

# DEEP HOLE DRILLER

AN ATLAS COPCO PUBLICATION FOR THE DRILLING PROFESSIONAL — NO. 3 / 2012

## A focus on water in Ethiopia



Farming communities looking for water

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Company drills in difficult areas with T3W

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Exploration drillers prefer RD10+ in Chile

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*Atlas Copco*

## EDITORIAL



The latest edition of Deep Hole Driller offers examples that demonstrate our ability to thrive in various markets with a diverse group of customers. Superior rock drilling tool technology ties us to a customer in a developed market. A partnership approach with another customer results in an outstanding level of cooperation and long-term customer loyalty. Finally, our penetration into complex markets such as Ethiopia shows our ability to develop a comprehensive approach.

The Ethiopian stories illustrate our lasting commitment to this market. Success in Ethiopia has not come overnight; in fact it has taken five years. It is a market where we first had to earn trust of the people, demonstrate our technical capacity, establish a presence and finally, in most cases, go through a tender process. With a committed local distributor partner in Hagbes PLC we have navigated through various relationships with NGOs such as EKHC, commercial drillers like KLR and state administrations like Oromia.

Atlas Copco has proven its commitment to developing markets and it is my hope that stories contained in this edition help to motivate other customer centers to stay the course in emerging markets.

**Lorne Hunter**  
Regional General Manager,  
Atlas Copco Eastern Africa Ltd

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**Atlas Copco**

# Focus on Ethiopia

A glance at a map or satellite photo starkly shows what has been causing water problems for Ethiopia: a scarcity of surface water. The land-locked country must get its water from underground sources. But in the difficult rocky soil conditions, wells are few and far between.



To further complicate things, a recent trend toward urbanization has been shifting the nation's water demands onto overburdened municipal wells. Even so, agricultural demand to water crops and livestock continues to rise as the country's farms strive to feed its 80 million-plus population. On all fronts, Ethiopia is urgently pursuing ways to increase its water supply.

While Ethiopia may not have aquifers as plentiful as Northern Africa's countries, it has water. Experts continue to regard accessing groundwater as the best way—in some locations, the only way—to meet water demands. Groundwater has the lowest construction time, least capital outlay, lowest impact on aquifer quality and quantity, and greatest drought resilience.

That means Ethiopia needs dependable equipment to tap aquifers in what is often challenging drilling locations. And Atlas Copco rigs and drilling tools are providing a reliable solution.

Whether they are used by companies working government contracts or by private organizations providing relief services, Atlas Copco drill rigs have been turning the traditional woman's ritual of carrying back a day's water from sources far from home into a nostalgic story to be told by the elderly to their grandchildren.

Drilling rigs such as the T3W water well and T3WDH deep hole water well models, as well as the highly mobile TH10, are hammering out what often tend to be difficult wells in fractured rock conditions. The versatility of the T3W rigs allows drillers to shift from air to rotary as needed. Coupled with well and water-supply education programs and with agreements that give local constituents ownership and care of the wells, the real shortage might only be the pool of skilled drillers.



*Tamireabe Gizawu (Schemes caretaker trainer),  
Teklu Teka (truck driver and assistant driller),  
Shimelis Seid (pump installation technician),  
Tesfaye Tessema (senior hydro-geologist),  
Beyene W/Michael (chief driller)*



# Serving the people

Church group brings water and education to Ethiopian communities



*A drill rig always draws onlookers in Ethiopia where people still must walk to get water for their daily needs.*

**F**ounded in 1927 the Ethiopian Kale Heywet Church (EKHC) has affected many lives through its community programs. Its Integrated Water and Sanitation Program brings water to local communities and educates them with proper sanitation processes.

This program is funded through the church by donors such as Tearfund UK, Tear NL, Evangelische Entwicklungsdinet (EED), Tearfund Australia and Conrad N. Hilton Foundation through Living Water International.

To drill these community wells EKHC's

Hydro-geologist Tesfaye Tessema works with the local government administration and EKHC to establish community development opportunities.

EKHC has owned many drills over the years including its drill of preference, the Atlas Copco TH10 drill rig. They've also purchased an Atlas Copco XRHS 366 compressor to provide the necessary air-flushing power.

In just the year and a half since the TH10 went into operation, the organization has drilled 64 productive wells. Tessema said it's this speed that is the biggest benefit of

the TH10. "The rig is fast-drilling and also mobilizes easily from hole to hole," he said.

Most of the wells drilled in Ethiopia are air-drilled with about 10 percent requiring a mud pump. For drilling with air, the preferred tools are the Atlas Copco QL80 and QL60 down-the-hole hammers with 8.5- (216 mm) or 6.5-inch (165 mm) bit sizes respectively.

Although the XRHS provides up to 20 bar of pressure, Tessema said the depth of holes seldom requires more than 16 bar. The XRHS offers up to 370 L/s (784 cfm) at 20 bar (290 psi) and can be dialed down to provide only the necessary amount of air. »



Ethiopia is a large farming nation, with homesteads that generally look like this.

