.*

Atlas Copco's Symmetrix system helps to bridge the gap at Pitkins Curve on California's Highway 1





*A wide angle view of the work site shows the coffer dam, trestle and Atlas Copco XAS 1600 compressors.*



» Without a doubt, California's State Route 1, often called Highway 1, is one of the most scenic routes in the world. Starting in Orange County and twisting north along the Pacific Coast through Ventura, Big Sur and Monterey, then crossing over the Golden Gate Bridge and ending near the Redwood Forest, Highway 1 is known for its rugged beauty.

However, the Big Sur coastline along this highway is also geologically active and unstable, according to the California Department of Transportation's (Caltrans) website. Broken and weak rocks are covered with eroded soils that are highly prone to landslides. As a result of groundwater, surface water infiltration, erosion and storms, this area – and particularly Pitkins Curve – has been in constant need of repairs since 1937.

Extensive studies revealed that landslides and resulting highway damage would continue to occur indefinitely without a comprehensive solution. Therefore, Caltrans determined that the safest and most cost-effective solution would be to bridge Pitkins Curve and build a rock shed at Rainrocks, a neigh-

boring area of roadway instability. Golden State Bridge Inc., based in Martinez, Calif., won the \$29.4-million contract and has been on the job since December 2009.

#### **Placing the pilings with Symmetrix**

In business since 1986, Golden State tends to get the challenging jobs that involve a trestle bridge or difficult access, and at Pitkins Curve they got both. The job site runs along a steep cliff and final bridge construction must proceed from a temporary trestle bridge. It's been Atlas Copco's Symmetrix system that has played a key role in placing the pilings for the temporary trestle bridge. For the job, Golden State selected the Symmetrix 24-inch SE 610 ring system with an Atlas Copco Secoroc QL 200 down-the-hole hammer.

After engineers determined the length of the piles for the trestle bridge, Golden State laid out its locations. With a 120-foot standard swinging lead on the ground, Golden State loads the casing and the Symmetrix system. A Grove HL150C crane then picks up the 120-foot lead to position the pipe pile

(casing) and begins drilling. The Symmetrix system advances the casing as it drills the hole for the pile.

According to Doug Podraza, Product Line Manager – Specialty Consumables, Symmetrix is the best choice for the varying ground conditions at the site. "There are portions of rock, portions of soft material. The material type is constantly changing. There are also angles and steep slopes. Symmetrix makes it easy to advance the casing, and will allow Golden State to use the same pilot bit in order to do both the temporary and permanent casings on the job. They will only have to switch the casing shoe and ring bit."

With the Symmetrix system, Golden State has been getting productivity rates of about 1 foot a minute, and they are going 50 to 60 feet in actual drilling depth. This means they drill a hole in a little less than an hour once they start drilling. As a result, they are installing about four piles a day, which are the support for one span of the trestle bridge.

Once the piles are in place, John Mat-



teucci, project superintendent with Golden State, explains that Caltrans requires them to test the piles for strength. “We lay the drill down and pick up a conventional diesel pile driving hammer. Then we drive the piles with an impact hammer. We check the length of the stroke, which is how far the piston comes out of the barrel, in relation to the number of blows it takes to drive the pile 1 foot. The result of the equation calculates the strength or load bearing capacity of the pile.”

Once this is complete, the piles are cut to elevation and a cap beam is set directly on top and welded to them. Golden State then sets the stringers from the previous point across to the next span. The stringers are welded onto the caps. Finally, 26-foot-by-5-foot crane mats are placed on the stringers. This creates the driving surface for the crane, which advances to repeat the process for the next span.

David Riccitiello, president, Golden State Bridge, points out that the team was fairly certain that they would go with a down-the-hole system on the Pitkins Curve project to ensure that the piles would be in solid ground. They interviewed a couple of DTH manufacturers and felt that the Symmetrix system was user friendly, as well as more cost-effective.

“We usually use pile hammers, but we didn’t feel comfortable driving in this material because it varies between hard and soft. We are running large equipment on the access road and the trestle line we’re building, so we wanted the piles keyed in some fairly hard stuff. I think we’re succeeding in that,” says Riccitiello. “We could also recover a lot of the bottoms that we were going to use and not spend as much money as other systems to advance the casing.”

Because Golden State is used to pile driving, Riccitiello says that they had a few challenges with drilling at the beginning but attributes this to the difficult access. “Drilling itself hasn’t been time consuming, but getting set up to do it in a tiny spot with all the equipment with piles as long as 110 feet is challenging. We can’t set up two cranes side by side. As far as the drilling production, we’ve been very pleased with the advancement rate of the piles into the rock.”

### The permanent bridge

Both sides of the temporary bridge will go out five spans, leaving an open space in the middle. This allows for construction of the two permanent piers. To do this, a cof-

fer dam is constructed to the bottom elevation or bedrock. Next, the drill will come in and sink four piling shafts into the bedrock, and then they will place rebar and pour the concrete to form the piling. There are four 60-inch-diameter pilings reaching a depth of 68 feet 9 inches for each 9-foot-by-12-foot pier.

Golden State then will construct the foundation, or footing. For this bridge, the footing will be post-tensioned to the pile. A series of rods will extend from inside the rebar cage for the pilings up through the top of the footing. After the footing is poured, a hydraulic jack will tension the rods to a specified amount of pressure, essentially cinching the footing and the piles together.

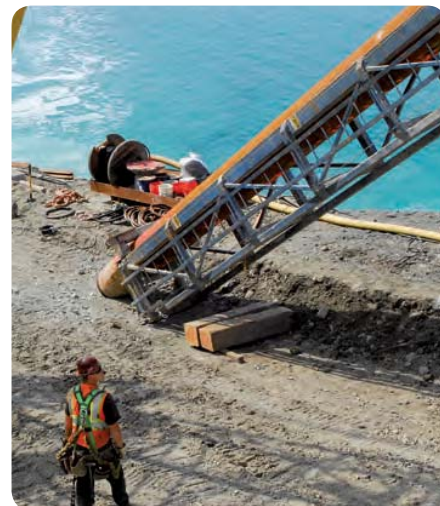
The temporary trestle bridge will also serve as the false work to support the superstructure of the permanent bridge. Two methods will be used to construct the superstructure. From each abutment to approximately 35 feet out past the new piers will be cast-in-place. The remaining 240 feet center span of the bridge will be cantilevered, each section being poured and then post-tensioned. When the two ends are about 12 feet from the center, a closure pour will connect them.

Weather, access and even a landslide have created some challenges, but overall Golden State is pleased with the progress of the job. Riccitiello is quick to credit his team and the support from Atlas Copco. “We’ve been in

business for over 20 years, and they are right up there with the best – if not the best. Generally when you buy something you don’t see anybody, but Atlas Copco taught us how to use the equipment and stayed with us on the job.”

Atlas Copco’s geotechnical drilling specialist Ken McClanahan, who works out of the Atlas Copco customer center in Sacramento, was on location for the first three weeks to ensure things were moving smoothly. McClanahan said, “It’s my job to make sure things go right.”

Riccitiello said, “When we had problems they took action quickly, sometimes overnight with a six-hour drive to Sacramento in order to have equipment fixed and back on the job by morning. We ultimately feel this will be a successful job, and a big part of it will be the DTH hammer for sure. We’re very happy with Atlas Copco.”



*Cranes lift the leads to get the drill into position before workers move the drill head to the final position.*





# COMPRESSORS WORK OVERTIME



## Company called to fix Interstate 40 rock slide relies on Atlas Copco compressors

**J**anod Corporation has specialized in rock stabilization and rock remediation since 1968. This expertise has played a critical role in clearing a 150-foot rock slide – and then stabilizing the slope – on a stretch of Interstate 40 in North Carolina near the Tennessee border. To help them accomplish this task, Janod has been using Atlas Copco compressors, XRVS 1000 CD6 (1000 cfm at 350 psi) and XAS 1600 CD6 (1600 cfm at 100 psi), to power the drills on the job.

