

USA MINING & CONSTRUCTION

**PIT VIPER ON THE
IRON RANGE**



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*MECHANIZED ROCK
EXCAVATION WITH
ATLAS COPCO*

NO. 1, 2016

Atlas Copco

“

Atlas Copco service personnel are ever ready to help you stay at the top of your game in a tight market.”



AS PRODUCT MANAGER of Atlas Copco USA Mining and Rock Excavation Services, I get to see the countrywide network of our service team making Sustainable Productivity—our brand promise—a tangible reality.

The articles in this issue of Mining & Construction USA feature leading technology of Pit Viper blasthole drilling rigs

and other machines. We also feature in this magazine new tools like the COP 86 and success stories about surface crawler ROC drills that are an industry favorite. While Atlas Copco’s products are a huge part of our success, high quality product support is certainly another.

Now, more than ever, we are focusing on providing stellar service to our customers. They need their equipment available and safe, and they aren’t always in the market for a new purchase.

Our CARE service agreements and Rock Drill upgrade programs ensure maximum reliability with minimal downtime. And the list of instances in which RigScan rig audits have saved customers time and money is continuously growing. Already available for most equipment, including our surface crawler drill rigs, our goal of making RigScan available for all of our machines is soon to be realized.

Across the board—mining, quarrying, construction, drilling—many of us are faced with tough times. Rest assured Atlas Copco service personnel are ever ready to help you stay at the top of your game in a tight market.

I hope this issue’s exciting success stories keep you as optimistic as we are of continuing profitability and a future that promises great things to come.

Martin Wallman

Product Manager of Atlas Copco USA Mining and Rock Excavation Services

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UPGRADES INCREASE FLEXIROC T20 PERFORMANCE

■ Drillers appreciate the 40 percent boost in drilling performance of the compact, radio remote controlled Atlas Copco FlexiROC T20. Based on an upgraded Rig Control System with next-generation electrical and hydraulic components, the rig is equipped with a COP 1435 rock drill with higher impact energy and improved rotation torque. Additional rig enhancements include a reinforced drill steel support, redesigned hose routing, and improved access for servicing.



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■ Surface blasthole drill rig owners can reduce the unnecessary expense of preventable downtime and keep their rigs at peak performance with Atlas Copco RigScan audits. The systematic, point-by-point OEM inspection conducted by Atlas Copco RigScan technicians assesses a rig's condition. Owners receive a comprehensive, easy-to-understand report with recommendations prioritized from the most critical safety items down to routine preventative maintenance.

NEW EXPLORATION BIT — AZURE

■ Wireline exploration drillers have a new midrange go-to coring bit. The Atlas Copco Azure bit offers the versatility of a single diamond-impregnated coring bit to cover rock conditions varying from broken and moderately abrasive to hard and slightly abrasive formations. Available in all wireline sizes in a variety of matrices, Azure bits are compatible for use with Atlas Copco Secoroc's wide range of exploration tooling and consumables.



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ON THE MOVE in the IRON RANGE

Question: What makes a mining company complement an all-electric drill fleet with a diesel-powered drill rig?
Answer: Better utilization.

The mining town of Mountain Iron lies on the Mesabi Iron Range, a narrow formation of taconite stretching west to east across northern Minnesota.

United States Steel Corporation's Minntac Mine at Mountain Iron, Minnesota, has supported mining activities for more than six decades and is permitted for a further 25 years.

Minntac has 10 electric drill rigs and recently complemented its fleet with a diesel-powered Atlas Copco Pit Viper 351 rotary blasthole drill and this highly mobile rig is making its mark.

Comparing diesel and electric rigs is not as simple as looking at fuel and electricity costs. Mobility, flexibility and downtime are all considerations when

gauging the efficiency of a rig.

Matt Luoma, Area Manager of Mine Engineering and Development at Minntac, said both types of rigs drill equally well. Minntac's fleet drills 16-inch-wide blastholes to depths of 65 feet—currently believed to be the largest diameter blastholes used by any surface mining operation in the world.

This large dimension is necessary for the big charges needed to blast rock with a compressive strength of 20,000 psi at the low end for waste rock, up to 100,000 psi for the hardest magnetite-bearing ore.

Patterns usually average 150 holes but at times can be over 300. Penetration rates here range anywhere from 20 feet per operational hour in ore, up to 100 feet per hour in waste rock.





▲ **Important tool:** The powerful breakout table on the Pit Viper 351 enables the large diameter drill pipe to be easily uncoupled.

► These magnetite iron pellets are shipped via the Great Lakes to steel mills.

Joe Froehlingsdorf, Drill and Blast Coordinator at Minntac, explained that while the PV-351 was purchased to increase drilling efficiency in certain situations, he has no reservations about using the diesel-powered rig for routine patterns normally assigned to an electric rig. “One of the obvious benefits of diesel-powered drilling is in rough terrain, when we’re pushing back the pit,” he said.

THE ORE BODY BENEATH THE glacial till of Minntac’s 9-mile-long west pit declines to the south at a rate of 7 percent. The mine strips away the glacial

till overburden and waste rock at a rate of 1.2 tons for every ton of ore mined. The waste rock consists mainly of slaty and cherty components that contain less than 14 percent magnetite.

Froehlingsdorf pointed out that moving a cable to an adjacent blast pattern can take a couple of hours and if the move requires stripping steel and lowering the mast on the machine it can take at least a day. In addition, if the move requires portable substations or extensive power cable work, setting a drill up may take several days. The diesel-powered PV-351 simply trams off one

pattern to set up on the next where it can start drilling immediately.