Tesfaya Tessema was educated as a hydro-geologist. His master's thesis focused on ground water potential evaluation based on GIS and remote sensing techniques in the Bilate River catchment, Ethiopian Rift Valley and the state of the ground water situation in Ethiopia. His paper "Practical Problems In Water Well Drilling And Pumping Test Analysis In Ethiopia" has been published online through the Ethiopian government and is now available at [DeepHoleDriller.com](http://DeepHoleDriller.com).


“The rig is fast-drilling and also mobilizes easily from hole to hole.”

**Tesfaya Tessema**  
Hydro-geologist, Ethiopian Kale Heywet Church

committee formed to maintain the operation of the well and educate the community to its use and benefits. In Africa domestic duties of the household such as fetching water are traditionally considered women's work. Having local ownership means men must also get involved with maintenance of the site.

**Well development**

The process of establishing a well's location starts with the government and the local community establishing need based on population. Normally, Tessema said, they drill a well to serve about 500 people, but in this case the need fit a smaller community of about 100 people. Previously two springs in different directions provided water. Women had walked about 30 minutes to fill their containers with water from them. In dry seasons these springs would dry up to the point that only one source of water existed, and the number of people pulling water from it would increase significantly.

The committee in charge of the well includes trainers, educators, caretakers and organizers who established the well location and will now keep the well in good condition. The government will continue communicating with this group even after completion to ensure the project's success. 

» Driller Beyene W/Michael, who has 20 years drilling experience, likes drilling with the TH10. He said the drill rig is easy to operate, and it takes only a couple days to drill the average 30-meter well. Well depths vary in the Shashemene Oromia Region.

Once the well is drilled, his crew gravel packs the well and moves offsite. Part of EKHC's agreement with the community is that they must provide the sand and concrete to finish off the hydrant.

EKHC's foundation installment crew will finish the site and turn it over to the community. Tessema said paying for sand and concrete is a minor expense but is vital in the sustainability of the project. "The community needs to have ownership of the well," he said.

Ownership consists of the nine-person

**ETHIOPIAN KALE HEYWET CHURCH'S WATER AND SANITATION PROGRAM**

The Integrated Water and Sanitation Program (IWSP) has a rich history starting in the 1920s. The program was formally established in 1985-86. In 1988 a drilling program was added after Samaritan's Purse donated a drill rig.

**Goal:** Sustainable health improvements among the rural communities in Ethiopia. Empower the people to sustain these improvements.

**Objectives:** Improved and sustained hygiene practices, sanitation facilities and safe water supplies established amongst the rural people in Ethiopia.

Drilling water is a part of EKHC's mission but the group also develops surface water by training residents to gather rain water and maintain more shallow, hand-dug wells. Deep wells are drilled with large rigs and have installed pumps for operation, which locals also maintain. Low-cost technology is favored over high-tech. The program educates people on how to handle household waste and teaches basic water hygiene. The program delves into other areas of education such as HIV prevention, domestic animal control and safe food handling that all keep communities more healthy.



# OPPORTUNITIES IN ETHIOPIA

Large agricultural communities need ground water to grow.  
One drilling company is doing that with the T3WDH. »









**Mulgeta Banteyirga**  
KLR Drilling Supervisor

**Fekadu Debalkie Alemayehu**  
KLR General Manager

styles to fit the formations. Then the hole will be drilled to total depth at 12 inches diameter and cased with 8-inch (203 mm) steel casing. The company uses an Atlas Copco QL80 hammer with carbide button bits.

The wells KLR has drilled average a flow rate of 8 gallons per second (30 L/s). In the driest regions in the north of Ethiopia the flow rate can be as low as 4 gallons per second (15 L/s) in these 12-inch (305 mm) wells.

### A joint operation

KLR is owned by Hagbes PLC, Atlas Cop-

co's distributor in Ethiopia. This relationship works well for KLR because Hagbes offers services and maintenance capabilities to the smaller company. Currently Hagbes has three service facilities in Ethiopia, but only one is dedicated to rig maintenance.

Hagbes's Sales and Marketing Manager Abayou Sitotaw said Atlas Copco rigs are larger than other brands commonly sold in Ethiopia. Hagbes supports all brands with tooling and compressor needs, too.

Hagbes Sales Engineer Dejene Adugna said there are lots of companies selling consumables, but Hagbes offers Atlas Copco quality products that customers see as

a value for both reliability and cost. "Often our customers are drilling long distances from population centers. If you're 400 miles (640 km) from Addis Ababa, it's important to have quality," he said.

In addition to maintenance technicians, Hagbes' ownership helps KLR with other professional services such as logistics, procurement and accounting so the company can focus on drilling.

KLR drilling Supervisor Mulgeta Banteyirga said his group has a focused goal—drilling. "We need to concentrate on the target and do what we can. Our goal is to be a successful leader in the drilling business in Ethiopia."

Fekadu defines three types of water wells needed in Ethiopia. First are shallow wells in the 330- to 490-foot (100 to 150 m) range that are mostly hand-pump wells or small, rural wells. These are for private customers, though primarily on government or non-governmental organization contracts.

Second are the mid-sized wells in the 490- to 985-foot (150 to 300 m) range for commercial, agricultural, industrial and municipal use.

Last are deeper wells in the 985- to 2,620-foot (300 to 800 m) range. The deepest municipal water well is a 1,970-foot (600 m) well in Addis Ababa.