After the slide occurred on Oct. 25, 2009, Janod received an emergency call from general contractor Phillips & Jordan to help stabilize the slide and remove debris from the road. Janod mobilized quickly and was onsite three days later with a light crew and smaller equipment such as small wagon drills, air bags, scaling bars and small compressors. Initially Janod drilled and blasted to break up the larger material and get it to ground level. Phillips & Jordan then used a Caterpillar 340 excavator with a hydraulic breaker attachment to break up the rock even further.

After the slide was cleared, Janod began the pro-

“Nobody has ever drilled for and then installed this much rock bolt, this high up, in this short amount of time ever in the world.”

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**Noel Philippon,**  
Janod's U.S. Operations Manager

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cess of securing the slope. It was determined that a rock bolting system would be most cost-effective. However, Noel Philippon, U.S. Operations Manager with Janod, explains that doing so has been extremely challenging given the site conditions.

The slope has a vertical face of 150 feet and then ascends at a 45-degree angle for about 500 feet. The slope is about 850 feet away from the center line of the road at the highest point of the slide, and the site is about 300 feet wide. The rock bolts are 1 3/8 inches in diameter, vary in length from 65 to 140 feet and can weigh up to 600 pounds; installing them on an unstable slope is no easy task.

Philippon explains that the installation process is done in stages. One crew prepares the rock bolts, which arrive on site in 45-foot lengths. The crew assembles the bolts, coupling them together, putting them in a tube for the grout, attaching a bearing plate, and cutting them to length for each hole.

Meanwhile, another crew is up on the slope drilling the holes for the bolts. Janod has developed its own wagon drill for this type of site. The drills are self-contained and have an air winch on them so they can be moved around for short distances on the hill. A helicopter moves them over larger distances. Janod is using a 4 1/2-inch down-the-hole hammer to get through the rock, which varies from soft and crumbly material at 4,000 psi to very hard rock with a strength of 25,000 psi.

The six Atlas Copco compressors have their work cut out for them powering the drills. "We're running 2-inch high pressure hose up to five, 400-gallon receiver tanks," says Philippon. "Because we're stretched out so far with the air line, we would lose the pressure – about 50 psi on just one hose – if we didn't put a receiver tank up there. Once the hose goes to the receiver tanks, which are positioned halfway up the slope, we split them off for the individual drills."

Once a series of holes have been drilled on the higher elevations, a helicopter flies in to lift the rock bolts off the ground, line them up with the hole and install them in one piece. Next grout is pumped into the hole, and then another crew must pull test each one. Test jacks weighing 300 pounds each have been set up on the slope using a Tyrolean system.

On the lower elevations of the slope, Janod installed a larger, 1 3/4-inch bolt, fully grouted with a nut plate.

Janod has been working 60 people on two

shifts. At night it's too dangerous to perform multiple operations, so Janod concentrates on drilling. Everything else is done during the day. Philippon stresses, "Construction and logistics have been a challenge from day one because of the time frame. It's been difficult maintaining flow and keeping the project moving; it's been an effort for everyone involved."

However, he is quick to acknowledge the help of Atlas Copco and Warren Legg, store manager and sales rep at Atlas Copco's customer center in Knoxville, Tenn. "Atlas Copco bent over backwards to help us get geared up for this job, even hunting down air compressors to ensure we had what we needed onsite" says Philippon. "All the air line had to be ordered. Everybody from the

rock bolt manufacturer to the helicopter company went the extra mile."

Janod, too, went to great expense to get the right equipment for the job, including air freighting specialty hydraulic drills from Italy in order to drill to the specified depths.

The first phase of the project was completed in April 2010 and I-40 reopened to traffic. A second phase is underway. In total, Janod and Phillips & Jordan moved 160,000 tons of rock and installed 56,000 linear feet – or approximately 9 miles – of rock bolt in the slope.

"Nobody has ever drilled for and then installed this much rock bolt, this high up, in this short amount of time ever in the world," says Philippon. "This is a world-class job."





# GOING SUPER

Advanced methods for expansion at the Zhelezny mine

**The Zhelezny open pit mine in the Murmansk region is developing super deep mining, requiring extraordinary control of drilling and blasting on near vertical benches. In Russia it is described as a breakthrough technique and with the right equipment, the mine management is more than optimistic.**

**M**ining company Kovdorsky GOK is confidently developing a “super deep” mine at its Zhelezny open pit. As a result, the company, owned by the fertilizer giant Eurochem, will be able to gain access to an additional 300 to 400 million tonnes of ore and extend its life by a further 30 years, from 2015 to 2049.

Iron ore is the primary production at Zhelezny but the pit also produces valuable apatite, which is used in the fertilizer industry as well as baddeleyite, a zirconium oxide, used in the industrial minerals sector.

The orebody is vertical and the pit measures almost 1½ miles in length, 1 mile wide and is currently 558 feet deep. It will eventually become 2,953 feet (more than a half mile) deep without any significant enlargement of the pit rim.

According to the plan, the first target will be to maintain the ore output at 23 Mt/y until the year 2032, after which production will gradually decrease.

The entire project has been preceded by several years of extensive studies using some of the most sophisticated methods of testing,

calculation and analysis in the industry.

From the results obtained it is clear that the project will depend heavily on the performance of the Atlas Copco drilling equipment at the site. There are two fleets involved, the first owned and operated by Kovdorsky GOK, the other by mining contractor Technobur. These include large-hole rotary drill rigs, down-the-hole crawlers and rock drilling tools from Secoroc.

It is also clear that extraordinarily careful drilling and blasting in order to maintain maximum stability of the 39- to 49-foot-high benches, is, and will continue to be, the key to success.

The studies resulted in a set of parameters for the engineering geologists and a 3D model of the deposit which was used to



# DEEP

## ATLAS COPCO DRILL RIGS AT THE ZHELEZNY PIT

### **Technobur**

- 3 DML LP 1600 and 1200 (rotary)
- 1 Pit Viper 275 LP (rotary)
- 1 DML HP (DTH and rotary)
- 2 DM 45HP (DTH and rotary)

### **Kovdorsky**

- 2 ROC L8 (DTH)

forecast areas where slopes might fail. Five different geological zones were selected for testing and for each one, the bench slope angles, heights and the required width of safety berms were defined.

This information led to a list of specifications for the excavation of the “new” pit including extra-careful blasting techniques involving pre-splitting, relief of water pressure in the benches, stabilization of weak rock masses using rock bolts and cement injection, as well constant slope stability monitoring.

The mine uses a combination of blast hole sizes and extensive tests were also carried out to determine the blastability of the rock. Five categories were defined and for each one, the burden, hole distance and

“ This is a very extensive project preceded by many years of sophisticated study.

**Igor Melik-Gaikazov,**  
Technical Director at Kovdorsky



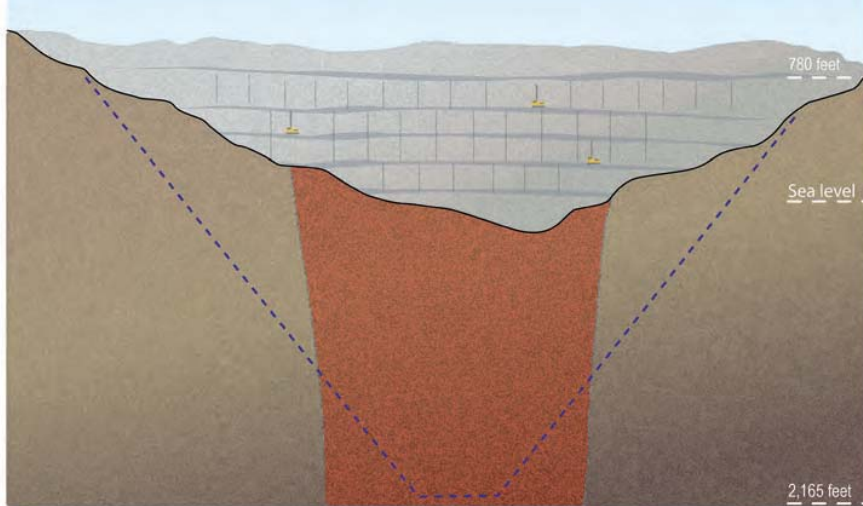
height of explosive charge are calculated in relation to hole diameters, bench height, grade of emulsion charge and row position in the blasting sequence.