Luoma added that since incorporating the diesel PV-351 into the fleet, labor costs and downtime associated with moving rigs are down 70 percent. “That’s mostly due to the efforts that go into clearing the electric drills outside of a blasting perimeter on the day of a ►



The perfect complement: Unlike electric drill rigs, the diesel-powered Atlas Copco Pit Viper 351 provides Minntac Mine with a high level of mobility. This enables the rig to be moved easily and quickly to any part of the pit.



blast,” he explained. “Labor resources are limited in the mine and moving electric equipment is fairly labor intensive. As a result, an electric drill would have to be moved out of the area hours before the blast, whereas the PV-351 can be moved out much closer to blast time, resulting in increased utilization.”

With a lighter rotary head weighing only 16,000 pounds, compared to Minntac’s 35,000-pound electric rotary heads, the rig has inherently greater tramming stability. The superior stability is especially noticeable while tramming with the mast raised, its rotary head high over the weighty drill string. When tramming in rough terrain or crossing the pit require the PV-351 to lower its mast, its live-tower capability means no downtime is lost to stripping steel.

Minntac’s pellets have a magnetite content of 65 percent. The mine takes the blasted ore (consisting of 14 percent to 40 percent magnetic iron and 3 percent to 10 percent concentrate silica) and delivers a blended product to the primary crusher from multiple shovel positions. This blend consistently falls within the required quality range.

“

On really bad ground I’d take the mast down, but it only takes three to four minutes.”

Joe Schechinger
Drill Rig Operator, Minntec Mine



In some parts of the mine, magnetite concentrations can be as high as 45 percent. In order to keep pellets within tolerance, the higher recovery iron ore must be blended with ore of lower iron concentration, which might be on the other side of the pit. This is no problem for the PV-351, which can be deployed anywhere in the mine.

ALL UNMANNED DOWNTIME IS counted against rig utilization, including drilling delays that are not drill related. Luoma said the PV-351 has an 81 percent utilization rate while the combined elec-

tric and diesel blasthole rig fleet utilization is 73 percent. “We collect data on everything, track everything,” he said. That includes a mix of 13 hydraulic and electric shovels, 50 haul trucks with 240-ton capacity, nine electric drill rigs, with one electric rig on standby, and the PV-351.

Records indicate availability for the PV-351 over the 10 months since its arrival to be about 10 percent higher than the fleet average. Part of the high utilization rate is due to servicing efficiency. Typical preventive maintenance on electric drills requires that the



Move costs down, utilization up: From left, Tom Froehlingsdorf, Shift Foreman; Joe Froehlingsdorf, Drill and Blast Coordinator; Matt Luoma, Area Manager of Mine Engineering and Development.



The cost of moving: Moving an electric cable to a new pattern can take hours, and moving the whole rig can take at least a day.

drills have the power on, but blasting activities do not always allow electric cables to remain in the area in case they are damaged. Since the PV-351 does not require any electrical power, it's service schedule can be coordinated with the blasting schedule more readily, effectively making service delay time coincide with blast delay time. "That's another example of its mobility," Luoma said. "Basically, you can service this PV-351 anywhere without having to send out a cable moving crew."

WHILE HALF THE MINNTAC BIT inventory is from a local manufacturer, the rest is all Atlas Copco. The bits have an average life of about 3,500 feet. The vast majority of the pipe is Atlas Copco Teamalloy steel, 13 ³/₈-inch-diameter and 35-foot in length.

When Mining&Construction visited the site, the operator was Joe Schechinger. Even as the excavator was touching up the pattern's far corner of freshly stripped waste rock, Schechinger positioned the PV-351 precisely over the first marker, mast up and ready, with its wireless remote control.

"On really bad, rough ground, I'd lower the mast," he said. "It only takes three to four minutes to take it down or raise it up. It's also got a really good break-out wrench."

Leveling the rig, he set up to drill the first 16-inch hole of a 100 hole pattern with a 40 feet by 40 feet burden and spacing. The operator display showed the pattern he was on, then the auto-drilling parameters. "I can switch to manual or change the settings," he said. "Maybe in this part of the pattern I only need to

collar to 3 feet and farther on change to 10 feet. I can change it depending on the conditions."

Minntac's PV-351 is equipped with an Interim Tier 4 engine with 3,800 cfm, 110 psi air package. Volume and pressure are adjustable, though Schechinger often runs it on full. For these holes, he kept about 118,000 pounds of pulldown on the bit rotating at 75 rpm. Single pass drilling of the hole took about 45 minutes.

Shift foreman Tom Froehlingsdorf said he appreciates the time saving from blast to blast that the PV-351 provides and also gets comments from a variety of people associated with the rig. "Everything I've heard around here about the PV-351 is all positive." Smiling, he added, "The only negative thing I hear is that we don't have two more of them." ■

BIGGER *BLASTHOLES*

New Secoroc COP 86 releases the full power of down-the-hole drilling while creating larger diameter holes



To save on blasting costs, some mines have switched to 8 ½-inch-diameter blastholes from blastholes in the 6-inch range. The larger diameter allows mines to drill fewer holes in larger patterns.

In theory, fewer holes should reduce blasting costs. But bigger holes generally have a slower rate of penetration (ROP) and are harder on tooling. Mining operations have had to wonder whether investing in bigger hammers and bits will be cost effective over time.

A mine in Mexico wanted to test whether bigger blastholes would prove to be a cost-effective way to drill. Mexico's Noche Buena gold mine, owned by Fresnillo PLC, a Minera Penmont property located near Caborco in Sonora, put the bigger blasthole theory to test.

Production was limited to meeting the mine's current monthly goal of 244,000 tonnes of ore. Guillermo Bernal, Noche Buena's mine operations leader, said, "When holes are expensive to drill, it doesn't make sense to drill any more than you have to."

In July 2014 Noche Buena began run-

ning the new Atlas Copco Secoroc COP 86 down-the-hole (DTH) hammer in a side-by-side performance test against its longtime favorite hammer and bit combo.