Today KLR has many municipal wells on the docket, but the government is looking for large diameter irrigation wells, also.

KLR Operations Manager Ourgie Zeleke, said he doesn't see a slowdown in business anytime soon.

Zeleke is very happy with the operation of the Atlas Copco rigs. He said, "In all the holes we've drilled we've not had a problem with the Atlas Copco rigs. Any issue we've had is minor. The rigs are working great."

Fekadu is happy with the rigs, too, but also with the relationship with Hagbes and with the opportunity for his country. The government offers tax-free operation to drilling companies coming into the country because it's so important to increase drilling. "We need more drillers and having a support system like this is good for our future." ☉

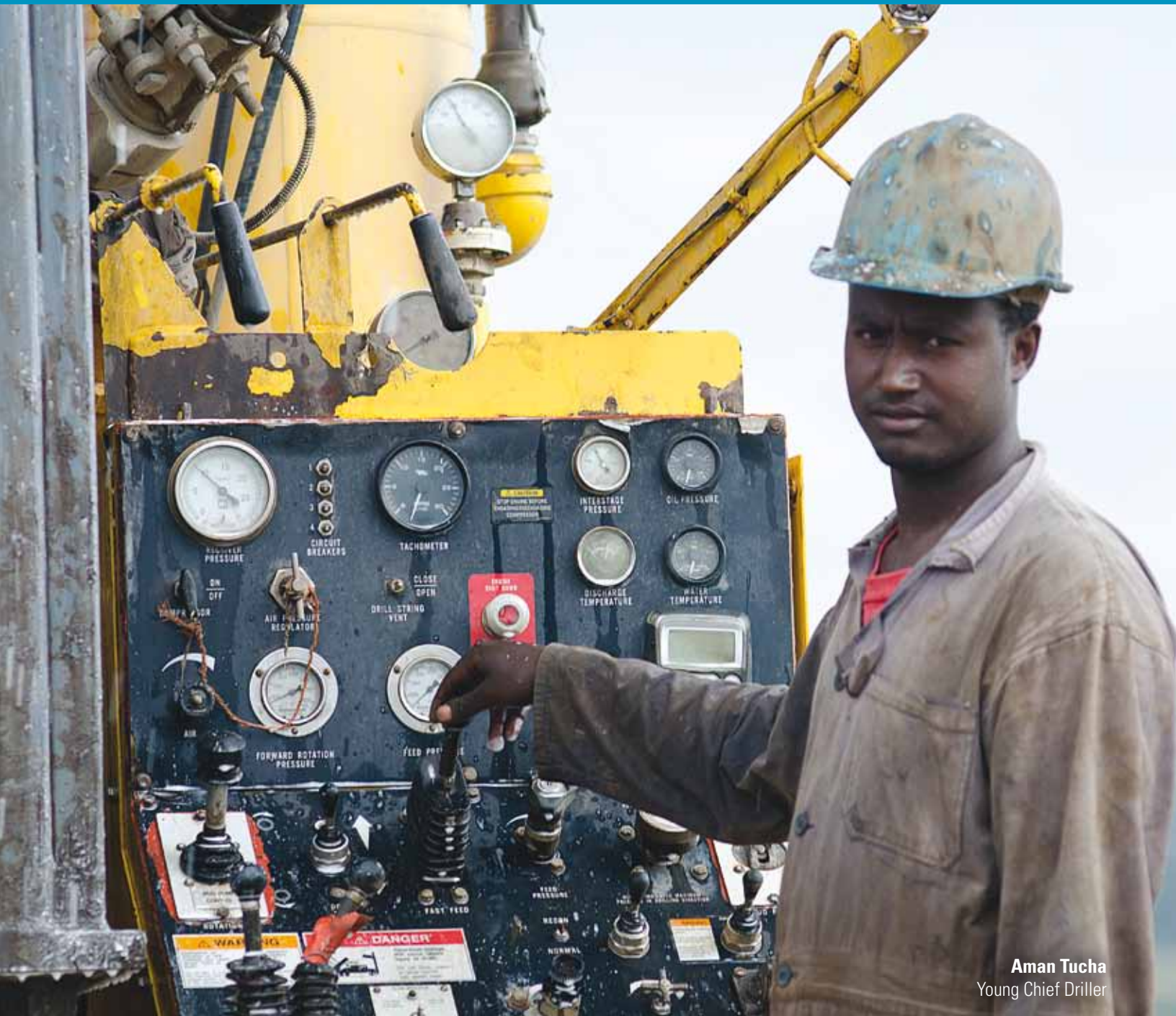


# Filling the gap

Drilling company covers tough jobs in tough territories »

*Crews here use Atlas Copco down-the-hole hammers and a tricone bit when necessary.*





**Aman Tucha**  
Young Chief Driller

» **O**romia Water Works Construction Enterprise (OWWCE) is Ethiopia’s administrative government agency responsible for water projects in the Oromia Region. The region’s topographical picture shows mountains, arid deserts, agricultural plains and eroded ravines. OWWCE uses its Atlas Copco T3W water well rigs to get to the most difficult locations, often where there are no roads, to drill large-diameter water wells.