The use of emulsion explosives instead of conventional types reduces the impact

on the environment, especially the urban area close to the mine. These explosives emit fewer gas pollutants and are not sensitive to the considerable presence of water flows in many of the holes.

For more than 30 years, Kovdorsky has

The diagram shows the vertical orebody and the planned angle of the slopes at the projected depth. Mining company Kordovsky aims to accomplish this with no significant expansion of the pit rim.



Atlas Copco rotary rigs are used to drill large diameter production holes.

» relied on Russian-built electric powered rotary drilling rigs of the SBSH-250 series. But, as Mikhail Togunov, Chief Mining Office at Kovdorsky, explained, a fleet able to drill a range of hole diameters with optimum efficiency was crucial for the new super-deep mine.



“A fleet able to drill a range of holes with optimum efficiency was crucial.”

**Mikhail B Togunov,**  
Chief Mining Officer for Kovdorsky

Technobur tested the DM rig against the electrical rigs and found that the diesel-powered rig was 30 percent faster. In 2007, Technobur introduced a fleet of diesel-powered Atlas Copco rigs to the mine and today this company is responsible for more than 70 percent of the drilling work.

Evgeny Perevozchikov, Site Manager for Technobur, who has more than 40 years of experience at the mine, says the diesel-powered Atlas Copco equipment was chosen for maximum efficiency and mobility.

Two Atlas Copco ROC L8 down-the-hole drilling (DTH) rigs are used by Kovdorsky to drill 5½ inch pre-split holes and 6½ inch buffer holes close to the margin of the benches.

### Pre-splitting

To stabilize the final walls of the open pit, pre-splitting is used. This is a blasting method designed to give rock walls a smooth surface and a minimum of cracks. Important factors for a good result are parallel rows of small diameter holes, a short distance between the holes, weak explosive

charges and simultaneous firing. When a presplit row is blasted, a crack is created between all of the holes in the row. No rock is broken. Instead, the rock outside the row is broken by the blast in the next row of holes. Besides pre-splitting, the mine is considering various other methods for further stabilization of the pit walls.

### Going for vertical walls


Kovdorsky is now using five SBSH electric rotary drills plus the ROC L8 rigs. All of the Atlas Copco drills used by Technobur are set up for rotary or down-the-hole multi-pass drilling.

The upper benches, to a depth of 230 feet above sea level, are 39 feet high but below this level they are generally 49 feet high and the sub-drilling is 10 feet. At present they

slope at 35 to 40 degrees from the vertical but the long term goal is to make them as vertical as possible. The production holes are normally 46 to 65 feet in depth.

In a typical month, the Technobur fleet drills more than 25 miles of a total of 34 miles. The rotary rigs use Russian tricone bits while the down-the-hole rigs use Atlas Copco Secoroc COP 64 hammers and 6.5 and 7.87 inch bits for production drilling.

The high pressure rigs, DML HP and DM 45 HP are used for either DTH or rotary drilling, depending on the rock conditions. Perevozchikov explains that Technobur services these rigs with the assistance of Atlas Copco service engineers.


The project is progressing according to plan and Kovdorsky expects to reach its first stage targets by early next year. 

*A major player in Kovdovsky's Super Deep Mining programme:  
Atlas Copco's DM45 HP rig on the pit's upper, 12 m high benches.*



**Footnote:** The Kola Peninsula covers an area of approx. 62,137 square miles and is known for its rich variety of ores and minerals. But it is also known as the home of the world's deepest hole – the Kola Super-

deep Borehole. The hole is the result of a scientific project started in 1970 to drill as deep as possible into the Earth's crust. A number of holes were drilled, the deepest of which reached 7.6 miles in 1989.



Ric-Man Construction used two ECM 590 drill rigs, and HB7000 and HB10000 hydraulic breakers to undertake a challenging caisson project in Dearborn, Michigan.

# BREAKING THROUGH

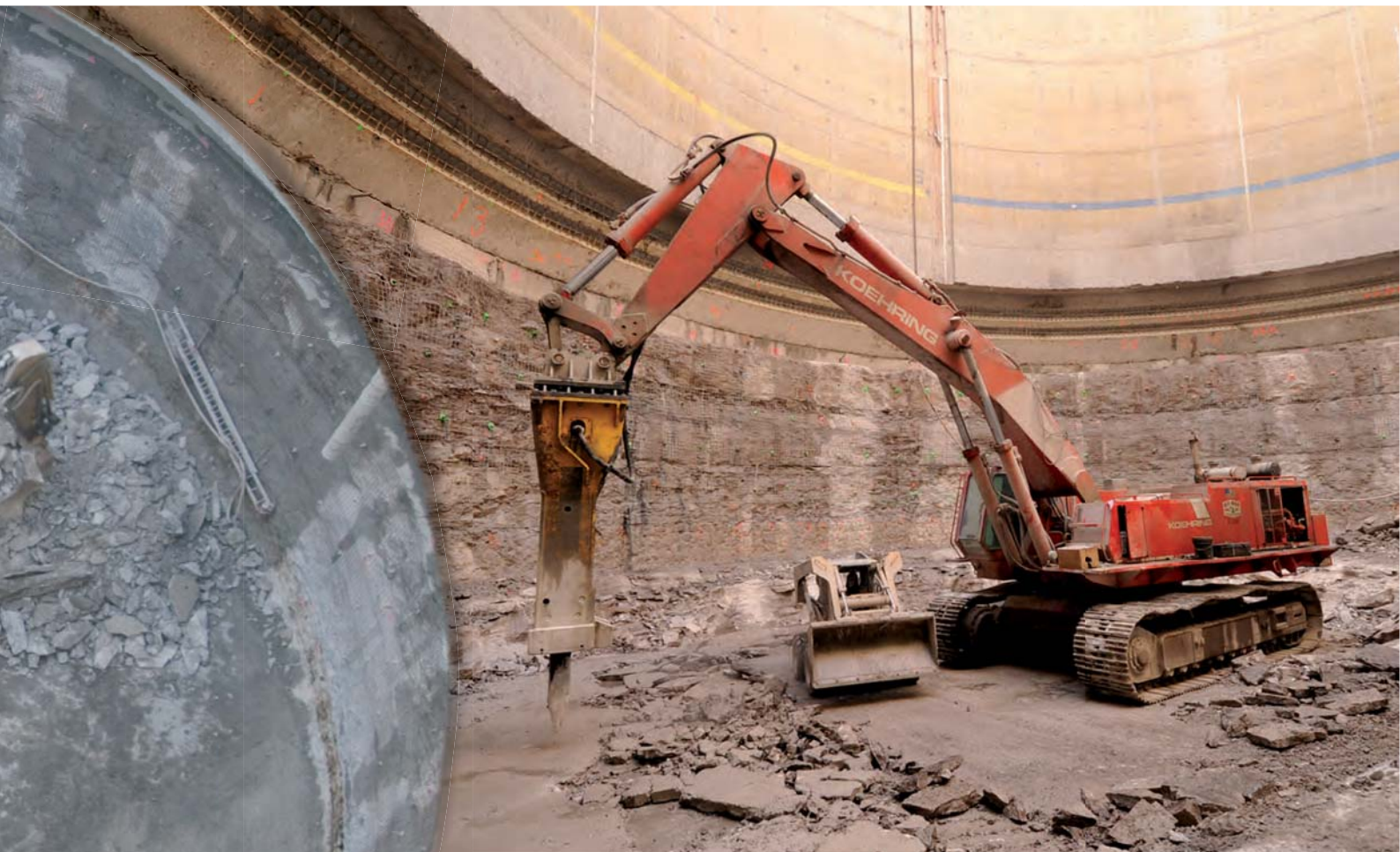
**F**ounded in 1965 by Richard Mancini, Ric-Man Construction Inc. has specialized in heavy underground and tunnel construction. Recently, the company has ventured into caisson work with construction of a combined sewer overflow facility in Dearborn, Michigan. Designed to hold 3.5 million gallons, this facility is one of the larger ones currently under construction in the region.

