

DEEP HOLE DRILLER

AN ATLAS COPCO PUBLICATION FOR THE DRILLING PROFESSIONAL — NO. 1 / 2012

Check out the
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Mixing it up



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RD20 drills
faster and safer

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drilling in
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Draining the
Bahamas' high
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Atlas Copco

EDITORIAL



Paging through this issue of Deep Hole Driller you'll notice themes of growing, global and gas.

We featured three of our most successful independent distributors, serving different regions of the United States. The Eastern United States has taken the worldwide lead in coal bed methane production, and that area is served by Stockdale Mine Supply and Keystone Drill Services. Meanwhile, the Texas and Oklahoma business Venture Drilling Supply is expanding.

Speaking of coal bed methane, Europe, specifically Ukraine, is ripe and ready to get into that market, which is perfectly suited to the advantages of the Atlas Copco RD20. Just as the world is poised to change the way it sees the oil and gas industry, Atlas Copco is always growing to meet its customers' demands and wishes.

Our water well customers are certainly not left out, and they benefit from our commitment to provide them with the most advanced drill rigs, too. We have just released the new T2W-III. Read what the T2W is doing in the Bahamas and learn how the T3W is drilling in Russia. We know you never stop, so Atlas Copco doesn't, either.

Alex Grant
Product Line Manager
Well Drilling

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Atlas Copco

Mixing it up

Drilling company sees changing approach to drilling surface holes as an advantage for the industry »

*(Pictured on the cover) from left:
Allen Cannon, Adan Madrid, Ryon
Webb, Adam Wells, Tracy Wells*

» **D**anny Tate is the new district manager for the drilling division of Key Energy Services. After 18 years in the field, Tate finally took an office job. He sees this as an opportunity to make changes in the industry and build something along the way. It's with this philosophy that he is embracing the mixed fleet approach with Key's fleet of rigs in the Permian Basin.

Currently the company first uses an Atlas Copco RD20 to drill 500-foot surface holes and set surface casing. Then an HP Flex Rig moves over the hole to take it to total depth. Cost reduction is the biggest advantage Tate sees in using this two-drill, or mixed-fleet, drilling method. However, looking at the overall environmental difference, he sees a change in the drilling culture.

Self Sufficiency—reduced equipment and manpower

The advantage of starting off with an RD20 to drill the first 500 feet is that the smaller drill rig can get on and off the pad in a shorter period of time. With fewer components and equipment to rig-up, the overall process is faster. From pulling on-

site through drilling, casing and cementing the hole, the process takes an average of two to three days. The company can drill 10 to 12 holes a month at diameters of 12 ¼ or 14 ¼ inches.

The RD20 and its support equipment takes just four hours to rig up, compared to the four days it takes to set up the company's super-single drill rigs. With only one mud pump and two diesel pumps to move fluid in and out of the pit, the site is light on equipment necessary to drill the well.

Also, fewer pieces of ancillary equipment are required. A diesel and water tank, tool trailer, dog house, and two light towers are easily loaded or towed to the next drill site.

Equipment requiring a forklift to load includes the drill pipe, collars, and pipe racks along with a tooling box of smaller equipment such as bits, slips, cable bales, and tongs.

Moving requires two flatbed semi-trailer, a sliding skid-deck truck and the crew's pickup trucks. Drill Superintendent Jeff Woods said he is impressed with how self-sufficient the RD20 site is. "A two-day surface hole translates into less time

over the hole than a larger rig, which really adds up," he said.

Drilling methods

One important part to add to the drill string according to Tracy Wells is the shock-sub. They have many connections using a saver-sub and crossovers dropping production pipe sizes from 6 ½ inches to 5 ½ and 4 ½, but the shock-sub is key to the string. "The shock-sub takes a beating, not the rotary head. It takes 50 percent of the shock out of the string," he emphasized.

The shock-sub will be rebuilt every six holes or so.

Driller Adam Wells pointed out that while in rock a driller will put 7,000 to 8,000 pounds of weight on the tricone bit, the Redbed formation requires less, only about 5,000 pounds. The Redbed is a reddish-colored, clay-like shale stratum, roughly 200 to 1,400 feet (61 to 427 meters) from surface in the West Texas Permian Basin oil field.



The formation here changes often, Wells said, which causes him to be attentive on the controls. "There are times the bit will go quiet and just drop, it's not uncommon." This is a result of softer or sandier formations that can require swabbing the hole to clean it.

Each well is different, one of the crew members pointed out. One well near the airport, he said, drilled as smoothly as a hot knife through butter, taking half the time of a typical well.

With a tricone in this formation they will pump 320 gpm of water while they drill, which was about 50 to 100 pounds of pressure. "We are not concerned with pressure when drilling. It doesn't take much to lift the cuttings," said Tracy Wells.

Fresh water is used for flushing, although they will sweep the hole with a polymer occasionally, about every other joint, and when the well is complete. This ensures integrity of the hole and helps to lift the cuttings. The crew trips out overnight to ensure nothing falls back on the bit.

The crew only works daylight shifts, an average shift lasting 12 hours. Occasionally))



Chevron's company man on-site is Dennis Call. Tool pusher Tracy Wells is shown center and driller Adam Wells at right.



Packing up gear and tooling is quick with the cage and winch. The cage easily loads on a flatbed to move to the next site.



» they'll work a longer day to get a hole cemented because they can't miss their window with the well service company. With a penetration rate of 120 feet in eight hours, the crew averages a well every two days. Total time with cementing included means the crew can move every few days.

Tool pusher Tracy Wells said this crew works well together, resulting in a 10 to 12 well-per-month schedule.

Key's philosophy and a culture of growth

Tracy Wells said using the RD20 rather than a larger rig requires a new way of thinking for him and a bit different work style. He said, "Paperwork requires more time off the rig and in the site's trailer. I have to keep the same records as for a larger rig that moves slower."