Drilling in this tumultuous region uncovers a similar variation in geology. Much

of the region is mountainous with fractured shale, basalt and sandstone. The water is generally sourced in the sandstone strata. Ninety percent of the drilling is done by air hammer, but 10 percent is mud drilled in sand, gravel or alluvial sedimentations. A driller has to be alert to formation changes at any time.

Of nearly 240 wells that will be commissioned by Oromia’s regional government this year, 53 will be awarded to OWWCE. The Ethiopian government commissions up to 400 wells annually.

**Understanding the mission**

OWWCE is both a drilling and construction company focused on water projects. Unlike the private, or non-governmental organization, drilling companies in Ethiopia, OWWCE will work a water project from well through delivery.

OWWCE also does large scale commercial projects such as dams and municipal water systems.

Of the more than 2,000 employees, 237 work in the drilling segments of the business. They can have seven drills working



at any one time, but for the deep and large diameter work they use the Atlas Copco T3W rigs. They own one each of the 30,000, 50,000 and 70,000 pound (135, 220, and 311 kN) pullback machines. The rigs use 900 or 1070 cfm, 350 psi (425, 505 L/s, 24 bar) onboard air for all drilling.

The T3W works well for OWWCE because of its mobility in the rough terrain, but also because it has a deck engine. Drilling Manager Kumo Kedir, said they put excessive time on the drive engine, and he doesn't want to overwork the deck engine. Driving

from one site to another could take days. Also, the crew could be sitting over a hole for 10 to 15 days drilling. Having a second engine balances out engine usage.

**Hole construction**

OWWCE often drills with a 21-inch tri-cone bit, cementing with 14-inch casing to 20 feet (6 m). They also use an Atlas Copco



“The wells we drill are often in the most difficult environment or situations”

**Kumo Kedir**  
Drilling Manager, Oromia Water Works Construction Enterprise

» QL80 DTH hammer and 12-inch bit and case with 10-inch steel production casing. They will use a 17-inch tricone to 650 feet (200 m) if the formation or design calls for it.

They occasionally drill a deeper telescoping hole if the conditions call for it. After the 10-inch casing they will continue with an 8-inch bit and case with 6-inch casing.

One hundred percent of the time they use welded casing for strength and integrity of the well.

**Challenging projects**

Of the projects selected for OWWCE, the method to the process is pretty straightforward. They are given jobs directly from the government. Kedir said “The wells we drill are often in the most difficult environments or situations.”

For example, they often work in Oromia lowland areas, including borders of Oromia Somali, Kenya and South Sudan, countries that have been in turmoil and civil war for years. Kedir said the government isn’t able to get contractors to bid on drilling projects near border towns. OWWCE must do those wells. “We go where others won’t. That’s just what we do,” said Kedir.

Formations also present problems for drillers. Drilling in broken formations and boring wells with mud and air drilling requires advanced skills. Kedir said they often get tasked to drill where independent contractors don’t have the skill level necessary. OWWCE’s drillers have years of ex-

perience. The crews literally live with the drill rigs moving the camp from one drill site to the next with the rig.

“We fill the gap,” Kedir said, speaking of their assignments. “We do what others won’t or can’t.”

At the time of this article, the company’s three T3W rigs were all completing wells to 200 meters, drilling 12 inches in diameter. “We often go deeper and drill more complex wells,” said Kedir. ◉



*The increased effort to drill more wells in Ethiopia will mean fewer people have to walk far distances carrying water for their daily needs.*





From left: Dejene Adugna (Sales Engineer, Water Well and Deep Hole Equipment), Sisay Feleke (Sales Engineer, Compressor Technique), Sinshaw Bokoro (Sales Engineer, Portable Energy)



From left: Abayou Sitotaw (Sales & Marketing Manager) and Dejene Adugna (Sales Engineer, Water Well and Deep Hole Equipment)



Atlas Copco Sales & Marketing, After Market and show room staffs

# Hagbes PLC

connects mining and water well drillers to Atlas Copco equipment

As Ethiopia's industrial base has grown, so has Hagbes to support that growth, becoming a leader in consumer retail and business-to-business commerce in the 60 years since its founding. The company sells everything from home furnishings and appliances to trucks and mining and construction equipment. Over the years Atlas Copco mining and construction products, as well as industrial equipment such as compressors, have become a major part of Hagbes' portfolio.

In addition to the water well business that's discussed extensively in this magazine, mining is also important to Ethiopia. The same subterranean formations that cause so much difficulty for water well drillers reveal the opportunity for metals mining. Many large multinational companies are mining metals such as gold and tantalum, in addition to potash for fertilizer and limestone for concrete.

Hagbes' Sales and Marketing Manager Abayou Sitotaw points out the connection

to his customers: "We offer our customers more than just a product. We give them confidence that we will take care of the products we sell. And when they need something Atlas Copco sells, we can offer that," said Abayou.

Atlas Copco products lead the market in many categories including air compressors, underground and surface drilling rigs for mining, and water well rigs. Companies looking to do business in the country know Hagbes can support the equipment they purchase, as well as various aspects of their business.


For sales support the company has eight mechanical engineers, one for each Atlas Copco product line. Hagbes also has an organized aftermarket staff with a manager, two service engineers, a spare parts engineer and six technicians. The office headquartered in Addis Ababa also has full administrative support including logistics and financial.