“The facility we’re constructing is de-

signed to handle combination sewage when there is a wet weather event and the system backs up,” explained Duane Mullica, COO with Ric-Man Construction. “Prior to overflowing, there’s an internal structure within the system that releases the flow into this facility, which will store, pretreat and screen the solids. Once the water treatment plant can handle the additional flow, it’s pumped out of this facility, back into the system and into the treatment plant.”

The project began in January 2008 with a substantial rock grouting and stabilization program. The water elevation is actually higher than the ground elevation in this area, so this phase was necessary to eliminate any water infiltration during excavation and construction of the caisson, which began in January 2009. The self-sinking caisson was poured in eight separate vertical lifts. Ric-Man used six Atlas Copco BBC 34W pusher leg mounted rock drills from





*To pour the caisson's bowl-shaped slab, Ric-Man had to excavate 13,000 cubic yards of material. The construction team had to decide whether to drill and blast the bedrock for excavation, or bring in hydraulic breakers to accomplish the task. They went with the breakers because of cost and because of the nearby residential area.*

“It's been working well, and we've gotten into a couple of really hard layers. We are on schedule and support of the HB10000 has been very helpful to us.”

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**Richard Mancini,**  
founder of Ric-Man Construction

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# BEDROCK

Stockdale Mine Supply to drill more than 400 holes for bolt installation in the vertical face of the rock during construction of the caisson wall. The rock bolts were used to secure wire mesh to the face. Ric-Man then sprayed 6 inches of shotcrete to seal off the rock, and then the final concrete was poured.

Lift 8 of the caisson was on bedrock at -140 feet. To pour the caisson's bowl-shaped slab, Ric-Man would have to remove and excavate 13,000 cubic yards of

bedrock, or an additional 50 feet of material.

At this point, the construction team had to decide whether to drill and blast the bedrock for excavation, or bring in hydraulic breakers to accomplish the task. They went with the breakers.

“Our real challenge with drilling and blasting at this site was the fact that it's a residential area,” said Mullica. “The cost and logistics of trying to blast, reassuring the residents and making them comfortable

that there will be no damage to their homes and the infrastructure – the complications grew as we talked about it. It's also a safety issue. You need to have so much training and more insurance. We felt there had to be a way to do this besides blasting.”

Most projects in the Dearborn region depend on drilling and blasting to remove bedrock, so there was very little history to refer to regarding mechanical removal or excavation. So, Ric-Man began extensively >>



(From left) Jon Pung, Ric-Man foreman; Walter Proctor, Ric-Man operator; Scott Hendricks, Atlas Copco Area Sales Manager; Gene Bowers, Ric-Man civil superintendent

‘donut’, and we would still have had to deal with logistics and time delays to survey all the homes, survey all the utilities, etc. It just made more sense to stick to our breaking schedule.

“Furthermore, Gene Bowers, our general superintendent, has spent almost his entire career dealing with rock removal. His experience brought a lot to the table and enabled us to drill it correctly.”

Ric-Man completed excavation of the bedrock by December 2009 and then poured the base slab of the caisson. The final lift, lift 9, was the caisson’s cap, which sits at ground level. Caisson construction was completed in April. Following that, Ric-Man completed all of the sewer connections, bringing the interceptors to the structure. They also built the control building on site. The final phase of the project will be landscaping the site; the entire project is scheduled for completion by July 2010.

“The quality, experience and method we chose to complete this project puts us in the running for others of this type,” Duane Mullica said. “We were able to foresee some of the challenges because of what our competitors had gone through. We looked at them early on and tried to figure out what our challenges would be and how they would be addressed.”

Concluded Steve Mancini, “The Dearborn project is our golden child project.”

researching hydraulic breakers and reached the decision to contact Atlas Copco distributor AIS Construction Equipment, which pointed them in the direction of Scott Hendricks, Area Sales Manager for Atlas Copco.

“AIS and General Manager Dave Pytlowany have done a great job,” said Steve Mancini, president and CEO of Ric-Man Construction. “You pick up the phone and they are right on it, even helping us set up the hydraulics. The availability (of the breakers) and the historical data supported our challenge,” added Mullica. “We were extremely comfortable when we finally committed to Atlas Copco.”

To begin the process, Ric-Man lowered two Atlas Copco ECM 590 drill rigs into the caisson to predrill 600 relief holes into the bedrock. The 2-inch and 3-inch holes were drilled to a depth of 45 feet on 4-foot centers. Relief holes make it easier for the hydraulic breakers to break the material by giving the impact energy somewhere to go, increasing productivity. Without the relief holes, the solid bedrock would just absorb the impact energy.

Once the relief holes were drilled, Ric-Man brought in a 170,000-pound Koehring 1066 excavator to handle first the HB7000 and then the HB10000 hydraulic breakers.

“About five years ago we dismantled the entire excavator and went through its pumps and drive motors, and installed a new four-stroke Detroit diesel in it. It’s really an upgraded unit,” said Mancini. “The benefit of this excavator model is that it has about five different pumps so it’s not too difficult to mount any attachment.”

Ric-Man initially started using the HB7000, but then opted to bring in the HB10000 to increase productivity on the bedrock. “Working with the HB7000 and the HB10000 has gone extremely well,” said Mullica. “In fact, it is as good as, or even better, than we anticipated. We’re able to break, muck out and dispose of material as fast as we can.”

Added Mancini, “We have been extremely impressed. It’s been working well, and we’ve gotten into a couple of really hard layers. We are on schedule and Atlas Copco’s support of the HB10000 has been very helpful to us.”

The inside diameter of the caisson is 105 feet, and Ric-Man had to remove bedrock to a depth of approximately 43-44 feet. The layers of bedrock have varied in hardness, though at some levels it has exceeded 12,000 psi. Ric-Man has averaged 200-300 cubic yards a day, and about 5 feet per week horizontally, although in the extremely hard material it took eight days to do a 4-foot section.

Mancini points out that they could have drilled and blasted the center core had they not achieved the production rates with the breakers. “We would still have had to break the outer



# Waste Not



## Industrial demolition firm uses Atlas Copco HB7000 to turn abandoned nuclear facility into a valuable property ... while recycling material

Indiana's only nuclear facility hasn't been notable for anything other than being an eyesore and a 30-year-old unfinished project. Now MCM Management Corp. is reclaiming the property with the help of Atlas Copco breakers and is turning the property into a valuable piece of riverside land. To do that, MCM is clearing land occupied by administrative buildings, outbuildings and thick concrete and rebar-covered silo and containment structures built literally nuclear blast proof.

MCM owns 577 acres of this property, of which 2,500 linear feet are along the Ohio River. The nuclear power plant was known as Marble Hill and is located north of Louisville, Ken., and south of Madison, Ind. Construction started on the facility in 1977 and after \$2.8 billion was spent, the project was abandoned in 1984 as nuclear energy was opposed by those leery of nuclear waste or disasters. This was after the well known nuclear meltdown at Three Mile Island, Penn.

Even though the nuclear facility wasn't ever operational, the construction was far along. The facility was designed to contain a tremendous amount of pressure in the event there was ever structural failure or a nuclear accident.

Mark Ramun, vice president of MCM Management, said, "Nobody ever considered how it would be to take apart. Conventional tools don't exist to handle it. The amount of engineering we've done so far just to get to where we are has been extensive."

Atlas Copco HB7000D breakers replaced breakers of a competitive brand that were used for about a month. Some of the lighter work could be done by the other breakers, but when it was time for the heavier concrete, the other breakers failed.

MCM worked with Columbus Equipment, an Atlas Copco dealership in Cincinnati, Ohio, managed by Jeff McVey. Fred Wahl handled the sale and said, "This job required breakers bigger than most of our customers regularly use." »

“We worked three days on one section with the [competitive] breaker and when we put on the Atlas Copco HB7000 the same amount of work was completed in three hours.”