Danny Tate realizes there is a change in drilling at the corporate level, too. "We are creating a new class of oil field worker. It's a new culture out there," he said.

Tate also brought up the work schedule. Since the RD20 crew only operates during the day, it reduces the potential for fatigue problems. "As far as an oilfield job, this is about as close to a 9 to 5 job as you're going to get," he said.

In addition to the speed at which they can move from hole to hole, he specifically likes the safety environment around the RD20. "Everyone's receptive to the



“It’s a money saver. It’s self-sufficient and it doesn’t cause problems. Bottom line, it saves our customers money and makes us a little, too.”

Danny Tate
Key Energy Services District Manager

increase in safety awareness practices, and the RD20 is a safer rig. I know our customers like this, too.”

Speed and mobility equal cost reduction

The customers also like the reduced cost that comes with the RD20. Its day rate is a third the cost of a big rig, which is really noticeable when a rig has to sit while the cement sets up. Once the surface hole is drilled and cemented, the RD20 moves off while the cement cures. A big rig would have to wait two to three days before it could go back in the hole.

Tate pointed out the moving costs are also a lot less with the RD20. "It costs

\$70,000 to \$80,000 to move a big rig versus \$5,000 to \$6,000 for the RD20.”

Overall there is just less to worry about with the RD20. Tate said, "I'd like to have three of them working, just because of the problems I don't have with them.”

"I know there is so much more you can do with it, but this rig was really well designed for surface holes," said Tate.

Tate summed up his opinion of the rig by focusing on the costs associated with it. "It's a money saver. It's self-sufficient and it doesn't cause problems. Bottom line, it saves our customers money and makes us a little, too.” ☉

From the bit to the drill pipe multiple crossover connections drop the size from 6 ½ to 4 ½. A shock-sub in this section absorbs half the bounce from the bit to the rotary head.



When to EXPAND

Atlas Copco distributor adds location: a model for others to follow



This new location in Midland opened in November 2011.

Venture's headquarters are in Tahlequah, Oklahoma, with another office in Georgetown, Texas. 888-45DRILL

*The new Midland-Odessa office. 432-561-9909
Manager, Paul Vinson cell 432-312-1874*

*See more about Venture at www.VentureDrillingSupply.com
and see used inventory at www.UsedRigs.com*

Venture Drilling Supply is one of Atlas Copco's largest independent dealers covering six states from three locations in Oklahoma and Texas. It sells everything from geotechnical equipment to water well drills. In addition to supporting the drill and blasthole quarry markets, where sister company Venture Drilling Inc. first got its start in 1977, it has growing business in construction and oil and gas. Deep Hole Driller spoke with the company's management to discuss the recent decision to expand their

Texas operation and how others around the world could use this as a model for growth.

Originally the expansion discussion started because servicing the West Texas market was logistically difficult from Venture's existing offices. Travel to the oil and gas hub of the Permian Basin, Midland-Odessa, creates nearly a 1,000 mile, 20-hour round trip in a service truck depending on the servicing branch and rig location. "Our customers simply didn't want to pay, nor did they have time to wait, for us to drive to take

care of their equipment," said Venture Drilling Supply's President George Gummere.

The foundation of Venture's success is service. To remedy the driving issue, they knew a service team in the Midland-Odessa area was critical. Before they made a move, Gummere and the company's owners enlisted the opinion of all Venture's employees who would do the work and their families.

"We couldn't make this decision without the shared commitment of our people. We talked to everyone—mechanics to secre- »



Garland Laird is one of six technicians serving Venture Drilling Supply customers in West Texas.

» taries,” said Gummere. He was particularly concerned with technicians and the extra time that would be asked of them. Making good technicians happy on the job is important to keeping them on staff, and Venture has some of the best.

Management decided that rotating service technicians weekly to the new area was the best way to start the expansion process. Venture wanted to move conservatively while continuing to offer technical service with quality people. Today the responsibility for parts and service is shared by Garland Laird, five additional technicians, and three service managers who rotate in for a week at a time, each possessing an oilfield 24/7 mentality.

On his rotation, Laird notes, “It’s not a bad thing working away from the home office.” He spends each day on the road in the region, much as he would do anyway in a different area. And it’s only for a week at a time. Then he returns to his home in Texas.

Gummere shared a lesson others can learn: “We thought we knew everyone in the area, but a good half of our business is from new customers.”

He focused on good employees. “It would be very difficult to do this without good people. We would not have moved forward with this expansion without knowing we had the personnel and their commitment necessary to do the job right.”

Although the new Service Center Manager Paul Vinson moved from East Texas to run the West Texas branch, he was originally from the area. Going to work for Venture has given him a chance to return to his roots.

Gummere thinks it’s very important when expanding a drilling-related service business to hire

people who know the value of quick response. “Paul is a likeable West Texas native with a drilling background who knows what the customer needs and expects. Uptime is critical to our business and Paul gets that.”

The new service center has also helped Venture’s capital equipment business. Although the expansion was focused on the West Texas oil and gas customers, additional water well and construction-related businesses have surfaced that Venture didn’t foresee. Vinson said, “We’ve met a great

new track drill customer right down the street who now stops in for coffee, conversation, and supplies. This is one small proof in management’s minds that the expansion has been a success.

The right manufacturer matters

Gummere also appreciates that Atlas Copco is a Texas-based supplier: “It’s great having an Atlas Copco factory in our backyard.”

Vice President Marketing for Atlas Copco’s Mining and Rock Excavation Services John Carnall said, “With our new strategy of putting Distribution Centers around the world, supporting all products, it will be as if everyone has a support system in their backyard.”