For parts and consumable support Hag-

bes has not only parts but also a showroom that displays their inventory of consumables such as rock drilling tools, light compaction equipment, construction tools and compressors.

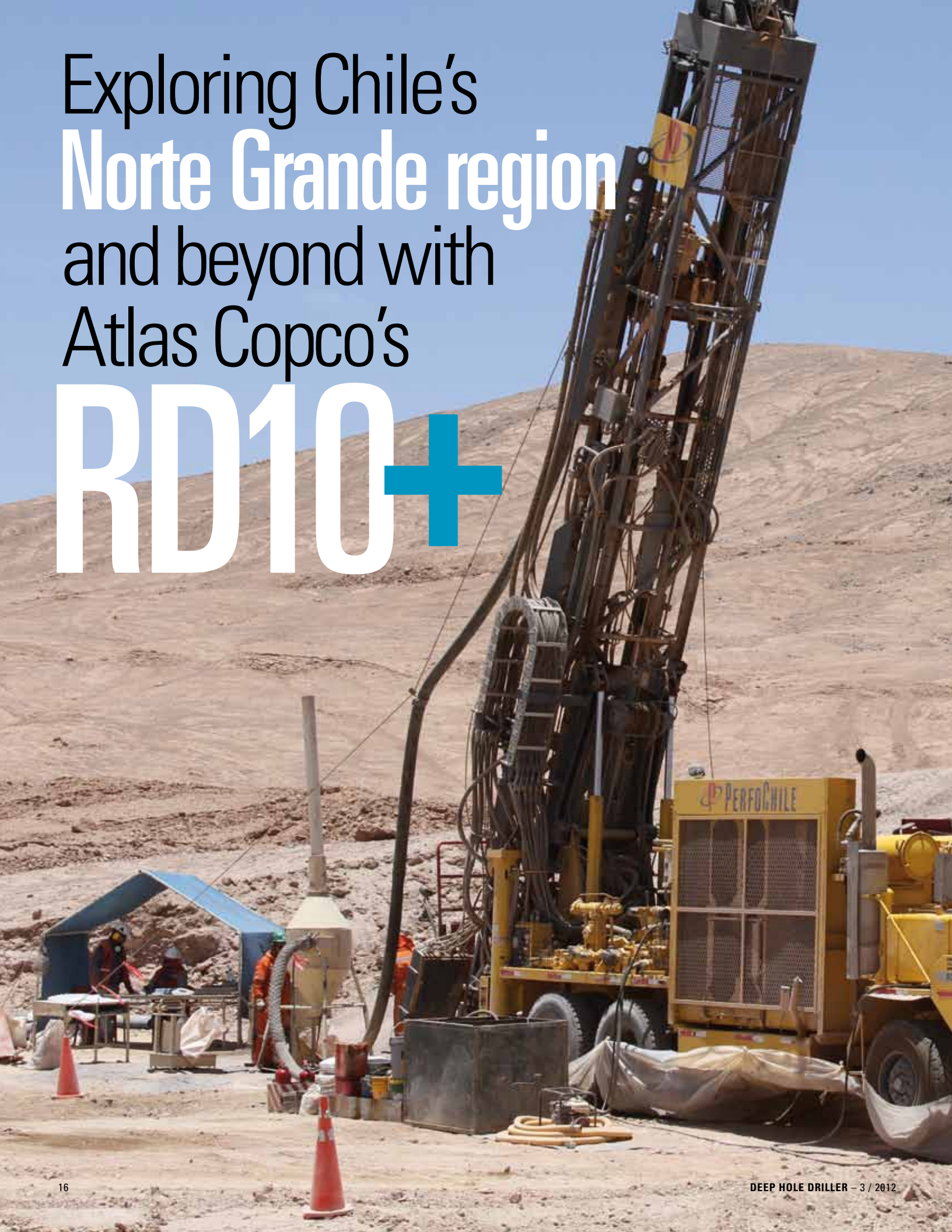
Larger equipment such as paving equipment and drill rigs are inventoried at their staging location.

Hagbes has three service locations. The company can do complete equipment overhauls as well as routine maintenance work.

For companies looking to diversify or expand their business in Ethiopia, Hagbes may be a good business partner. Its professional team is comparable to many Atlas Copco Customer Centers around the world, and what they don't offer in house can be sourced from their support office, the East Africa Atlas Copco customer center. 

Hagbes can be reached at Hagbes Atlas Copco Sales [hagaco@ethionet.et](mailto:hagaco@ethionet.et) or [hagbes@ethionet.et](mailto:hagbes@ethionet.et)

# Exploring Chile's Norte Grande region and beyond with Atlas Copco's RD10+





*Atlas Copco RD10+ is designed for deep hole RC drilling. With a pullback capacity of 100,000 pounds force (445 kN) it can reach deposits 4,000 feet (1,200 m) deep. RD10+ features a 755 hp (563 kW) Cummins diesel engine. Drilling is fast and efficient with torque of 10,000 foot-pounds (13,560 Nm). The derrick allows for drilling angles up to 45 degrees with jacks providing extra stability.*

*The deck engine has an isolated powerpack base that drives the hydraulic gearbox and 1250 cfm at 350 psi (590 L/s at 24 bar) air compressor. The air compressor can be disconnected when it's not needed, saving fuel and component life.*



Chile is a country rich in mineral resources with the mining sector serving as one of the primary forces driving the economy. Known as the copper capital of the world and producing more than one-third of the world's copper supply, Chile also has an abundance of gold, silver, and iron. A number of multi-national companies are active and are always ready to explore new ground to find the next great locale for these precious resources.