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**Denise Brown**  
Site Manager, MCM

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» Wahl was proud of Columbus Equipment Service Technician Randy Calhoun and all of the time he spent on the job site with the customer. Atlas Copco Technical Support Representative Jeff Graham also worked on the site making sure the breakers operated properly.

Ramun said, “Prior to receiving Atlas Copco hammers, none were effective at dealing with this concrete. These are very effective. Within two to three weeks we ordered a second one because of the performance of the first.”

Denise Brown is site manager for MCM. She said, “We worked three days on one section with the [competitive] breaker and when we put on the Atlas Copco HB7000 the same amount of work was completed in three hours – these hammers are pretty amazing really.”

Dan Perry, MCM Equipment Manager, said, “Challenging isn’t even a word for it. It could not be destroyed.” Perry has worked in the equipment industry for 30 years and has seen a lot of demo projects, but said this one was unique. He noted that the company’s 25,000-pound wrecking ball was supplemented by the Atlas Copco HB7000.



Kevin Loomis, Atlas Copco Product Manager of hydraulic attachments in North America, isn’t surprised by those results. Loomis said, “The HB7000 is a powerhouse breaker with a proven reputation for hard hitting performance. It has a host of features that make it easier to operate, last longer and produce higher results. In fact, our entire HB line of breakers is designed to maximize production through variable output energy based on the job conditions, which makes them extremely efficient and extends service life of the components.”

#### Not the usual demo

Denise Brown has been in the construction and demolition business her whole life, hanging out with her father

on job sites since she was a kid. She said about the Marble Hill construction, “They didn’t skimp on rebar. The silos are 5 feet thick concrete with 2- to 4-inch rebar everywhere.”

The hydraulic breaker’s job is to expose the rebar so the silos can be imploded and laid over on their sides and to remove the concrete structure separating the two silos. The silos would not tip if the structure behind is intact. The idea, like cutting down a tree, is to give the structure a wedge on one side and a stress point at which to break on the other. The breakers have to remove the building to allow for that break point.

Throughout the project the concrete surrounds the steel rebar like a thick skin. To determine what explosives are necessary to implode the silos, test shots are necessary. Test holes (3 inches in diameter and 16 inches deep) are drilled to load dynamite. Dynamite is loaded at 3½ pounds per drilled hole in a 36-inch x 42-inch pattern. That averages to 2½ pounds per yard. Normally concrete will crumble at 1½ pounds per yard.

To drill the holes up to 71 feet up the sides of the silo, MCM uses an air drill mounted on a hydraulic fork lift.

Subcontractor Chicago Explosives is the blasting contractor on the job. Fred Ni-



*The water truck helps control dust. The truck works the site all day, moving from one excavator to the next.*

col is managing the blasting for Chicago Explosives. As a former mining explosive engineer, he has seen blasting from all angles. He moved from mining to demolition in the 1980s. His statement about the blast is very simple. “It’s unwilling. You could run a train into this and it wouldn’t budge.”

Test shots have had varying effects. One blast can be very effective, while another may show little damage. As an example, the fourth blast of five loaded holes barely made a mark on the internal face of the silo. It did expose vertically running #18 rerod with horizontal stirrups of #8 rerod holding everything together. The steel under the concrete skin is like fabric of various weaves at different levels on the structure. Once the steel is exposed, cutting torches and grapples are used to remove the steel.

In addition to the hundreds, if not thousands, of feet of steel rerod of varying diameters, within the silos are thick steel beams and below grade is a round, steel vessel, which was meant to contain the nuclear material. Also, stainless steel tanks inside the facility are nearly four stories deep, sunk into the ground. Nicol said, “Basically, this is an amazing amount of thick steel.”

Brown said the structures were all well built and it was obvious that quality workmanship was a focus for the engineers as well as contractors. She found that all beams had codes or inventory numbers stamped in the steel. She said, “Noth-

ing on this job has been easy. When you think there is a solution to taking something apart or exposing something, there is another layer of structure beneath it.”

That’s why the crew is glad they decided to try Atlas Copco breakers when they did. Ramun said, “This is our first experience with an Atlas Copco breaker and we have a very large fleet of equipment. At times we’ve had more than 100 hydraulic mobile shears in our company’s inventory, and we’ve processed millions of tons of steel, but we’ve never seen concrete like this before. We understand the value of using the right tools for the job and how important it is to feel comfortable with the relationship we have with the tool supplier; especially on jobs like Marble Hill. If these hammers continue to perform like they have, I think it’s safe to say that we’ll be sticking with Atlas Copco in the future.”

While the story of Marble Hill hasn’t been positive to date, that is about to turn around. Almost all of the materials on site will be recycled. Ramun said, “It was never activated and never contaminated so it’s a new structure, really. So our goal is to recycle 99 percent of the structures by weight.” He added that he’s proud of the progress MCM has made on the project so far and looks forward to what the future of the riverside property might bring.

#### ATLAS COPCO HB7000

- Working pressure.....2,320–2,610 psi
- Oil flow.....95–119 gpm
- Frequency.....280–450 bpm
- Tool Shank .....8.27 inches
- Operating weight.....15,432
- AEM Energy\*.....9,381 foot pounds**
- Energy Class.....15,000 foot pounds
- Carrier.....143,300–264,600 pounds

\*The Association of Equipment Manufacturers (AEM) developed a testing system that provides an objective standard for comparing hydraulic breaker power output. This simply gives contractors the facts so they can make an educated decision when choosing a hydraulic breaker. Today only a handful of companies publish those standardized energy ratings. When looking at a class of breakers, one number means more than the others – AEM measured energy – the actual impact energy needed to break an object.

**ATLAS COPCO HAS SOME OF THE HIGHEST IMPACT ENERGY RATINGS ACCORDING TO TESTS OF THE AEM.**

# What it takes for SUCCESS

## Atlas Copco works with American Drilling to develop their exploration fleet, including a Diamec U8 and Excore Bits

**M**utual respect is the feeling in the air when speaking to anyone related to the contract exploration drilling company American Drilling. From the guys who work on the rigs to their customers to even the vendors, it's evident that success comes from a conscious effort to work together. Atlas Copco is one of those vendors who has worked with American Drilling from its inception, supporting its fleet of rigs, as the company developed relationships with customers.

Steve Elloway, President of American Drilling, is private about his customers, yet is very open about the quality of his people. "I don't see American Drilling growing into a big company; I want to be a small company doing the best work we can for our exclusive client list."

Mostly the company focuses on underground core work, but they will do surface work if their clients request it. When the company opened for business in 2008 they began working with Atlas Copco to purchase its first Diamec series drill rig.

"I want to work with a company that will work with us to make improvements to our equipment and business, which is what Atlas Copco does – makes us better," said Elloway.

Atlas Copco Area Sales Specialist John Wolfe has a slightly different angle on that philosophy. "We are not here to make them better; they have made us better," he said, referring to the company's open-minded way of doing business.

This example of how both parties dealt with a change to one of the company's rigs is recent proof of the good relationship. "We knew there was an issue with the dump valve," said Elloway. "Atlas Copco made

changes three or four times to make it the best it could be. That effort says a lot about Atlas Copco."

Although the company also has a Diamec U6 for more cramped conditions, and a CS 10 drill for surface work, American Drilling's main drill for most operations is the Diamec U8 core drill rig. "We decided to go exclusively with Atlas Copco. I firmly believe the U8 is the best underground drill on the market. We pride ourselves on having the best, and safest, technology and that is why we are exclusively with Atlas Copco," said Elloway.

Elloway decried the U8. "There is nothing more impressive. You *can't* drop a rod. Our mission statement is to have state-of-the-art equipment and to be a step

ahead. The U8 fits our mission."

Wolfe said, "They'll try anything new and give feedback. Their drillers keep good records, which helps when testing new products and improving on existing equipment."