Over a period of time, Atlas Copco plans to establish seven locations around the globe that will support regional shipping needs for parts as well as rebuild centers. Today there are locations in the U.S. and Sweden with service support hubs in Southeast Asia, South America, Australia, South Africa, India and China.

Locations are targeted to benefit from logistics related to manufacturing. The new locations are also geographically located to place parts closer to large markets.


Having this kind of support is critical not only to growing businesses like Venture Drilling Supply but also to their customers’ growth and success. In conclusion, Gummere says, “With this unprecedented level of manufacture and distributor support, why would anyone choose any other product but Atlas Copco?”

“We would not have moved forward with this expansion without knowing we had the personnel and their commitment necessary to do the job right.”

George Gummere
President, Venture Drilling Supply



SAFETY is GOAL for PIPE LOADER

Oil and gas drillers benefit from hands-free features of Atlas Copco Automatic Pipe Loader 



(above) From his position, the driller can see the Pason screen and camera at the top of the tower. The assistant driller operated the pipe handler from a remote control just off his shoulder.

(left) The camera was added to the tower so the driller can more easily see when the pipe is threaded.



» **D**rilling companies expect safer drilling features from equipment innovations that reduce the chances of crews putting themselves in harm's way.

The new automatic pipe loading and handling system on the Atlas Copco RD20 exceeds expectations of safety while making drilling operations faster.

One drilling company in the Surat Basin, Australia, is relying on the safety and reliability of the RD20. Safety is a top priority for both the drilling and energy companies and is a driving force for implementation of new processes and tooling. The challenge is to reduce situations that compromise safety. Atlas Copco has designed an automatic pipe loading system (APL) for the RD20 for that purpose.

This new APL does not require any hands to touch the pipe from the time it arrives at the site and is loaded onto a rack system to the point it's added or removed from the drill string. The APL is operated by the assistant driller standing off to the side of the platform, just over the driller's shoulder. He controls the functions with a wireless remote control unit that can rest on a stand or be carried with a shoulder harness.

The APL handles drill pipe, collars, and Range 3 casing of varying sizes up to 13 ³/₈ inches. Hydraulic slips allow pipes to fall, one at a time, into the cradle of the pipe-loading arm. Clamps are engaged and the loading arm is raised into position under the rotary head. Additional safety is built into the clamping system, which cannot disengage if the pipe is raised above 15 degrees. The operator and pipe handler must be in communication, as the pipe can only be released when the driller releases it.

This company has installed a camera system at the top of the tower so the driller can see when the pipe is properly threaded into the top drive. This saves the driller's neck from straining to see the operation from the working floor. The camera also ensures proper connectivity before he releases the clamps from the loading arm.

During the process, driller and assistant driller stand about 6 feet (2 meters) apart, allowing them to communicate every step of the way to ensure a proper connection is made. The floorman also has visual and verbal communication with the others so he knows when to pull the slips holding the oilfield-style pipe.

The men are a coordinated team moving quickly. The aid of automation is a big safety factor as it reduces excess fatigue when changing pipe or adding casing.

Including connections, the crew averages a rate of 121 feet (37 meters) an hour when advancing the drill string. The drill crew was averaging 262 to 328 feet (80 to 100 meters) an hour instantaneously drilling and 114 to 147 feet (35 to 45 meters) an hour including connections. As a specific example, they had just finished a well in one full shift and an hour into the next shift. That was 2,130 feet (650 meters).

They also use the Pason data system, which can be viewed at the driller's station, inside the company trailers and from any office around the world.

Finding the seams

The formation in this region of Australia consists of Springbok Sandstone just below the overburden, Upper and Lower Juanah down to 525 feet (160 meters), and then Tangalooma Sandstone to about 850 feet (260 meters). The coal lies below these strata in the Taroom and Durabille coal seams. In the area photographed, the

hole reached total vertical depth at 1,568 feet (478 meters). The deepest they will run in the area is around the 2,295 foot (700 meter) range.

The coal is found in multiple seams 1 ½ to 6 ½ feet (½ meter to 2 meters) thick with sandstone between. Once they drill to total depth they open each seam with a 16-inch reamer. The reamer collapses as it moves down, with teeth that can expand when they reach the seam.

The hole is drilled with an 8 ½-inch PDC bit. They use 4-inch drill pipe and 5 ½-inch collars. They will use two stabilizers 50 feet (15 meters) back from the bit and 10 collars at the bottom of the drill string.

Specifications require the drilling company to use three sizes of casing with the APL including the 14-inch conductor casing, 12 ¼-inch surface casing and 7-inch production casing—each cemented in place after being set.

When complete the lower half of the production casing will be perforated pipe. A packer is cemented to seal off the surface aquifers from the production zones.

To drill the hole they will use 450 gpm of fluid mud, which keeps it clean and stable. The gas isn't under pressure and water must be removed to get the gas flowing, so they are not using heavy mud while drilling.

Can they keep up?

The enhanced safety in the RD20 has not come with a trade-off in the rig's productivity. In this case it has taken just eight to 10 hours to move the entire setup 3 miles (5 kilometers). They were able to finish one well to spud in the next in less than 24 hours. That includes everything. They are definitely still keeping up. ☉

AUTOMATIC PIPE LOADER FOR RD20 DRILL RIG

Safety is always a concern on a drill site. As a result, Atlas Copco has developed an Automatic Pipe Loader (APL) system for its RD20 mobile rotary drill rig. Designed for hands-free pipe handling, the APL system can be used with standard RD20 pipe, as well as other types of oilfield or external upset pipe ranging from 3½ inches OD to 13¾ inches OD. It is designed to work with any RD20 Range 3 model, and in some cases with earlier Range 2 models.

Featuring a solid design, the APL is a stand-alone system and features its own hydraulic power unit that operates at a maximum capacity of 64 gpm at 3,000 psi. This means the APL does not draw on the hydraulic power of the RD20 to com-

mise its drilling performance.