Pete Vassar, a DTH product specialist for Atlas Copco Secoroc, said one of the benefits of the COP 86 hammer is that it can be used with a variety of Atlas Copco high pressure blasthole drill rigs—including the DML, DM45, DM30 and Pit Viper. "Customers get to use the rigs they already have on their benches," Vassar said. The COP 86 can even be used on a truck-mounted top head rig such as the Atlas Copco T4 BH.

Noche Buena put the COP 86 on three Atlas Copco DML rigs, whose air packages are rated to 1,450 cfm at 350 psi. Running at these air settings could shorten the life of an ordinary 8-inch DTH setup without approaching anything near the ROP of a COP 86. Noche Buena began compiling the data. Even if the hammer ran faster, they needed to see how it would fare after a year of running full out in his mine.

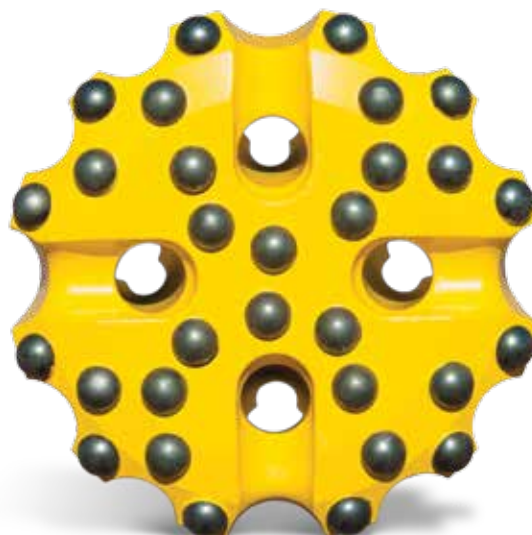
The COP 86 bits are a key component in the high-power, long-lasting design, specially engineered to make full use of

the hammer's power. Michael White, research and development manager at Atlas Copco Secoroc, said the bit's solid shank makes it not only stronger but eliminates a typical failure point found in the vast majority of DTH bits: the foot valve.

Most DTH bit foot valves on the market are simple plastic exhaust tubes extending from the bit shank. The solid-shank design has fewer bit components—fewer additional failure points—than other DTH bits, whose designs incorporate mechanisms to mitigate the cumulative effect of piston reciprocation in the foot valve's immediate environment.

A COP 86 bit has neither a foot valve nor a center-shank exhaust bore. Instead, exhaust travels along the shank's exterior fluting through ports in the bit face to the hole bottom.

Weight of the hammer has also been reduced. Lighter hammers are easier, therefore safer, to handle from shipping and receiving to servicing. White compared the COP 86 dimensions to another successful Atlas Copco hammer design, the QL 85, which is fairly representative ▶



The COP 86 bit has no exhaust hole through its center, so it has the extra strength of a solid shank.



Guillermo Bernal,
Mine Operations Leader



Mariel Marquez,
Engineer



(Left to right) Juan “Johnny” Cazares, Atlas Copco Mexico rock drilling tools support technician; Pete Vassar of Atlas Copco Secoroc, Roanoke, Virginia, USA; Karina Dominguez, Noche Buena DML operator; Martin Ocano, Atlas Copco sales rep for Northwest Mexico; and Cristian Martinez, DML operator and driller trainee mentor today in this rig.

of most 8-inch hammers on the market. The COP 86 is 20 percent lighter at 443 pounds and 22 percent shorter (44.7 versus 57.4 inches).

The COP 86 bit and hammer combo began providing clear signs that increased production was feasible, exactly the results Bernal had been looking for. Bernal said, all four Noche Buena Atlas Copco DML drill rigs previously had to run a non-Atlas Copco hammer 16 hours to drill a 300-hole pattern with 18 foot by 22 foot burden and spacing in slightly fractured rhyolite with a rock density of 2.7 kg/cm³.

While a pattern still took 16 hours

to complete using COP 86 hammers, Noche Buena used just two rigs to do it, with a total run time of 8.25 hours on each. Bernal added that when Noche Buena’s rigs are done drilling their production pattern with the COP 86, they trammed over to help a development contractor’s DML rigs drill its pattern because that contractor wasn’t using COP 86 hammers.

Vassar had the opportunity to witness one of Noche Buena’s practical studies in progress at the pit’s bottom. Two Atlas Copco DML rigs were single-pass drilling 8 ½-inch-diameter blastholes to 52 feet and sub-drilling them 3 feet.

One DML drilling rig was equipped with the competitor’s 8-inch hammer. The other was using the COP 86 DTH hammer and bit.

“It was a direct head-to-head comparison,” said Vassar. “Our COP 86 was drilling 12 to 13 holes to the competitor’s eight in the same exact conditions, on the same pattern.”

The rig with the COP 86 was also being used to teach a driller trainee, while the other rig was operated by accomplished driller, Karina Dominguez. Vassar tracked the time it took each rig to drill the 29-foot holes. The competitor’s hammer typically finished a hole

COP 86 PERFORMS WELL IN U.S. TRIAL

THE ATLAS COPCO SECOROC COP 86 down-the-hole hammer and bit was also put to the test in hard rock conditions of a U.S. gold mine.

Drilling was done with an Atlas Copco DM45 midrange rotary blasthole drill equipped with a 1,450 cfm / 350 psi air package.

The goal was to complete 30 holes to 31-feet per shift. Drillers would need to average 15 minutes per hole. Time per hole included tramping, drilling, re-drilling and withdrawing.

Geology at this location was unconsolidated rock varying from sedimentary to meta-sedimentary:

limestone, siltstone, breccia, meta-basalts and quartz. One end of the pit was more competent and harder than the other.