That's where companies like PerfoChile come in—independent contractors who provide a number of services that large corporations usually don't perform themselves. In PerfoChile's case, they're in the exploration business, and their rig of choice for the job is Atlas Copco's RD10+.

### **A new business begins**

PerfoChile was founded Sept. 10, 1984 by Osvaldo Carmona Vergara, who was a former mine superintendent just outside of Santiago. After the mine he worked for closed, Carmona Vergara decided to open up his own contracting business. In order to get started, Carmona purchased a T4BH at another closing mine's auction. He had worked with the rubber-tired T4BH blasthole drill in the past and was comfortable and happy with the output the machine offered.

Initially, Carmona Vergara was contracted to drill blastholes for production in large-scale mining. He later decided to specialize in reverse circulation (RC) air drilling and diamond core drilling in mines.

Now PerfoChile is known for RC air drilling, blasthole drilling, and service work with shops based in Santiago, Antofagasta and Pozo Almonte. Most of the company's contracting jobs are in northern Chile and they've drilled more than 23 million feet (7 million meters) since Carmona Vergara started the business nearly 30 years ago.

### **Visit to Garland, Texas**

In October 2012, PerfoChile's Operation Manager Osvaldo Carmona Morales, son of Carmona Vergara, and Business Development Manager Eduardo Eguillor visited the Atlas Copco factory in Garland, Texas, USA to

check on the status of their new RD10+ that would be ready for shipment by the end of 2012.

Carmona Morales recalls his father's trip to Garland back in 2000: "When my father wanted another T4WC, he came here and talked to Ron Buell, former Deep Hole Product Manager." At the time, Carmona Vergara was looking for something a little more versatile that could drill deeper than the T4WC.

During that same trip to Texas, Carmona Vergara looked at a prototype of the RD10+. "So they had this prototype—the RD10+. He came back to Santiago and he said he bought that rig, and we said, 'You can never go back again,'" Carmona Morales laughed.

That was PerfoChile's first RD10+, which was built by Ingersoll Rand. When the Ingersoll Rand Drilling Solutions division was acquired by Atlas Copco in 2004, many of the customers remained, as was the case for PerfoChile. Their second and third RD10+ purchases came in September 2005 and February 2009. In addition to their fleet of RD10+ rigs, PerfoChile also has three T4BH rigs, and one T5BH. All these drills are used for exploratory and production drilling contract jobs.

The majority of contractors in Chile are focused on core drilling, which is a much slower process than RC drilling. The two methods are similar, but have differences. The speed of RC is ideal for the early phases of exploration. RC method also tends to be more cost effective than core drilling simply because of the time spent drilling.

PerfoChile typically drills between 1,000 to 2,300 feet (300 to 700 m) depth for their customers. Every job is different, and depending on the terrain drillers may have to drill different depths for each hole. With exploration drilling there's no defined drill pattern. Carmona Morales said, "Sometimes the holes will be 1 kilometer apart, others 500 meters apart, and some can be much closer. It's wherever the geologist decides."

PerfoChile is not in the business of analyzing the samples. "We drill the hole, but the customers take care of the samples," Carmona Morales said. The drillers are often aware of what's been found in the sample, but discussing the findings of each hole is not allowed. »



» **Exploring northern Chile and beyond**

According to Carmona Morales, the RD10+ has at least 90 percent availability and typically performs at a higher level. “We prepare the rig before the job, and if something were to happen to the rig we’d put all of our resources into that rig to get it running again,” said Carmona Morales.

With a three-man crew consisting of one driller and two drill helpers, PerfoChile works three shifts per location, including a relief shift. Typically each shift includes time for breaks, set-up and maintenance.

Most jobs consist of eight to 10 holes, typically drilling a total of 1,000 feet (3,000 m) per month. On average each hole will be about 400 meters deep. Carmona Morales said they even hit a total of 16,400 feet (5,000 m) in one month for a customer who needed 10 holes drilled to a depth of approximately 1,640 feet (500 m). How quickly and smoothly a job will be in a given location depends on the ground and rock conditions.

Each hole is typically 5 ¾ inches (146 mm) in diameter using a down-the-hole, RC hammer drilling method. Atlas Copco’s RD10+ is a hydraulic top-head drive drill that produces 100,000 pounds force of pullback (445 kN) and 10,000 foot-pounds (13,560 Nm) of torque.

A great majority of Chile’s mining takes

place in the Norte Grande (Big North, Far North) region, bordering Peru to the north, and the Atacama Desert. The Atacama Desert is a 600-mile (1,000 km) stretch of the driest desert in the world located in northern Chile along the Pacific Ocean. Average rainfall per year in this region is 0.04 inches (1 mm).

Working in rugged, remote locations requires PerfoChile to set up camp for each job.