Weighing 35,000 pounds (15.8 metric tons), the APL system is transported as an oilfield skid. It can handle Range 2 drill pipe and Range 3 casing up to 45 feet (14 meters) and a tubular weight range up to 6,000 pounds, or 8¼-inch collar at 198 pounds (89 kilograms) per foot.

The APL system is adaptable for drilling off the ground or when sitting on top of a 10-foot (3 meter) substructure. The APL's boom elevates the pipe to a vertical position to make contact with the mast. Special docking arms stabilize the pipe underneath the top drive to make a connection. A cycle time of 75 seconds helps ensure productivity.

Automatic Pipe Handler System—RD20

Technical Specifications

Weight	35,000 pounds (16 metric tons)
Length	605 inches (50.4 feet/15 meters)
Height	56.25 inches (142 cm)
Width	102 inches (259 cm)
Width-operational mode	247 inches (627 cm)

Pipe Handling

Tubular Diameter Range: 3½ inches to 13¾ inches

Tubular Length Range: Range 2 Drill Pipe/Range 3 casing—designed for 45 feet

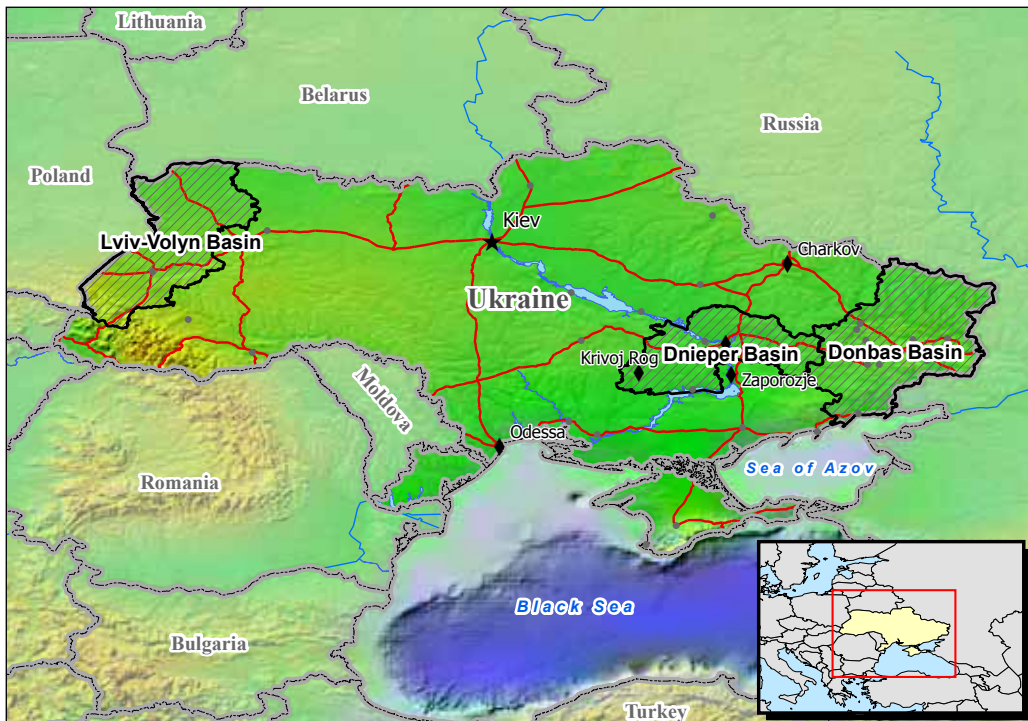
Tubular Weight Range: 6,000 pounds

Hydraulic Requirement (max.): 64 gpm at 3,000 psi, based on collar



Ripe for the drilling

Ukraine ready to step up CBM production with plenty of reserves, but a need for drillers



Ukraine is a large country, 233,000 sq. mi. (603,000 square kilometers, or slightly smaller than Texas) that has some of the largest potential in the world for utilizing its coal bed methane (CBM) resources.

The Donbas-Dnieper Basin, also known as Donets Basin, is the most important coal mining region in eastern Ukraine, mined since the 1700s. Almost all the coal fields of this basin have high CBM content, and this basin is seeing the most CBM development so far.

Lviv-Volyn, or Lublin Basin, in western Ukraine is also the focus of a boom over the last decade, especially on the Polish side where several of the world's largest oil companies have licenses to drill.

Ukraine is believed to contain between 11 and 12 trillion cubic meters of coal bed methane (CBM). By some estimates, Ukraine has four times that in Russia's Shtokman gas field.

The initiative from Ukrainian companies and the government itself is clearly in place. In fact, Sept. 14, 2011, Ukrainian Prime Minister Mykola Azarov said publicly, "I met the leaders of one of the largest corporations in the world—Chevron. They want to invest in production of shale gas in Ukraine. These are difficult deposits for exploration and large investment is needed here." At the same time, other large oil companies have been meeting to work out plans for extract-

ing shale gas and coal bed methane in Ukraine.

But they need equipment and drillers.

The United States—with 2 trillion cubic meters in reserves—has taken the forefront globally on CBM production so far, but for Ukraine, this could be the time to step up operations. Gas prices are higher in Europe, so there is economic incentive to production; there are reduced transportation costs because of shorter distances from the well head to the end market; there is greater accessibility to existing pipelines near the source of CBM; and there is a desire to reduce gas imports from Russia and the Middle East since they have raised their prices

to Ukraine substantially (from \$2 per gallon up to \$14 per gallon) in the past three years.

Making the country even riper for CBM production is the fact that the geological landscape has thicker gas-bearing formations. In Ukraine, 330 seams and layers have been identified and each well is expected to produce for 20 to 50 or more years.