### Proof in productivity

Great Basin Gold's Hollister Mine in Nevada is a location where American Drilling is putting the U8 to work. While partners Steve Elloway and Casandra Mulligan are located in the headquarters in Spokane, Wash., Johnny Johnston is American Drilling's general manager of operations in Nevada and a partner in the company. Johnston said, "The U8 [at Hollister] has only gotten better as we have put time on it." »

### ATLAS COPCO DIAMEC U8 — CORE DRILLING RIG

#### Basic data

Max depth.....6,600 feet  
Diameter.....4 inches  
Max speed.....1,200 rpm  
Max torque.....1,630 foot pounds  
Feed/pull force.....29,000 foot pounds  
Feed lengths.....70 inches

#### Modules

Flush pump.....Trido 140  
Power unit\*.....PU 110E or PU 160DT

**PHC**, Pilot hydraulic control

**APC**, Automatic performance control

\*Electric or diesel



“ I’ve never seen a drill work this good this long. It drills better today than when we got it and there has never been a real problem.

**Josh Tiner**

Driller, American Drilling



*Brian Morris  
Exploration Manager,  
Great Basin’s Hollister Mine*



*John Johnston  
General Manager of Operations,  
American Drilling*

### ATLAS COPCO EXCORE RANGE — DIAMOND CORE DRILLING BITS

#### Three application segments:

- Excore for soft to medium-hard rock with abrasive and fractured to competent formations (Matrix 1-4)
- Excore for medium-hard to hard rock with slightly abrasive and slightly broken to competent formations (Matrix series 5-8)
- Excore for hard to very hard rock with competent formations (Matrix series 9-10)

Each Excore type is also available with various crown designs: the Extended Channel Flush (ECF) for broken to competent formations; the patented JET profile for fast cutting in competent formations; and a face discharge design for extremely broken and triple tube applications.

Combining these crown profiles with various crown heights ranging from 10-16 mm means each Excore bit type will cover a wider range of rock conditions.





*The Atlas Copco Diamec U8 works on the lateral at Hollister Mine. Monthly totals range from 4,000 to 6,000 feet.*

» American Drilling drill operator Josh Tiner said, “I’ve never seen a drill work this good this long. It drills better today than when we got it and there has never been a real problem.”

The reason for that performance record is because Atlas Copco has worked with them in the field to make improvements to the machine based on the working environment. Johnston said, “Atlas Copco has been here every time we have needed them, and for that reason all our equipment works great.”

Drilling in Nevada is difficult because of the broken and abrasive formation.

Johnston said, “Most who have drilled around the world would agree that Nevada is about the most difficult drilling.”

John Wolfe agreed, “If you can drill here, you can drill anywhere.”

An example of those difficult conditions is that all core drilling in the region requires oversized bits, just .385 extra, to give the barrel extra space in the annulus. Johnston said, “Basically it’s just a hair larger, allowing more grease to be applied for better wall cake.”

In addition to all the core barrels and other consumables, American Drilling uses the new Excore bit from Atlas Copco at the Hollister Mine.

Drilling at Hollister is mostly horizontal to a slight incline. The holes average 700 feet and have gone as far out as 1800 feet. When abandoned, the holes are concreted to protect future mining operations. Johnston said, “Great Basin’s abandonment policy is to use concrete, they really want it done right.”

#### Setting records

American Drilling driller Ty Kidd recently set a mine, and a company, record at Hollister using the U8 and the Excore Bit. In 11 hours, using NQ size pipe, Kidd drilled 348 feet with helper Rod Fisher handling the pipe. Johnston said this is a testament to his entire team at Hollister, which also includes Bill Hauser, Bob German and Josh Tiner. Tiner said, “We help each other by leaving our equipment ready for the next crew.”

Exploration Manager for Great Basin’s Hollister Mine, Brian Morris is very complimentary of American Drilling and its crews. “You can tell these guys are all professionals. They run a tight ship. Once an MSHA inspector even complimented the crew saying, ‘This is the cleanest station I’ve ever seen.’”

For Morris it’s not just about appearances though. “When I heard the guys at American were starting up [business] and

getting a U8 I couldn’t wait to get them here.” Morris said the exploration company working here before was getting 1,500 feet a month even after they were on the job a while. “American exceeded [the previous company] in the first two weeks they were here. Last month was the biggest month at 6,500 feet.” Monthly totals range from 4,000 to 6,000 feet.

Morris said, “My cost-per-foot is half of what it was before and I’m getting more production. We have to stay ahead of the mining operation. I’ll gladly pay more. I’m happy to write that check.”

American doesn’t give up on safety for speed either. Morris said, “Because these guys are productive and work safe, I sleep well. And because American hires the best guys, I won’t get a call in the middle of the night, and that means a lot to me.”

Elloway was clear he is not looking for business, but rather focused on keeping those he works for today happy. “We don’t have a driller with less than five years of experience and we have great customers. We owe a great deal of success to Atlas Copco. Since we started out they have been there, backed us up, and helped us move forward. They are committed.”





## Atlas Copco expands production in United States with new Pennsylvania plant

Atlas Copco has expanded its Fort Loudon, Pa., campus to include down-the-hole hammer production. The facility there has been making down-the-hole hammer bits since 1989.

The expansion includes a new 20,000-square-foot office, assembly and distribution facility to support the hammer assembly demands for the global market in the 4-inch and larger, QL- and TD-model hammer range.

Plant Manager Keith Mackling said, "Atlas Copco has already invested millions of dollars into Fort Loudon and this is an evolution of that investment." Previous upgrades included state-of-the-art robotics and other machining equipment designed to meet increased business growth around the world.

The expansion of the Fort Loudon facility was celebrated with a ribbon cutting ceremony and open house.

Guests at the event included Atlas Copco employees and management and some family members, as well as community and state representatives from the governor's office, state legislature and area economic development organizations. In addition to the funds from

Atlas Copco, the facility was supported by a grant along with incentives from the state of Pennsylvania. For the state funds, Atlas Copco agreed to hire 15 additional workers over three years, but has already hired 17 and forecasts that it will hire double the number originally promised.

"I think we've shown our division management a good quality product," Mackling said about the workmanship of local employees.

"They've done a really good job for us," agreed Jaco van der Merwe, Secoroc's Vice President of Manufacturing for United States operations.

This expansion in Pennsylvania coincides with the regional growth in the Marcellus Shale formation, which is one of the United State's top natural gas producers. State Sen. Richard Alloway II, who spoke at the event, said he expects Atlas Copco's down-the-hole hammer and bit production to be in even greater demand as more natural gas drilling occurs in the northern part of Pennsylvania.

"We really are happy to see this growth... As an international company, [Atlas



Copco] could've gone anywhere to do this expansion," Alloway said.

Gene Mattila, U.S. Business Line Manager for Atlas Copco Rock Drilling Tools is looking forward to the expansion at Fort Loudon and said, "The United States is the largest individual market for Atlas Copco's hammers and this location is in the heart of the hard-rock drilling region."

Van der Merwe said Atlas Copco has grown despite the rough economy and will be ready for greater production as the economy recovers. "The success at Atlas Copco is a testament of the quality of people we have," he said.