An experienced driller who tried the COP 86 completed 39 holes in a shift, 30 percent better than he had managed with the previous brand of bit.

A fairly inexperienced driller had an average hole time of 15 minutes, 13 seconds on a non-Atlas Copco hammer as indicated by previous records.

The first hole drilled by the COP 86 was 11 minutes, 50 seconds. The hole started with 350 psi, settling down between 330 and 340 psi. Over the course of a few

“

Our COP 86 was drilling 12 to 13 holes to the competitor's eight in the same exact conditions, on the same pattern.

Pete Vassar,

DTH product specialist for Atlas Copco Secoroc

in five minutes. The COP 86 drillers finished in as few as three minutes and never required more than four.

By the time the COP 86 had completed its eighth hole, the non-Atlas Copco hammer was still drilling its fifth.

Elsewhere the COP 86 hammer has consistently out-performed other 8-inch hammers by 25 to 35 percent. Vassar's notes at the end of his visit to Noche Buena showed the COP 86 hammer in this mine's conditions, in the hands of their DML drillers that day to be 50 percent faster than the competitor's hammer they were using. Vassar's figures matched those being kept by Mariel Marquez, engineer in charge of tracking Noche Buena's drilling operations. ■

hours, hole times were consistently less than 12 minutes with several holes taking less than 10 minutes. An hourly drilling rate would be between 150 and 300 feet per hour.

Moving to more competent rock, the mine was able to compare times with Atlas Copco COP 86 and the other brand running next to each other. Hole time for the COP 86 was 12 minutes, 14 seconds. Hole time for the other brand of hammer was 15 minutes, 39 seconds—or about 22 percent slower.

This driller said he was impressed with the COP 86 performance: "It was a lot more forgiving than other hammers." ■

After fueling up, the two Atlas Copco DML rigs started the pattern side by side, both drilling 8 ½-inch blastholes. The rigs have the same air ends, but within a few holes, the rig with the COP 86 hammer and bit (nearest) with 50 percent greater ROP is already outpacing the competitor's hammer. By the COP 86 hammer's 13th hole, the hammer made by another manufacturer is still drilling its 8th.





High Profile

Controlled marine implosion with Contract Drilling and Blasting is routine for Ken Tully, but noteworthy job to be a part of

Decades of study determined that the 83-year-old San Francisco–Oakland Bay Bridge needed replacement due to its vulnerability to earthquakes. The new bridges are now open with 10 lanes to cross the bay.

Capable of withstanding a worst-case scenario earthquake, the bridges are expected to last 150 years or more with reasonable maintenance.

By fall of 2015, only the pier foundations of the old East Span from Yerba Buena Island to Oakland and their caissons were left to demolish.

Contract Drilling & Blasting LLC performed the implosion as approved by the San Francisco Bay Conservation Development Commission. Ken Tully of CDB was the Controlled Blasting Specialist for the project and was responsible for designing the blast, overseeing the drilling

and conducting the blasting operations.

Tully, who has worked on high-profile marine pier implosions along the East Coast and in Canada, said the pier assigned as a demonstration of the technique was unique due to both their immensity and their design. The original builders had driven the Pier E3 caisson 180 feet below the mudline. Other than that, it was a straightforward pier implosion job.

The plan was to cause rubble from the imploded caisson to collapse upon itself, falling into its honeycomb-like hollow chambers, leaving nothing above the mudline.

For the vertical drilling in this application Tully needed to precisely drill 159, 2 ¾-inch holes in the caisson's 3-foot-wide reinforced concrete walls. Holes would be drilled to depths of 86 and 67 feet. Of these, 24 had to be drilled through 29- and 46-foot casings into the angled, completely submerged buttress walls.

One of the blasthole rigs Tully used on the job was supplied by Ray Hall of the Atlas Copco–Sacramento store.

Tully credited the combination of the finely-tuned rig and the operator expertise of his drill superintendent, Ed Harvey (“Big Ed”) for making ideal blastholes.

He said, “Three feet of concrete wall may seem like plenty of room, but you can’t count on walls being perfectly straight. And then there’s rebar in there. Hitting rebar dead on isn’t as much of a problem as if you only glance it. It wants to kick off a little bit. Ray was able to get the rig tuned down for us until it was perfect for these holes.”

The drill string also helped keep the hole straight. A 2 ¾-inch retract bit was attached to a two-foot-long guide coupling on T45 speed steel.



“
Whether they go with
implosion for the rest
of the piers or prefer
mechanical demolition,
the PowerROC T45
performed well.”

Ken Tully,
Controlled Blasting Specialist for Contract
Drilling & Blasting

Reinforcement was an obstacle to overcome. “The steel eats up the bits pretty quickly. Ray kept us well supplied in bits.”

Sometimes a hole would encounter a “weep window.” Weep windows were voids intentionally cast into the caisson to equalize the hydrostatic pressure inside and outside of the structure’s walls.

Encountering a weep window, Tully would ream the hole with a 2-inch to 4-inch pilot bit and then case through it to isolate the opening. Once the weep

windows were cased through, drilling of the 2 ¾-inch hole could continue to total depth.

Drilling of the vertical holes with the T45 was completed by Oct. 16. The blast was conducted on Nov. 14.