Dr. David Kahn, longtime leader in the international CBM field, serves on a number of industry-related boards and is the Vice President of Technology and Business Development for Iskander Energy in Ukraine. Active on many fronts, Kahn is involved with other gas businesses as

“It is easier to cement wells with hard rock, but it is harder to drill. This is why we love the Atlas Copco RD20 and drilling with air hammers.”

Dr. David Kahn

VP of Technology and Business Development, Iskander Energy

well. He has focused on unconventional resources for much of his career and has been a leader in North America in identifying, securing and commercializing various unconventional resources including heavy oil, shale gas and CBM.

Kahn said, “There is support for CBM in Ukraine. In July 2009 it was determined to be a strategic resource so there is zero income tax, zero import duty on CBM and the government has made it easier to get permits.”

The structure of Ukrainian CBM reserves requires less fracking than, for example, those in the eastern United States, so there are fewer environmental con-

cerns generally. The gas comes from coal beds that are more concentrated and are a grade of coal four to five times higher than in the U.S. In fact, the CBM efforts in the Ukraine are seen as an environmental plus—removing the methane gas from coal mining areas where 500,000 people work to produce 120 million tons of coal a year. Degasification of the mines saves the mines ventilation costs, reduces delays and enhances safety while capturing a resource.

Another oil company is looking for drilling contractors to work on its six fields with 10 leases approved. And that’s just the beginning.

The right people with the right equipment

Atlas Copco Vice President of Marketing for Geotechnical Engineering Drilling and Exploration Johan Kempe said, “In Ukraine, there are several companies holding substantial gas assets. These companies would prefer to contract out the well drilling work, but there are currently few contractors with modern, deep-hole well drilling equipment here.”

Kempe said Atlas Copco’s equipment is ideal for the market. “Atlas Copco is ready and willing to support any contractor who wants to get started. This includes matchmaking with operators and a gas company. We need to find a rig investor to step up.”

When it comes to the geology of Ukraine, Kahn said it is at the same time advantageous and a challenge for CBM drilling. “It is easier to cement wells with hard rock, but it is harder to drill. This is why we love the Atlas Copco RD20 and drilling with air hammers.”

Until recently, drilling with air was not done in Ukraine, but Kahn said it’s made the difference. “It has reduced the cost of our wells. We use air in the first 300 to 500 meters (984 to 1,640 feet). And we used to have only huge triples or platform rigs or else old-style drills. The RD20 has a smaller footprint and is mobile. On sites in North America we have reduced our time from two months to just two weeks per site, so that is a savings of four to five times.”

Kahn said production begins at 980 to 3,200 feet (300 to 1,000 meters). That’s within the capacity of the Atlas Copco RD20 drilling rig, which is unusual in that it can drill vertically and horizontally to reach CBM up to 5,000 feet (1,524 meters) deep. In another investment area, Kahn purchased 18 of the RD20 rigs for gas drilling. “We love those rigs,” he said.

Ukraine as a country hopes others will seize the opportunity to develop CBM with equipment like the Atlas Copco RD20 so the country can become more energy independent and profit from a resource it’s known about, but didn’t know how to capture, until recently. ●



UKRAINE DRILLERS ASSOCIATION

Monthly meeting

Members of the Ukraine Drillers Association met for their monthly meeting in Kiev, Ukraine. The group meets regularly to discuss techniques, advances in equipment and industry-specific issues presented by the group. The group’s members represent geotechnical, water well, oil and gas and exploration drilling interests.

At the May meeting representatives from Atlas Copco’s customer center in Ukraine presented product advances from the oil and gas and exploration product lines. Atlas Copco Vice President of Marketing for Geotechnical Engineering Drilling and Exploration Johan Kempe, Yegor Gurin, Evgeniy Kotlevskiy and Volodymyr Chasnyk offered information to the group.

Regional Manager for Atlas Copco Drilling Solutions Mark Stewart was visiting from the USA and had the opportunity to meet the group for the first time. Stewart said, “It was interesting to see the broad range of experience in the group and how they interacted to address issues affecting the industry.”

One of the general topics for the group was the lack of drilling companies available to match the growing demand for projects in the country, especially for unconventional gas such as coal bed methane.



Russia's Crown Jewel

Water drilling connects to diamond mining

In northwest Russia, about 120 kilometers north of the Arkhangelsk region in the Verkhotina license area, an Atlas Copco T3W water well rig is hard at work. When you're traveling to the mine through rigid, demanding terrain (often covered in multiple inches of snow depending on the time of year), it's evident you're traveling to one of the more remote areas in the world. The first sign

of civilization is upon arrival at the mine camp some three hours after departing Arkhangelsk City.

The Grib Mine diamond deposit was first discovered in 1996 and then the race was on to win majority ownership. After 12 years of lawsuits and controversy, the winner was the chief executive and controlling shareholder of one of the largest private oil and gas companies in the

world, Lukoil.

The project at the Grib Mine was underway by January 2011. However, in order to effectively extract the diamonds from the deposit, a large amount of water would have to be removed.

Arkhangelskgeolrazvedka (AGR), a Lukoil sister company, was contracted to dewater the Grib Mine. Dewatering holes was going to be essential if the mine was

going to be productive over its 15-year lifespan. AGR began researching which machine they would need to add to their fleet of one water well drill, which is currently a 15-year old Russian model.

General Director of AGR Igor Prokudin said his mind was made up when he visited an Atlas Copco T3W in the eastern region of Russia. "We visited a drill rig in Kuzbass and we loved it, and it was exactly what we wanted to get." Prokudin discussed the prospect of acquiring a T3W water well rig for a little more than two years with Atlas Copco salesman Alexander Shpekht, who helped Prokudin through the process. Prokudin liked that there are multiple Atlas Copco branches in the region and throughout Russia. He said Atlas Copco's presence in the area made his decision to purchase a T3W that much easier.