**Built to last**

The compact design of the RD10+ is a big benefit for working in remote locations, according to Carmona Morales. “We can go to the mountains and you need a big space to drill deep holes. It’s compact. You can move on the freeways, the highways.” Carmona Morales continued, “Our country is very, very long so sometimes you need to drive 1,400 kilometers (900 miles) from Santiago to another city.”

With inevitable travel between jobs, the ability to go anywhere at anytime without a great deal of support along the way is crucial. It takes approximately three truck loads on average to move from site to site.

“We use one compressor and booster, a truck for rods, and another truck for fuel. We use trailers for a camp, too,” said Carmona Morales.

*(above) Carmona Morales visited the Atlas Copco Drilling Solutions factory in Garland, Texas, USA.*

*(right) Product Line Manger Alex Grant (left) discusses some of the features of Carmona Morales’ new RD10+.*

Throughout South America and around the globe, PerfoChile drillers have become expert RD10+ operators. Some of them helped with the setup and training of an RD10+ that was shipped to a customer in Brazil. Actions like this show the strong relationship between PerfoChile and Atlas Copco.

PerfoChile has been well-known in Chile as an expert in RC drilling for years. Eguillor said, “We’re a way to show that this rig is working and working good. There’s a lot of continuity, confidence, and loyalty between what was Ingersoll Rand and what’s now Atlas Copco,” continued Eguillor. It’s the confidence Atlas Copco and PerfoChile have in each other today that ensures they will continue as partners well into the future. ☉



## RC DRILLING EXPLAINED

**R**everse Circulation is most commonly used to obtain information from a large ore body where minerals are not concentrated in narrow veins. Flushing occurs at the hole collar in the annular space of a double-tubed drill string and is pushed to the bottom of the hole, flushing up the cuttings through the inner tube. Once drill cuttings reach the surface, they're sampled.

For many companies, even when they plan to take conventional core samples, starting with RC drilling is preferred because of the cost and time savings it offers. Cost and time savings are especially significant when pre-collaring a deep hole is required to reach the ore body.

Upon meeting the ore body, the driller or customer will decide whether to continue using the RC method of drilling or begin diamond core drilling, switching from evaluating extracted chips to studying retrieved cores. The choice can depend on the geologist's preference for chip samples or solid cylindrical cores. However, as time and technology advance, many geologists are coming to believe that chips are just as reliable as core sampling.

# Decision depth



QLX offers driller ultimate flexibility and longevity for deep water well drilling

**B**ob Wade Drilling based in Bentonville, Ark., is a three-man operation consisting of Bob Wade Sr., his son “Bob Jr.,” and 21-year veteran driller Ed MaGelky.

Bob Wade said they have just had their best fall and winter since the recession began where Bob Wade said most residential wells are completed by 600 feet (180 m). That takes them to the reservoir that lies below a 100-foot layer of St. Petersburg Sandstone down in porous limestone, whose larger chip profiles can look like a petrified sponge. The company keeps its rig outfitted to go deeper, though. If a customer’s required flow has not been reached by 800 feet, which Wade calls “decision depth,” the next step is to head for the Roubidoux Formation at 1,100 to 1,500 feet (330 to 457 m), a dolomite, quartz sandstone and chert formation that extends eastward across northern Arkansas’ Ozark aquifer.

Tapping the Roubidoux amplifies the volume that reaches the pump. Pumps can usually be suspended somewhere before decision depth. This saves well owners the cost of heavier gauged pipe to support the pump and the additional length of pipe and wiring that would be required to reach it.

Bob Wade saves drilling time by not having to trip out to reset for drilling past decision depth—that is, at least not since he got an Atlas Copco Secoroc QLX 60. He said it’s the only hammer that lets him go to the Roubidoux this easily.

*Bob Wade isn’t ready for this new Atlas Copco Secoroc QLX 60. Nearly a year and a half of drilling up to 130,000 feet with his first one, he has not rebuilt it nor repaired it. He hasn’t even flipped the reversible case yet.*

(right) Driller Ed MaGelky, Bob Wade Jr. and owner Bob Wade Sr. said the Atlas Copco Secoroc QLX 60 hammer gets them to the Roubidoux with confidence. They can run 1,250 cfm to clear the hole of water to reach depths in the famous Arkansas aquifer that no other hammer has gotten them close to.

(bottom right) MaGelky displays a piece of the aquifer's porous rock. "Some people have the notion we drill until we hit a hole full of water, but it's rock with little holes in it or fractures within the limestone formation, like this."

### Proven results

Bob Wade gestured toward a neighboring chicken farm where he drilled wells for watering the chickens and maintaining sufficient operation of the chillers that keep them from overheating. Going deep for the Roubidoux raised 120 gpm (450 lpm) from what had been just 15 gpm (56.8 lpm) nearer the surface. Tapping the Roubidoux for a hospital project in Siloam Springs, Ark., produced 150 gpm (568 lpm). The two wells of the Crystal Bridges museum project in Bentonville, Ark., got 180 (680 lpm) and more than 200 gpm (760 lpm) at 1,177 feet (360 m).