Tully said, “Whether they go with implosion for the rest of the piers or prefer mechanical demolition, the PowerROC T45 performed well. And I can’t say enough about Ray Hall and the support we got from Atlas Copco throughout the job.” ■

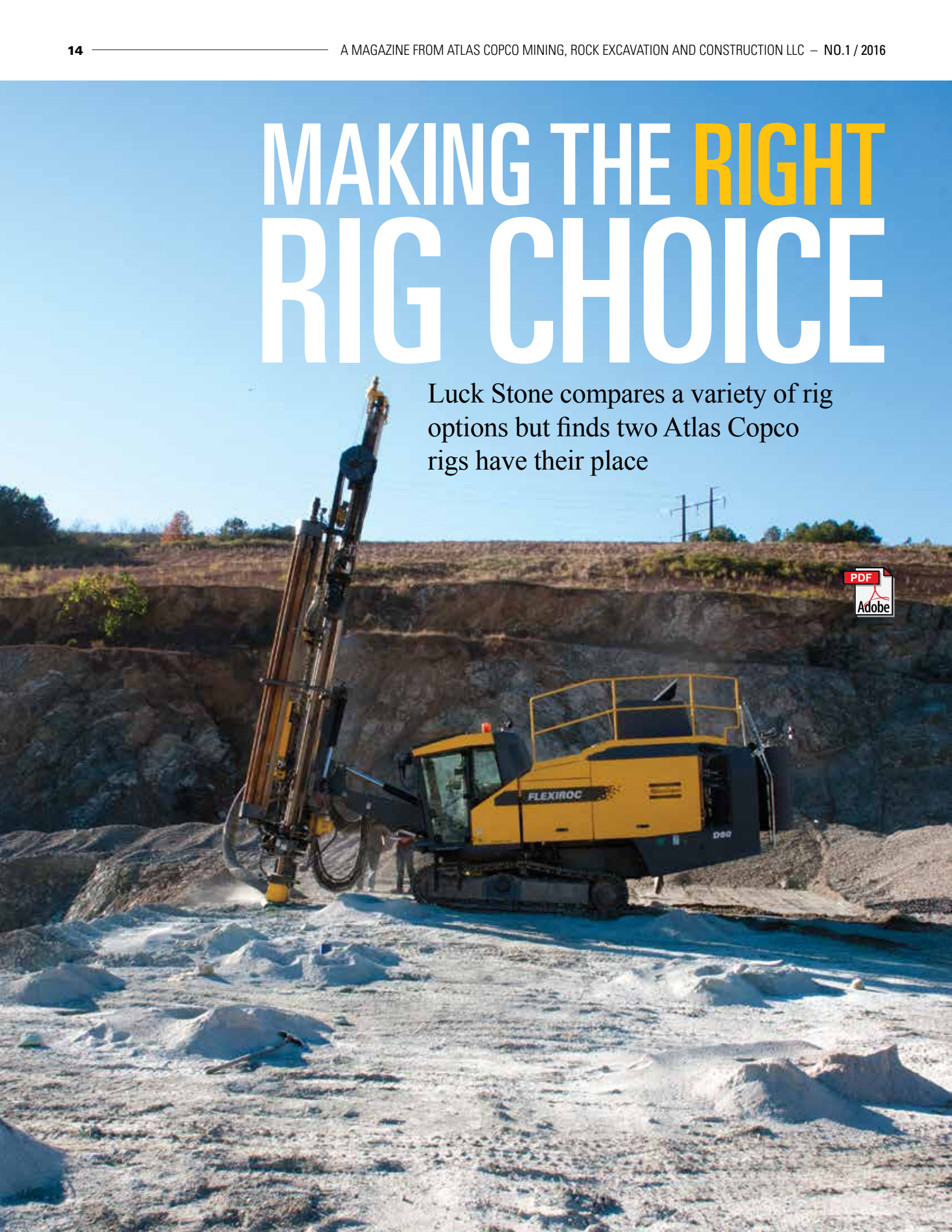
Demolition strategy for the underwater, reinforced concrete structures divided opinions. Some stakeholders believed mechanical demolition was the more environmentally responsible method. To prove that implosion was a more suitable technique given the bay’s sensitive marine habitat and wildlife, a practical demonstration and study of pier implosion for the largest of the the structures, Pier E3, was approved by the San Francisco Bay Conservation and Development Commission and state and federal agencies. Success of the implosion in meeting their requirements would determine whether demolition by implosion could be used for the remaining East Span piers.

The new bridges shown in the background are known as The Skyway and are designed to withstand the strongest earthquakes.



MAKING THE **RIGHT** RIG CHOICE

Luck Stone compares a variety of rig options but finds two Atlas Copco rigs have their place





While the Atlas Copco T4BH is quicker bench to bench and pit to pit, the FlexiRoc D60 is faster hole to hole and can maneuver into places that are a challenge for truck-rig drillers. Both rigs have a place in Luck Stone's 2020 expansion goal.

To achieve significant growth by 2020, Luck Stone of Richmond, Virginia, needed to supplement its Atlas Copco T4BH truck drill rigs with crawler drill rigs to support pit expansion. Steve Molter, Luck Stone manager of rental equipment said, "As a result of the expansion, we were more frequently encountering tight bench locations and rough terrain and needed equipment that was more flexible. On some faces, our drillers would have to get out to crib the T4 on every hole."

Luck Stone had reduced choices to three rig makes and models best suited to their various plant conditions. The choice of rig was made by a team that included drillers themselves. Molter said including the drillers in equipment choices is just one more way Luck Stone "ignites their potential."

The purchase of an Atlas Copco FlexiROC D60 demonstrates Luck Stone's long held values. It's reflected in the choice of manufacturer, a company whose values are similar to Luck Stone's, in the equipment's reliability and servcabilty, and in how the drillers themselves took part in the final selection process.

Driller Steve Kopilchak was one of the drillers examining rig options. An Atlas Copco T4BH driller, Kopilchak also serves on a Luck Stone "reclamation crew." His 22-year career has given him expertise as a truck driver, excavator and dozer operator. He's also a utility man and operates rock breakers. Sixteen of Kopilchak's years include drilling experience.