Shpekht, who was recognized by Atlas Copco Drilling Solutions for his outstanding excellence in deephole sales in 2011, took Prokudin to Siberia to show him how the rig works in some of the world's toughest conditions. Shpekht also worked with AGR to calculate different technology parameters for the rig to show Prokudin and AGR how the T3W would work in a variety of geological conditions. When it became clear that the Grib Mine's geological conditions were more difficult in reality than they had originally estimated on paper, working with Atlas Copco became even more attractive. Shpekht helped AGR through the process.

The biggest obstacle for AGR in purchasing the Atlas Copco T3W was making sure they had the job with Lukoil. Once they signed the contract with Lukoil to drill dewatering holes around the mine, AGR purchased the T3W water well rig for the project.

AGR began drilling with the T3W in July of 2011 and plans to drill a minimum of 40 holes around the mine for dewatering purposes. There are also a few monitoring wells, which are often used to sample groundwater for chemical substances. AGR uses its Russian model water well rig for exploratory well drilling around the mine.



Efficiency is one of the largest benefits for AGR regarding its T3W water well rig. According to one drill operator, the T3W can drill a hole four times faster than a Russian model rig. Currently AGR is using the T3W to drill holes ap-

proximately 100 to 300 meters deep with hole diameters starting at 650 millimeters. AGR is using an Atlas Copco QL120 DTH hammer and 381-millimeter spherical bit also supplied by Atlas Copco. The depth of each hole depends on the wa-

ter-bearing zone location since the water-bearing zone must first be crossed to pump as much water as possible from the hole.

For now, they've drilled only three holes because they're still testing different technologies and learning how to manage the geological conditions they're faced with. Although it is difficult to determine now, Prokudin said: "It's most important for us to choose the right drilling technology."

Currently AGR is searching for the right combination of drill bit and flushing medium with a goal of using a down-the-hole drilling method with air to depths of approximately 100 feet (30 meters), with clay serving as the primary drilling application. There's also the possibility of using foam or mud drilling to complete the rest of the hole, which will be drilled to depths between 820 to 885 feet (250 to 270 meters).

An Atlas Copco XAHS 186 compressor is used for developing the water well after the T3W finishes drilling the hole. The compressor is needed to pump out the cuttings from the hole and remove small fragments of sand that can wear the pump out in a matter of hours. The compressor is instrumental in the well's development, because it moves excess mud and water from the hole's wall in order to make the water-bearing zone as productive as possible. This process can take between three and seven days depending on how fast it takes clear water to emerge from the hole. Once clear water appears, a small pipe that was needed to inject air into the hole is removed, and a submersible pump is placed in the hole to pump the water on a regular basis by an electric motor. The water-bearing zone is not

“It's most important for us to choose the right drilling technology.”

Igor Prokudin
General Director, AGR

» at a defined depth around the mine, and needs to be crossed in order to remove as much water as possible from the depth that the hole needs to be drilled in that particular location.

One of the more noticeable adjustments AGR has made to the rig is the side paneling they've built to keep the machine warm and protect it from the many elements it battles daily, especially during the winter months. AGR purchased the cold weather package for their T3W because the average temperature in the Arkhangelsk region during the winter ranges from 14 to 20 degrees Fahrenheit in the beginning of winter down to minus 30 degrees Fahrenheit (minus 34 degrees Celsius)

as the winter season progresses. Once winter has passed, the crew will remove the side paneling on the rig for the spring and summer seasons.

As production at the Grib Mine goes on, pumping out excess mud and water will prove vital to the mine's productivity. Currently AGR couldn't be happier with how its T3W is drilling, and in time, productivity is likely to increase as the drillers become more comfortable operating the rig and learning what type of drill bit and flushing medium works best in the demanding conditions found in northwest Russia. ☉



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DRAINING SATURATED GROUND

Where the water table in the Bahamas is nearly at the surface, the way to evacuate rain water is a simple solution »



Rain water quickly dissipates when it has a borehole to act as a drain. In this location, a mile from the sea, the water table is inches from the surface. Here the tide has already started to go out. Notice the cruise ship docked in the far distance.



Cuttings from the discharge line are captured in a steel box so they can be hauled away or disposed of easily. Attaching the discharge line to the box anchors the line and diverts water away from the work area.



Drainage holes are for control of the rain water in parking lots and a future roadway for a large sports complex that's currently under construction.

» Although the Bahamas are blessed with beautiful water, white and pink sand beaches and an abundance of sunshine, as a tropical island nation the islands do have spots of excessive rain. Land is little more than a meter or two above sea level in the Bahamas. Yet when it rains, water must be absorbed into the ground because the islands don't have a storm drainage system. Drainage wells help displace water faster. For drilling contractor Bahamas Hot Mix (BHM), the Atlas Copco T2W is a good choice because of its ability to quickly drill and case these relatively shallow drainage wells.

In the past, drill rigs in the Bahamas didn't need to have great depth or speed. Surface water is fresh, and most potable water for the islands comes from reverse osmosis well systems, from bottled water or from a 3 million gallon tanker that arrives daily. Within 20 feet of the surface, water becomes brackish, then totally salty by 30 feet.

"We drill 60 to 140 wells a year," said BHM Technical Director Brian Davies. "We can do a well about every two days, or three a week." This year the company is on schedule to drill 100 wells. But as Davies points out to drillers outside the country, they needn't rush to paradise—the government protects such work for Bahamian companies.

Davies said they got into the work out of necessity. The company happens to be the chief supplier of asphalt to the islands and does much of the paving. Drainage wells are necessary in construction projects for roads as well as property development. In order to stay ahead of the projects BHM needed to increase its drilling

capacity, which otherwise is done by cable rigs.