Grout plant proves successful in stabilizing California mountainside



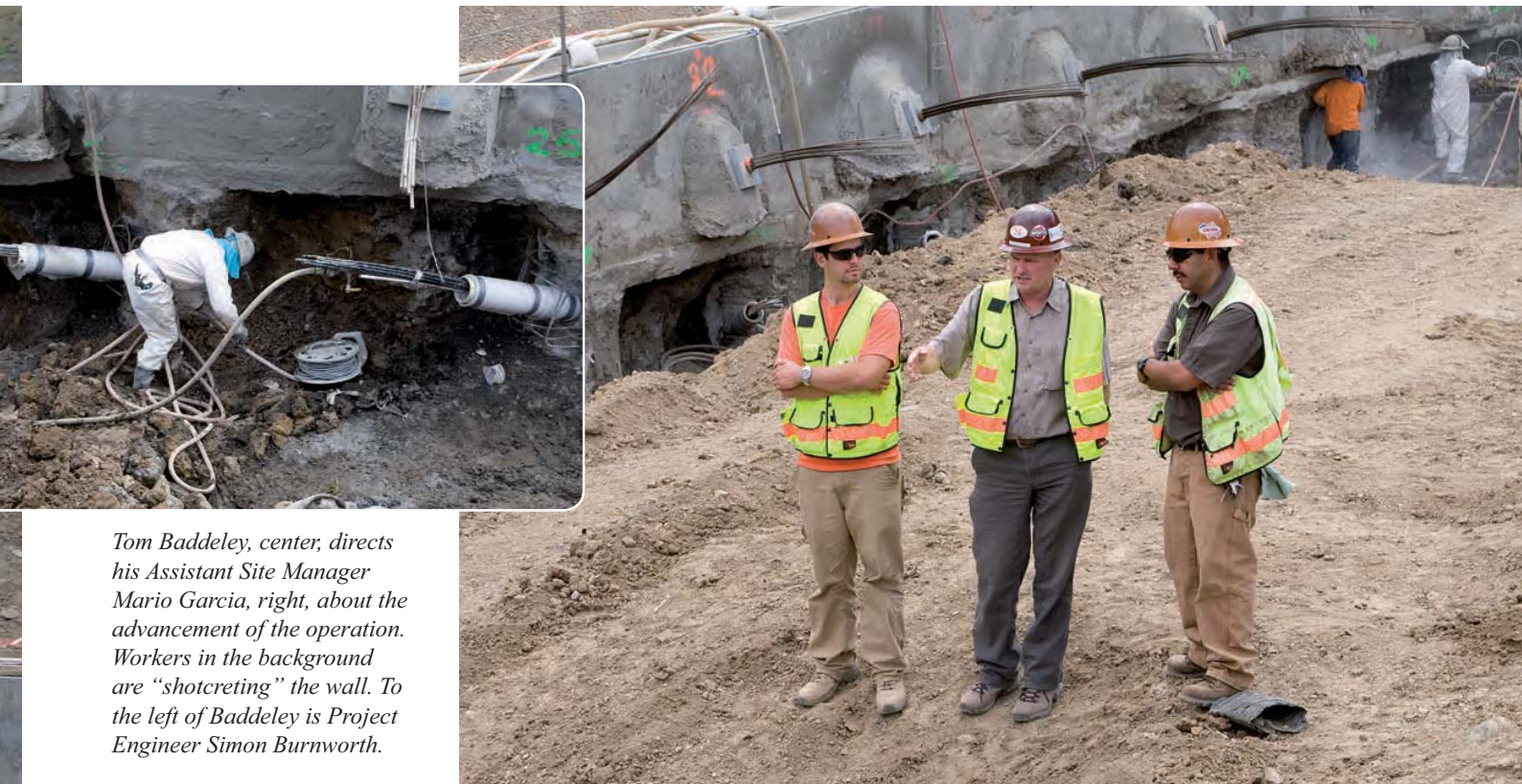
# CONCRETE MOUNTAIN



**S**outhern California is famous for its beautiful mountaintop homes with impressive vistas. The region is also famous for wildfires, earthquakes and mudslides. Occasionally, this heavily populated area of the country needs a little help holding it all together.

The Landslide Repair Foundation is a nonprofit organization formed after a group of 66 homeowners settled a lawsuit brought against the California Department of Transportation (Caltrans) arising out of work it had previously performed to the lower mountain slope. As a result of the earlier work, the entire mountain became unstable and began to slide. A \$50 million settlement in favor of the plaintiffs secured an opportunity to shore up the mountain the right way – in more ways than one.

The Foundation retained the engineering firm of Cotton, Shires and Associates (CSA) to do the geotechnical design work. The multi-phased construction project was awarded to Condon-Johnson & Associates Inc. The project is located in Santa Barbara, Calif., in the Sycamore Canyon area. Construction began in 2008, with the work scheduled



*Tom Baddeley, center, directs his Assistant Site Manager Mario Garcia, right, about the advancement of the operation. Workers in the background are “shotcreting” the wall. To the left of Baddeley is Project Engineer Simon Burnworth.*

for completion in the summer of 2011. Tom Baddeley is the project manager for Condon-Johnson, overseeing the process. Mario Garcia is the superintendent on the project.

Baddeley said the job utilizes “a top-down construction method by installing a series of walls with integrated drainage to hold the mountain in place.” Upon completion, the walls will be buried and the terrain will be graded to resemble natural grades.

Baddeley said the project is progressing “like clockwork” and has “gone as well as any job I have ever done with Condon-Johnson.” He attributes this to the relationship with the project owners and engineers and timely delivery of steel and concrete from Vista Steel Co. and Mission Ready Mix. The Foundation is governed by a board that meets once a month, yet will meet as necessary based on the project’s needs.

Unlike jobs governed by bureaucracy, this project enjoys a relationship between the owner, engineer and contractor that results in changes that can be presented, agreed to and implemented without delay. “Everybody is focused on the project. All the parties communicate well with each other to explain or understand a situation and subsequently the solution is agreed upon – it’s fixed tomorrow. To that end, this job has been very refreshing.”

Baddeley feels that the project schedule and delivery cost have benefited because of this relationship. He said, “No project can

have a cookbook solution, but when dealing with this private entity and engineering firm, the focus has been proactive and the process has been expeditious.”

### **Holding back the mountain**

In total, seven walls will be installed with each running at varying elevations along the natural curvature of the mountain’s face. The walls are installed as a multistep process; each new wall is constructed as the crew works down the mountain. Each wall is a series of piles anchored to competent material with rows of tiebacks every 5 vertical feet.

Once the 48-inch diameter concrete piles are installed, the tieback holes are drilled through the pile at a 20-degree incline. These 6-inch holes will penetrate the mountain at varying depths, 57 feet to 220 feet, depending on where they are located on the mountain.

Once the tiebacks are installed they are tested to 415 kps then backed off to 312 kps and locked in place. Each pile has, on average, five rows of tiebacks totaling over 1.5 million pounds of tension. When completed, each wall will have about 200 tiebacks.

Getting the grout under pressure to the various points on the mountain is the job of an Atlas Copco Unigrout Flex D grout pump. The D stands for diesel, which powers the hydraulic pumps.

One of the reasons Garcia likes the diesel unit is because it’s easier to maintain on site. “When you have an electric grout

pump it’s necessary to have an electrician on site. Hydraulic is a quick fix.” The crew has had no problems with the Atlas Copco unit. They work with Atlas Copco to supply parts and do the preventative maintenance themselves on site.

Another reason Garcia likes the Atlas Copco unit is because it mixes the material thoroughly. Flaws in the material can cause problems in frictional strength in the tieback. Having to redrill a lost tieback would cost time and money. Each batch of grout requires ten, 94-pound bags of mix. This 940 pounds of grout mix combines with 50 gallons of water to fill the hopper. Mario said each tieback averages two to three hoppers of grout. The hole is filled with grout pumped at 200 psi through a 1-inch line. To place grout in the hole, a PVC pipe is inserted to the bottom of the hole where it (the PVC pipe) will remain after the hole is filled. Once load tested and covered with shotcrete, the balance of the hole is filled with grout to complete the process.

When completed, the new walls on this mountain in Santa Barbara will make the homes virtually impervious to sliding into the valley below. This is possible with thousands of pounds of concrete secured through a series of steps tying the mountain together. The goal of Condon-Johnson is to secure the mountain; the homeowners are doing their job too, by making this a smoothly run project.



# Atlas Copco introduces advanced CC 650 Combi Cutter

**W**ith a service weight of 1,389 pounds, Atlas Copco’s new CC 650 CombiCutter is designed for carriers in the 13,200-pound to 26,500-pound weight class. The CC 650’s hydraulic rotation device allows 360-degree rotation of the attachment for quick and easy positioning. Featuring an impressive 50 tons of crushing force, the CC 650 is ideal for light-duty demolition work and interior reconstruction and gutting work.