Kopilchak has also been at the controls of other truck-mounted drills such as the Atlas Copco T3W and TH60, as well as several track-mounted drills including

the Atlas Copco D7 and D9. Consequently, Kopilchak knows the advantages of both carrier types well, and both have their place at Luck Stone.

"A crawler is more versatile and gets in tighter spots than a truck drill. Plus, you don't have to back it up to the highwall. But a truck-drill is more mobile and is able to hop quickly from bench to bench or go from one pit to another."

Once on the bench, Kopilchak said a crawler quickly makes up for lost time because it can transition between holes more quickly. A truck rig driller must lower the tower, pull ahead to reposition, raise the tower, leave the cab to pin it and climb into the rear operator cab to begin drilling.

"I actually like the T4," Kopilchak said, "but I've timed it—the crawler is seven minutes faster hole-to-hole than the T4." ▶



Drillers are production-driven by nature. Giving them the tools they need to achieve their best performance, says driller Chad Perkinson, “boosts morale.”

Luck Stone driller Scott Shorter also took part in deciding which rig to buy. Speaking specifically about the D60, Shorter said, “It was love at first sight.” The rig was comfortable, quiet and less dusty than other rigs he had been in. It handled its drill steel fast compared to other rigs. And the electronics offered him precision he hadn’t experienced before. Complex shots requiring angled holes on specified azimuths were easily setup using joystick inputs to align crosshairs on the operator’s display that depicted the hole.

SHORTER DEMONSTRATED how just a few light bumps of his knuckle on the joystick blinked the digital readout from 10.0 to 10.1 degrees. “Tenth of a degree—how’s that for precision?” Shorter smiled. “The drill plan is right in the rig, too.”

Atlas Copco’s Abingdon personnel keep in touch with Molter, and a direct line of communication is open between drillers and Atlas Copco technicians in particular.

Luck Stone drillers call technicians at Atlas Copco—Abingdon from their cabs. Molter said, “We believe the person closest to the highwall knows best what he needs.”

Abingdon location manager John Swift said such communication has mutual benefits: “The drillers each have our technicians’ mobile phone numbers saved on their phones and know that open communication is encouraged to ensure maximum uptime for Luck Stone. Our techs are frequently able to help drillers troubleshoot issues remotely. Also, Mike Wiand, our technician, makes it his regular practice to actually call the drillers directly for feedback on

how the drill is operating.”

Swift said that open communication is important to Atlas Copco as well as the customer. “Such feedback is very important to us because it ensures not only that we are making decisions based on the real-time needs of the customer, but also that we are incorporating their feedback into future product revision and development.”

Molter said in the end, Atlas Copco’s responsiveness was the biggest selling point. “Rigs from the top manufacturers all drilled well in the comparison, and many features are similar. They have Tier 4 engines and their cabs have similar creature comforts. But, like all machines, they will all eventually breakdown. That’s what sets Atlas Copco’s drill program apart—they respond immediately and get us up and operating again within 24 hours of an issue. With another

Bryan Smith, Mine Development and Blasting Manager (left)
Steve Molter, Manager of Rental Equipment (right)



VALUE PROPOSITION

At Luck Companies, we believe doing good (making a positive impact) is the best path to doing well (progressing personal or business performance).

DOING GOOD TO DO WELL

ONE OF THE LARGEST FAMILY-OWNED and operated producers of crushed stone, sand and gravel in the nation, Luck Stone has never lost sight of its founder's vision. For 92 years, all decisions and all activity at the region's largest granite supplier have been based on that fundamental principle—Doing good to do well. Modeled by founder Charles Luck Jr. and then by the next two generations of the Luck Family, Luck Stone is grounded in the belief that people are its highest valued asset. As a result, Luck Stone is highly dedicated to their associates, customers and communities.

Bryan Smith, mine development and blasting manager at Luck Stone, recalled an incident some time ago that illustrates how sincerely the company sticks to its principles. When a contract driller's rig broke down shortly after 4 p.m. one afternoon, the crew immediately headed to their home shop 200 miles away for parts. They started

the next day on time. Luck Stone did not want a crew working for them who had not gotten adequate rest, despite any initial gain in production.

Smith said, "They were working for us. And if we did nothing, what does that say about our values, our belief that people are our greatest asset? We had no choice but to ask the contractor to put a base closer to the site or find someone more local."

Luck Stone firmly believes that optimum productivity is achieved as an outcome of prioritizing personal well-being above all else.

Luck Stone's values inspired the company motto and tagline: "Igniting Human Potential." The tagline describes Luck Stone's on-going, companywide, daily focus on values-based leadership through their values of Leadership, Creativity, Integrity and Commitment with the ultimate goal of sustainable profitability. ■

company, we might be down four or five days — maybe a week. That's why we chose Atlas Copco."

Atlas Copco trainers were on hand for the startup of Luck Stone's new FlexiROC D60. Swift said initial training systematically covered the entire operator's manual, followed by three days of supervised hands on training. Future, advanced training for operators and mechanics working with the D60 can be tailored to cover precisely what Luck Stone determines to be most advantageous to their operations.

SHORTER WAS AT THE CONTROLS of the FlexiROC D60 on this day at Luck Stone's Powhatan Plant. Kopilchak was manning the T4, pulling ahead to set up on a hole in the middle of the pattern. "It's really tight back there in the corner," he said, nodding to a narrow point at the far end where the berms converged. "You know, I would have done



Driller Steve Kopilchak

it, but it's tight for a truck. So I just left that part to the D60."

Both the T4 and FlexiROC D60 rigs were drilling 5 3/4-inch-diameter holes with Atlas Copco Secoroc COP 54 hammers to depths averaging 48 to 50 feet. Burden and spacing was 16 by 17, typical for this location. The plan called for angled holes at 20 degrees, due to burden.