What started out as an added service to their grading and paving work, Davies said, "Today the T2W work has taken on a life of its own. We got the drill four years ago and it has never stopped."

He said they bought the rig used and have been very happy with it. Service assistance comes from the U.S. Center of Excellence office in Milwaukee, Wisconsin, via phone with Technician Joel Kraft and Parts Manager Steve Matic.

Drill operator Jimmy McAleenan has also been happy with the used rig. "If I need something I can call Steve and he knows what I'm looking for most of the time without me even having to give him a part number. I just describe what I need." This is important to the crew, who do all the maintenance themselves.

McAleenan said he was the shop maintenance foreman before becoming a self-taught-driller. "I needed the change and this is great for me." He said they've never had a major problem with the rig, and at the most they were down just two days because they needed a part shipped from the United States. The problem in that instance was seals that gave out in the swivel because of the abrasiveness of the rock.

Drainage wells

Currently BHM is four months into a 22-month project that includes drilling



“Today the T2W work has taken on a life of its own. We got the drill four years ago and it has never stopped.”

Brian Davies
BHM Technical Director

60 drainage wells. The specifications for the wells require 150 feet of clean hole when complete. To get that, the crew drills a 170-foot bore hole, allowing for cave-in space during casing.

McAleenan said they never know what to expect in the formation and could get loose rock as easily as voids or caves. "No two wells are ever the same. A well right next to another could be totally different," he said.

The rock is mostly oolitic limestone but they also see dolomite and some quartz. McAleenan says the most difficult material to drill through is clay-like sand. "The stuff looks almost like beach sand, but you can squeeze it in your hand and it's sticky like clay."

The sandy zones can be thin or thick and the only way to get through them is to pack it into the drill string and trip out, then clean the pipe. The zone is usually too thin to change drilling methods.

BHM has found the best way to drill the drainage holes in this formation is to

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are key distributors for Atlas Copco



Stockdale Mine Supply

Stockdale Mine Supply and Keystone Drill Services are names synonymous with drilling in the Eastern United States. With the recent boom in the Marcellus region, the companies are close to new customers while continuing to serve their base of traditional oil

and gas, water well, geothermal, coal mining, quarry and construction customers.

Barney Stockdale and Bob Means started the predecessor to Stockdale Mine Supply almost 65 years ago. They first owned Stockdale & Means Explosives Inc., a drilling and blasting company that served the coal market. They saw a need for drilling support products and services so they later formed Stockdale Mine Supply Inc., a full service repair and supply company.

Mike Hetzler, sales manager of Stockdale said, "Stockdale's success can be attributed to devotion to product development that kept us on pace with the evolution of the drilling industry."

Steve Means, son of the original owner, has worked for decades in the industry and is now the president of the company. Stockdale Mine Supply has offices in Punxsutawney, Pennsylvania, and Norwich, Ohio. Stockdale has been a distributor of Atlas Copco drilling equipment since 1981. Stockdale provides drillers with rotary drilling expertise, complete machines and parts sales in addition to



product support and service.

Hetzler said he is proud of the company's ability to provide customers with the latest and most efficient methods of drilling with equal devotion to product support. Hetzler said, "Stockdale has become a household name among drillers in the eastern U.S. Stockdale Mine Supply didn't just build a customer following, it became a part of a family with ties that date back generations."

Keystone Drill Services was started in 1985 with products and services available 24 hours a day, seven days a week for customers in the oil and gas, foundation and construction, water well, blasthole, ground engineering, pipeline and directional drilling industries.

Keystone Capital Equipment Sales Manager Devin Biehler said, "There's been an uptick in activity, which has been ideal because of our location. Natural gas in the region is an up-and-coming and active play, and there are a lot of companies relocating equipment here."

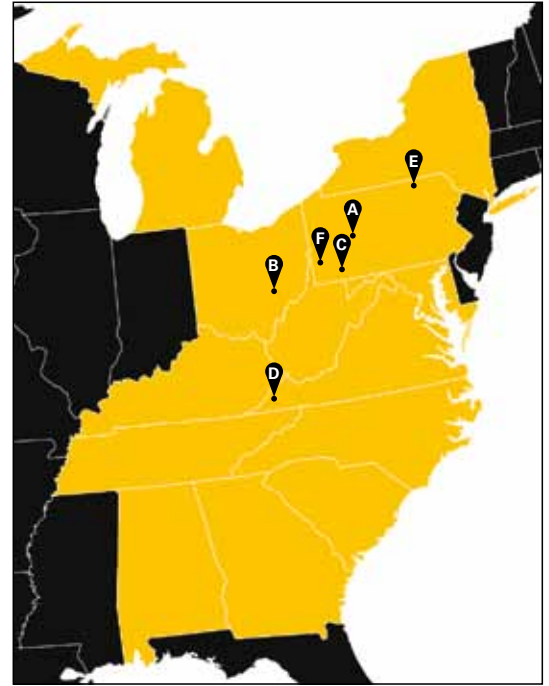
Of course, competition has tried to set up camp to capitalize on the recent

growth in the Eastern U.S. But that hasn't meant a dip in Stockdale and Keystone's business.

Biehler said, "As drill companies come in, they find out about our business. Word of mouth has done a lot for us because of the number of legacy drillers here."

Keystone Drill Services is based in Somerset, Pennsylvania, with branches in Wysox as well as Norton, Virginia, and a new facility in Westland, Pennsylvania. Keystone specializes in both Atlas Copco Secoroc down-the-hole hammers and drill bits as well as custom-built auxiliary and booster air compressor packages to compliment the drill packages.