The CC 650 has all the features of larger models in the CombiCutter line. Two movable jaws and two main hydraulic cylinders offer consistently high crushing force throughout the entire operating cycle. The jaws are supported by a central main pin, which combined with “CAPS” (Atlas



Copco’s Coupling and Positioning System) allows both jaws to be fitted or removed as one unit for easy replacement on site.

The cutter blades can be turned around for additional use, doubling the wear time, and they also can be quickly and easily replaced on site.

“We are excited to offer a new model to our proven range of CombiCutter hydraulic attachments,” said Kevin Loomis, product manager – hydraulic attachments. “Atlas Copco’s new CC 650 can be used on a smaller excavator, saving on operating costs while still offering ‘heavy weight’ performance.”



# New HB 3100 hydraulic breaker with PowerAdapt and optimized box design

**A**tlas Copco’s HB 3100 is the newest model in its heavy hydraulic breaker line. With a service weight of 6,944 pounds, the HB 3100 is suitable for carriers in the 66,139-pound to 114,640-pound class.

The HB 3100 has all the proven features of Atlas Copco’s heavy duty breaker range:

- **VibroSilenced System:** reduces noise and protects the operator and carrier against vibrations;
- **AutoControl:** adapts the blow frequency and impact energy to the rock hardness;
- **ContiLube II System:** an integrated automatic lubrication system;
- **StartSelect:** allows the operator to choose the startup and shutdown process of the breaker to match the application at hand;
- **DustProtector** (optional): a two-stage seal system that protects the hammer unit and bushings against damage from dust and rock particles in the lower part of the breaker.

The HB 3100 also features the **PowerAdapt system** that shuts down the hydraulic breaker when oil pressure exceeds the maximum input value. Self preservation features such as PowerAdapt protect your investment against costly mistakes from improper set up or incorrect operating mode choices made in the cab of the excavator.

In addition the HB 3100 features an improved box system for better stability and resistance. The dual retaining bar system, for example, provides better protection against wear and tear, especially in the lower part of the hydraulic breaker.

The HB breaker range was developed to get even the toughest and hardest jobs done. It’s a genuine heavy duty tool designed for millions of hits under the harshest conditions. In addition, Atlas Copco breakers are easy to service and maintain, which makes them suitable for a wide range of applications such as primary and secondary breaking, demolition and tunneling.

# Atlas Copco commits to ‘Sustainable Productivity’

To effectively communicate its efforts to ensure reliable, lasting results with the responsible use of human, natural and capital resources, Atlas Copco has launched a new brand promise – Committed to Sustainable Productivity. This new brand promise encompasses all Atlas Copco divisions and is effective immediately.

“With the new brand promise we can communicate that in addition to our ability to innovate for superior productivity, we are a very responsible company,” said Annika Berglund, senior vice president – Corporate Communications. “Sustainability – thinking about what will last – has always been a part of our product innovation, customer service, diversity, safety, and environmental concerns.”

For Atlas Copco, the concept of sustainable productivity includes more than just “green” or environmental issues. It refers to an entire set of corporate values that embraces a long-term view of commitment,



Ronnie Leten

interaction and innovation that improves product quality and productivity, while simultaneously benefiting Atlas Copco customers and the global community at large.

“In today’s corporate world, we as a company need to be open about what we stand for in order to attract the best people and assure our customers that we are a trustworthy business partner,” said Ronnie Leten, Atlas Copco president and CEO.

**To that end, Atlas Copco’s commitment to sustainable productivity includes:**

- Reducing the impact of production on the environment;
- Promoting diversity amongst employees and management;
- Improving energy efficiency and reducing the cost of ownership;
- Supporting suppliers in implementing best practices;

- Having the most reliable products and services;
- Ensuring a consistently high competence level;
- Boosting health and productivity through better ergonomics;
- Focusing on health and safety in the workplace;
- Offering services that secure maximum availability;
- Innovating for continuous product development; and
- Acting for a better society around us.

Leten pointed out that delivering on this promise will require a lot of hard work throughout the Atlas Copco organization, but the reward will be a stronger, better company. “Our customers need to know that they will be productive not just today or tomorrow, but even years from now. We always strive to provide the highest possible productivity, but we believe doing so at the expense of certain values would ultimately damage both Atlas Copco and our customers. Our culture is what makes us stand out among competitors, and this new brand promise will reflect that.”

## Scooptram ST7, the next generation of underground loader

The latest addition to Atlas Copco’s comprehensive line of four-wheel-drive LHD underground loaders – the Scooptram ST7 – features major advances in performance, serviceability and comfort. The ST7 has a tramming capacity of 7.5 tons with a 3.4 cubic yard bucket. Powered by a fuel-efficient, clean burning Cummins Tier 3 engine, the ST7 features articulated steering, an oscillating rear axle and the best operator visibility in its class due to the low back end. The ST7 benefits from traction control that reduces tire slip and improves loading performance. The load-sensing hydraulic system increases traction and improves fuel economy.

The Scooptram ST7 comes with Atlas Copco’s patented spring-applied, hydraulically released (SAHR) brake system that includes automatic brake testing with diagnostics and logging. Safety is further enhanced by three emergency machine stop buttons and a system that applies the brakes, blocks steering and prevents bucket movement when the cabin door is open.

An oil-free cabin environment with a comfortable air suspended seat and ergonomic, multi-function control joysticks adds to operator safety and comfort. Furthermore, routine maintenance is easier with accessible service points, filters and valve blocks. The Scooptram ST7 is built for demanding underground applications where its small size combined with high performance are keys to superior productivity.





# Training for drill rig operators

**T**raining drill rig operators with the aid of simulators is gaining popularity, rapidly becoming the method of choice for mines around the world.

Atlas Copco is a forerunner in driving this trend and now offers simulators for most of its surface and underground equipment, the latest of which is a new simulator for training operators of Pit Viper blasthole drills.

These modules provide extremely realistic and effective training for operating such large rigs as the new Pit Viper 235 in a safe and controlled environment.

“The simulator will be used as part of our Master Driller program,” says Peter Lawrence, Technical Services Manager Parts and Services.

“The opportunity to learn in a realistic environment will allow operators to thoroughly familiarize themselves with these rigs before taking the controls in the real thing. This means new operators can contribute



*Effective and realistic: Atlas Copco’s new Pit Viper training simulator in “action” in Texas.*

more rapidly to a company’s operations.”

Simulator training has proven to have a positive impact on performance and reliability as operators learn to avoid causing

unnecessary wear and stress on key components. In addition, it enables training to take place away from the site so that working rigs can continue to focus on production.



*Comes standard with a COP 1838ME rock drill, which not only has a high penetration rate, but boasts excellent drill steel economy because of its double dampening. An optional long-hole feed kit is available, suitable for both face drilling and long-hole drilling.*

## New Boomer for narrow veins

**High penetration rate, easy to service**

**T**he new Atlas Copco Boomer T1 D face drilling rig builds upon the proven features of the Boomer 104 in narrow vein applications with improved productivity, more strength and more options. The hydraulically controlled rig has a tight turning radius, and with the enclosed cabin option, stands just 1300 mm wide and 2722 mm high.

Serviceability is improved on the Boomer T1 D with easy access to all service points, making for faster diagnosis and repair. The standard protective roof is FOPS approved, as is the optional enclosed cabin. The ergonomic design of the operator compartment makes this a very safe, comfortable and productive machine to operate. It is equipped with SAHR emergency and parking brakes; improved LED tramming lights that provide better visibility with lower power consumption; and HID (Xenon) work lights that provide better visibility and are less sensitive to water splash.

## Rock Drills for tough conditions

**A**tlas Copco has launched three new heavy duty versions of its COP1800 series hydraulic rock drills, specially designed for face drilling underground in tough conditions. The newcomers – COP 1638HD, COP 1838HD and COP 2238HD – feature a new side bolt design that minimizes the risk of impact piston misalignment and secondary damage to internal parts. This design also improves serviceability.



*Designed for face and long-hole drilling in the hole range 38–64 mm.*



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