The FlexiROC is also demonstrating good fuel economy at just 9 gph, Molter



Driller Scott Shorter

said. "But some of the new SmartROC rigs would probably do even better than that."

One year since the arrival of the first FlexiROC D60 at Luck Stone, Molter reported that it has drilled for 1,652 hours without a problem. The 10-year-old T4 was at 8,744 hours. Currently, Luck Stone is running two T4 rigs and one D60. They are planning to sell one of the T4 rigs when their second D60 arrives. ■

DELIVERING PERFORMANCE WITH CARE

CARE agreements take the weight of service off your shoulders



In spite of tremendous advances that have lengthened equipment life, the fact remains—demanding conditions and high production schedules take their toll on equipment. Atlas Copco ROC CARE Agreements increase productivity through planned maintenance and minimizing unscheduled repairs. ROC CARE provides you a fixed cost solution tailored to meet your unique production needs.

CARE plans are designed to ensure

- Consistent machine performance
- High productivity
- Records for needed service
- Protection against extra costs
- Avoidance of unplanned downtime
- Long-term lower total cost of ownership
- Better resale value
- Flexible financing

ROC CARE—FOR YOUR SURFACE DRILLING AND EXPLORATION RIGS

The Atlas Copco ROC CARE Agreement delivers you peace of mind and security with an extended machine warranty.

ROC CARE gives you an extended machine warranty of 4 years or 5,000 engine hours, whichever comes first. The warranty program is available before the machine has reached 250 hours of operation.

Scheduled service

Drill rigs are serviced according to each original equipment manufacturer's maintenance plan. A ROC CARE Agreement covers all parts needed for the scheduled service, including oil filters, air filters and fuel filters.

Inspection protocol

You receive a comprehensive report that provides full details of rig inspections and service and highlights further measures to take that can prevent potential problems from occurring.



Remote monitoring system

The CARE Agreement includes subscription access to Atlas Copco Certiq during the agreement period, the system that allows you to monitor rig status anywhere in the world. Certiq gathers, compares and communicates to you a rig's location, engine hours, impact hours, drilled feet (valid for SmartROC series) and time-to-service. Compare two rigs, check on a whole fleet, see how a rig performed today or review how it was used over the last three months. Avoid coming to a standstill for a fix by staying one step ahead. You'll even be able to track fuel consumption and find ways to keep it down.

ATLAS COPCO COP +

New Atlas Copco COP + Edition—Now with longer service intervals

The “+” edition is the next evolution of the Atlas Copco Rock drill series. The new edition of rock drills still come with the same superior performance as their predecessor. With an improved design, the standard time between service increases by up to 50% compared to previous models. This design improvement increases productivity and lowers operating cost.

The new Rock Drill + edition is available for the majority of Atlas Copco COP Rock Drill series and is also the new standard on many new drill rigs.

For customers currently operating COP series Rock Drills there are several options to upgrade to the latest design. Atlas Copco has programs to convert your old rock drill or to trade it in for the newest innovative design. Case studies have shown that upgrade costs can be recovered in as few as just four service intervals.

AS GOOD AS NEW

Atlas Copco provides remanufactured components



Atlas Copco's remanufacturing program can get you working sooner and minimize downtime through completion.

The remanufacturing process returns a component at the end of its life to OEM condition at a fraction of the cost of purchasing new.

Atlas Copco facilities can restore more than 500 different components back to OEM specifications or to the latest design and performance improvements of component upgrades.

Current inventory of remanned components includes rotary heads, airends, pumps, motors, valves and final drives for surface equipment and items such as complete MBUs, transmissions, axles and cylinders for underground equipment.

And Atlas Copco remanufactured components are factory warranted.

USE THE ATLAS COPCO REMAN PROGRAM THREE WAYS:

- **Service Exchange**—Discount for your core's value toward a new component
- **Reman**—Discount for your core's value toward remanned component
- **Repair and Return**—Reman of your original component

Service Exchange and Reman offer you the least downtime and maximum productivity with fastest access to replacement components.



REMANUFACTURING BENEFITS

- **Cost saving**—Lower operating and inventory cost (Savings up to 40%)
- **Superior warranty**—Peace of mind
- **Always available**—Off the shelf
- **Genuine parts**—Safe operation
- **Guaranteed pricing**—With predictable scheduling
- **Financing available**—Convenient through Atlas Copco Finance

RIG REBUILD EXAMPLE

The Atlas Copco T4 BH—the truck-mounted blasthole drill rig that will be favored yet for years to come—is a great example of the value of the Atlas Copco Certified Rebuild Program.

As with all reman candidates, the T4 BH must first undergo a thorough RigScan Audit to determine its suitability as a reman candidate. If it is sound enough as a core, it is completely disassembled. All parts are sandblasted and repainted. Then it is rebuilt from the chassis up with new stabilizers, cab console, derrick tower, drill deck, power head, power pack, air end, hydraulic system, water injection system, dust collection system, lubrication system.

The carrier itself is rebuilt, including engine, transmission, axles, brakes, drive lines, and steering box.

The use of remanned parts during the rebuild cuts cost. Any components that can themselves be remanned increase ready inventory for your needs as well as ensure the fastest rebuild and delivery times.

Greer Limestone Co. takes delivery of first Atlas Copco Boomer XE2 C in U.S.

BUT 45 booms and COP 1838+ rock drills improve rig performance & reliability

Greer Limestone Company, a division of Greer Industries Inc., has taken delivery of the country's first Atlas Copco Boomer XE2 C at its underground limestone quarry in Morgantown, West Virginia.

The dual-boomed face drilling rig is used to drill up to 60 feet wide and is an adaptation of the three-boom Atlas Copco Boomer XE3 C. Removing the center boom allows room for a second water tank, providing Greer operators with a combined tank capacity of 450 gallons for flushing and dust control.