Biehler said, "Between our president, Tom Walker, and service manager, Bill Lincoln, and down the line to the rest of the staff, our expertise is extremely valuable. Bill has been in the industry for so long, he's well known for being able to troubleshoot equipment over the phone so customers don't have the downtime they otherwise would. And Tom is well known to all the drillers as knowledgeable and trustworthy." ☺



Keystone Drill Services



Stockdale Mine Supply and Keystone Drill Services distribute and service Atlas Copco equipment in Michigan, Ohio, Pennsylvania, New York, West Virginia, Kentucky, Tennessee, Virginia, Maryland, North Carolina, South Carolina, Georgia and Alabama.

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Atlas Copco Secoroc awarded \$3.4M energy grant



The U.S. Dept. of Energy (DOE) has awarded Atlas Copco Secoroc \$3.4 million for a three-year research and development project. Working with Sandia National Laboratories, Atlas Copco will create a down-the-hole (DTH) hammer design capable of low-cost, high-production drilling in the high temperatures of deep geothermal wells.

The grant is one of 32 research and design projects for geothermal power production funded through a \$38-million initiative by the DOE's Office of Energy Efficiency and Renewable Energy.

Sandia, Atlas Copco

Ron Boyd, the Atlas Copco Secoroc Project Manager for deep-hole drilling applications, said the project is a result of Atlas Copco's current work with Sandia National Laboratories. Known foremost for its work developing science-based technologies for U.S. national security, Sandia also addresses scientific challenges on a broad range of issues, including energy security.

Sandia engineer and senior staff member for geothermal research David Raymond sought Boyd out when this research and development opportunity arose. Boyd, with the support of TJ Plunkett, then formed a project team with Atlas Copco engineers Paul Campbell and Dale Wolfer, who devised and submitted their proposal for developing a high temperature hammer for the DOE initiative.

Geothermal power

"If you mention geothermal drilling, people may think of water well rigs making holes on residential and commercial properties. People are more familiar with that use of the word," Boyd said. He added that even within the mining and drilling industry most people are not likely to understand the challenges that geothermal-based electricity generation presents to the industry.

"Depending on the location of the heat source, they have successfully drilled over 10,000 feet down. The deeper you drill, the hotter and more expensive it is," Boyd explained.



Key players in the joint research project are (from left): Elton Wright, Sandia National Laboratories (SNL); David Raymond, SNL; Bernie Bladies, Atlas Copco Customer Center; Ron Boyd, Atlas Copco Secoroc; Jeff Greving, SNL; Jiann Su, SNL; Steve Knudsen, SNL; Dale Wolfer, Atlas Copco Secoroc; Paul Campbell, Atlas Copco Secoroc, and Doug Blankenship, SNL.

To date, this has excluded current down-the-hole (DTH) hammer designs because the hammers have heat-vulnerable parts, including rubber and plastic. "They are drilling at 300 degrees Fahrenheit and higher."

Hot air

While companies have managed high temperature drilling with other techniques at these depths, those methods do not offer the benefits of air, also known as percussive, deep-hole drilling. Percussive drilling's greater penetration rates can cut time in the hole by half, which greatly reduces the cost of boring a deep hole.

Boyd said most of those currently familiar with state-of-the-art geothermal energy production are in a limited number of countries, but these advancements will have worldwide applications. Geothermal power is no longer dependent upon isolated spots of high-pressure, high temperature steam, which had held back its viability as an alternative to fossil fuels because of its relative unavailability.


Recent successes with "binary cycle" generating stations have vastly increased

the number of geographic locations where geothermal production is feasible. These binary plants use hot water pumped from underground to heat liquids that have boiling points much lower than water, such as liquid butane. The vapor from these liquids drives the generating turbines in place of steam.

Lowering cost

Atlas Copco was awarded one of the two largest contracts involved in the DOE initiative. Other projects by universities and research institutions will pursue solutions to such technical challenges as aerial identification of geothermal reservoirs, more precise methods for predicting reservoir capabilities, and other cost-reducing techniques for creating and sustaining enhanced geothermal systems.

Multiple benefits

In addition to engineering technologies that will further develop the nation's geothermal resources, the initiative will "create skilled jobs for American workers, and help diversify our energy portfolio," U.S. Secretary of Energy Steven Chu said. 

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Drill Engine: CAT C15, 565 hp
Drill Hours: 906
Compressor: 1,070 cfm / 350 psi



Atlas Copco T3W/2002 sn:6753
Location: Milwaukee, WI
Tower: 32 ft.
Drill Engine: CAT C15, 565 hp
Drill Hours: 6,562
Compressor: 900 cfm / 350 psi



Atlas Copco T3W/2000 sn:6592
Location: Tucson, AZ
Tower: 32 ft.
Drill Engine: CAT 3406, 465 hp
Drill Hours: 11,000
Compressor: 900 cfm / 350 psi



Atlas Copco TH60/1992 sn:3640
Location: Milwaukee, WI
Tower: 38 ft.
Drill Engine: Cummins N14, 410 hp
Drill Hours: 9,207
Compressor: 750 cfm / 300 psi



Atlas Copco RD20 II/1998 sn:6389
Location: Denver, CO
Tower: 51 ft.
Drill Engine: Cummins QSK 19C, 755 hp
Drill Hours: 7,972
Compressor: 1,250 cfm / 350 psi



Atlas Copco RD20 III/2001 sn:6660
Location: Denver, CO
Tower: 61 ft.
Drill Engine: CAT 3412, 735 hp
Drill Hours: 13,950
Compressor: 1,250 cfm / 350 psi



Versa Drill V2000/2003 sn:1120
Location: Milwaukee, WI
Tower: 35 ft. 6 in.
Drill Engine: CAT C16, 600 hp
Drill Hours: 4,443
Compressor: 1,070 cfm / 350 psi



Versa Drill V2000/2001 sn:1097
Location: Tucson, AZ
Tower: 35 ft. 6 in.
PTO Engine: CAT C15, 475 hp
Drill Hours: 8,914
Compressor: 900 cfm / 350 psi

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