Tim Beaman of Venture Drilling, the authorized Atlas Copco distributor whom Wade calls on for hammers and bits, believed Wade would find the QLX 60 the best hammer for his needs. The QLX series combines the air flow choke tubes of the QL hammer design with that of the Air Select feature, in addition to other design upgrades, such as a smaller, less bulky back-head, new radial alignment of the air select guide to the casing inner diameter, and a new tail seal design. "I brought it to him on a snow-covered site on a cold, 24-degree (minus 4 C) January day in 2011. We sent the first stick down in only 10 minutes."

Beaman said of Bob Wade, "He's an intelligent driller who knows exactly what he needs his equipment to do, and he wants you to get him there. That's where Venture comes in. We help get him there."

The hammer had already seen steady use for more than 15 months and was now at 659 feet (201 m) on this project near Rogers, Ark. MaGelky and Bob Jr. were misting at 2 to 3 gpm to cool the air and components, control dust, aid with clearing the hole and help lubricate the hammer. They



hit consolidated rock at 8 feet (2.5 m) and cased the hole to 42 feet (13 m).

Since the flow was only 6 gpm (23 lpm) with a customer requirement for 12 gpm (45 lpm), Wade bet his crew would be going to the Roubidoux on this one. As always, their 425 cfm (201 l/s) auxiliary compressor was tied to the drill rig's 425 cfm compressor. "Two compressors will get you to decision depth okay," said Wade. "Past that, we put on a third compressor."

Neither Beaman nor Bob Wade had an exact count, but drilling up to 130 wells a year, they estimated the drill feet on the hammer might be over 130,000 feet (39,600 m) at this point. It has not been rebuilt, it has not had to be repaired, and although the QLX 60 has a reversible casing, >>





(above) Driller Ed MaGelky, Venture Drilling Sales Manager Tim Beaman, owner Bob Wade Sr. and his son Bob Wade Jr.

(right) MaGelky holds up two of the more intact chips of abrasive bright white sandstone he encounters anywhere he drills in the forty mile radius of the company's typical range. The crew shovels the finely ground sandstone under the rig or trailer because it clings to boots, drillstring and here, MaGelky's hand.



» it has not yet been flipped. Wade said it has given him no problems at all.

It isn't that the hammer has been given light duty. The formation Wade Drilling routinely works in includes a 100-foot (30.5 m) layer of brilliantly white sandstone that comes up as abrasive grit. MaGelky and Bob Jr. immediately shovel it out of the way when it comes up because it tends to stick to everything, looking like bits of bright Cream of Wheat on the drill string and their boots.

At this location they had cut through the white sandstone and continued on, reaching a 20-foot (6 m) seam of Chattanooga Shale at 428 feet (130 m) then entering the porous limestone of the upper reservoir. It is a stratification that the Wade Drilling crew anticipates, watching the familiar colors of the cuttings change and remaining alert to the tell-tale sounds and vibrations of the drill string and rig.

At decision depth the crew will quickly connect the third 425 cfm (201 l/s) auxiliary compressor and continue drilling from there on at 1,275 cfm (590 l/s). They lose no time because the QLX 60 preset at Air Select position 5 works as well with 850 cfm (413 l/s) from two compressors it does with 1,275 from three. This setting diverts more than

enough volume from the air stream to clear the hole. Bob Jr. said, "You can get even more than that if you pull out the choke."

Beaman said, "You could easily send a stacked column of water up over the mast if you wanted to."

Wade said he has tried a lot of manufacturers's hammers, and he's had tremendous back pressure then and hammers watered out. He just couldn't reach the Roubidoux with them. "If there is a hammer that can match the QLX 60, I haven't heard of it. Others plagued us. They're all good at the surface, but when they get to water at 30 to 50 gpm (114 to 190 lpm), drilling suffers. Joints that take 15 minutes at the surface take 45 or 60 minutes then. Pressures build up to almost 600 psi (41 bar). With the QLX we keep it in the 400 psi (27.5 bar) range and keep right on drilling."

Wade mentioned it wasn't just hammers that had given him problems. Six years ago he had been trying another manufacturer's bits when he encountered quality issues. "They were consistently breaking out carbides," he said. "Once I switched to Atlas Copco, the quality issue stopped. Never lost carbides like that again."

For every water well Wade suspects he

might have to go to the Roubidoux on, he begins with a fresh bit. He said he routinely gets 2,500 feet (762 m) on one. He doesn't let them go to waste, though. "I re-sharpen them at 2,500 feet and then get another 1,500 feet (460 m) from them. Some I even touch up a third time for use in shallow wells."

Beaman had a brand new QLX 60 in his truck bed. Wade and his crew joked that Beaman needed to leave it with them. Beaman laughed as he yelled back, "You have to wear that one out first!"

Even with a project calendar as full as Wade Drilling's, and given the demands of their well bores, Beaman said there's no sign Bob Wade Drilling will be needing that new hammer any time soon. ☺

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



**Atlas Copco TH60/2001** sn:6661



Location: Milwaukee, WI  
Tower: 38 ft.  
Drill Engine: CAT C10, 490 hp  
Drill Hours: 15,462  
Compressor: 825 cfm / 350 psi



**Atlas Copco TH60/1998** sn:6353



Location: Milwaukee, WI  
Tower: 32 ft.  
Drill Engine: Cummins N14, 435 hp  
Drill Hours: 13,192  
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

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