Founded more than 100 years ago, Greer Limestone Company is the largest producer of limestone in West Virginia. Highly advanced mining operations at this location are based on a large base of quality reserves suitable for asphalt and concrete production, metallurgical flux, cement, agricultural lime, and construction aggregate and ballast. Greer Limestone Company's highest grade product is valued for use as a key chemical component in manufacturing processes.

The rig arrived first at the Atlas Copco–Abingdon store, where OEM-certified technicians did a pre-delivery inspection before shipment to Greer and conducted training with local personnel.

John Swift, branch manager of the Abingdon store, said, "Our mission as an Atlas Copco Customer Center is to help our customers do what they already do well. The skilled crew here at Atlas Copco–Abingdon is extremely proud to see Greer receiving the country's first-ever Boomer XE2 C. And we are excited by the opportunity to provide continuing customer service and product support."

Flushing requirements have been supported further by replacing the standard GAR 5 air compressor with two electrically driven Atlas Copco GAR 37 units. The combined capacity of the two



Photo Courtesy Ron Rittenhouse/The Dominion Post

The first Atlas Copco Boomer XE2 C in the U.S., Greer Limestone Company's new two-boom face drilling rig creates 60-foot-wide blasthole patterns for its underground Morgantown, West Virginia, mining operations without having to first paint the face.

GAR 37 compressors provide up to 131 cfm of compressed air for mist flushing.

The Boomer XE2 C rig's drill plan feature, supported by proprietary Atlas Copco Rig Control System (RCS), allows Greer to create blasthole patterns on a PC in the mine office. Blasthole patterns do not need to be painted on the face. A typical round consisting of 88, 2-inch-diameter holes is viewable on the operator's monitor.

The Boomer XE2 C is equipped with BUT 45 booms, a standard feature of E Series Boomer, Boltec and Simba rigs. The BUT 45 includes a box structure with double rotation units for increased accuracy, speed and durability. The boom extension has been increased from 5.25 feet to 8.2 feet for increased face coverage.

Greer selected COP 1838+ rock drills for the rig, the upgraded version of the COP 1838ME. The COP 1838+ includes a square driver and replaceable damper

sleeve, as well as improved sealing. The improvements increase the service interval on the rock drill by 50 percent.

The Boomer XE2 C also provides improved operator visibility over the rear of the carrier. The hydraulic oil coolers and GAR 37 compressors have been relocated under the hoods, for clean sight lines.

Greer Limestone Company has maintained Atlas Copco face drilling rigs in the fleet of its flagship Greer mine since the late 1970s, beginning with a Promec TH 601 drill. Its first Boomer XL2 C face drill with RCS arrived in 2000. A second XL2 C was added in 2006.

To keep pace with scheduled expansion goals, Greer Limestone purchased a third two-boom face drilling rig in late 2014.

The Boomer XE2 C brings the current number of large Atlas Copco rigs in use at Greer Limestone to four, including a Boltec LC rock bolting rig equipped with Bolt Plan Navigation. ■

Wagner inducted to International Mining Technology Hall of Fame



wide, 22 feet long and 60 inches tall made it well suited to underground. The first underground 4-wheel-drive, horizontal discharge, telescopic mine truck called the Teletram (MTT-425) followed next, as well as the ST-5 Scooptram, the first full-reversing LHD with 4-speed power transmission and a sideways-oriented operator seat. The company was the first to introduce fully enclosed, wet disc brakes on their model ST-3 ½ in 1977. They also developed the revolutionary fail to safe Spring Applied Hydraulically Released (SAHR) brakes on their model ST-8B in 1988.

In 1970, the first public offering of stock was made and the company's name was changed to Wagner Mining Equipment.

In 1989 Atlas Copco purchased Wagner Mining Equipment.

Today production for global sales and support of the successful Wagner designs continues under the Atlas Copco brand names Scooptram and Minetruck.

Presentations to the 2015 and 2016 inductees to the International Mining Technology Hall of Fame will be made at a gala dinner in February 2017 in Denver during the annual meeting of the Society for Mining, Metallurgy & Exploration Inc. ■

An international panel of judges has chosen Eddie Wagner—“Father of the LHD”—as the 2015 inductee to the International Mining Technology Hall of Fame in the category of underground production. The distinction recognizes Wagner for his 1958 introduction of 4-wheel-drive articulated load-haul-dump (LHD) vehicles to the industry. Wagner LHDs and underground haul trucks are the forerunners of Atlas Copco Scooptram LHD and Minetruck lines in use today around the world.

Kip McCalla, business line manager of Atlas Copco Underground Rock Excavation, said, “Eddie Wagner designed products that were built to last. We identified parts for a 1962 model of his original 1958 MS-1 scoop design that was still running in a uranium mine in New Mexico in 1979.”

Prior to designing the MS-1, Eddie and his brother Elmer had been experimenting in wheeled front-end loaders starting in 1940, founding Wagner Tractors at their Oregon base of operations. At the request of Hidden Splendor Mining in Moab, Utah, Eddie adapted a 1949 articulated tractor design of his brother's. The mine had been looking for something more versatile than its current rail loading system underground.

Phillips Petroleum commissioned Eddie to build a similar vehicle in 1958. Together with his wife and son, Eddie founded Wagner Mining Scoop Co. that same year, manufacturing the MS-1. The MS-1 was the first commercially available, articulated, rubber-tired, underground mining scoop.

Quickly following the successful MS-1 design was a rear-dumping haul truck, the MT-10. Capable of hauling a 10-ton payload, its compact size at only 8 feet

International Mining (IM) is currently accepting nominations for 2016. Nomination instructions can be found at the IM Hall of Fame website: www.im-halloffame.com/home/nominations.

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