

DEEP HOLE DRILLER

AN ATLAS COPCO PUBLICATION FOR THE DRILLING PROFESSIONAL — NO. 1 / 2013

Lightweight, agile **TH60**



Tapping into a
hot market

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RD20 XC fills
the gap for
Apex Drilling

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T2W and
Secoroc hammer
for city wells

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Atlas Copco

EDITORIAL



After 12 years working for Atlas Copco's Rock Drilling Tools division and almost three years as the General Manager in the South African sales company, I am delighted to have joined Atlas Copco's Drilling Solutions division to begin work as Vice President of Marketing for the deep-hole product line.

I am really excited about this new opportunity and trust that the combined efforts of our engineering and marketing teams will help us to continue developing the deephole product line into a sustainable business within Atlas Copco.

Over the next few months we plan to visit customers around the world and have meetings with key people within Atlas Copco to really understand what our customers' expectations are. We have already planned our first strategic review of the business and the focus will be to understand where we are today and to start talking about the future.

I am also excited about the possible synergies we can extract from the larger Atlas Copco organization, specifically with our colleagues involved with rock drilling tools. Over the next few months we will contact our key customers and sales companies to discuss the deephole business. I'm looking forward to working with each of you over the next few years.

Jaco van der Merwe
Vice President Marketing Deephole

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Atlas Copco

Take it from the top

Apex Drilling's TH60 grants greater accessibility, punches 8,200 feet in first six weeks »

(page 3) Apex driller Andy Johnson has the TH60 rigged up along what will be a new residence's driveway in the Crystal Mountain subdivision of Round Mountain, Texas. Apex has completed 50 wells in the neighborhood over the last 13 years with about 20 more to drill.

The good driving characteristics of a lighter, single engine rig and its more compact size help Apex reach its clients even in tight rural settings such as this residential water well installation. Johnson said, "We just couldn't do before what we can do now."

Apex driller Andy Johnson talked about how the new Atlas Copco TH60 drills compared to the T3W he was used to. Among the few differences Johnson noted was that the T3W had its fastest feed rate geared for returning to the bottom, while the TH60 had a faster feed rate coming up.



» **A**fter five years working as a geologist and wireline engineer overseas as far away as Indonesia, Mike Becker set his sights on Hill Country in Central Texas.

"There's a lot going on here geologically with seven to eight major and minor aquifers." He explained the Llano Uplift, the pre-Cambrian granite in the western portion of Texas Hill Country, describing the mathematical wizardry of hydrologists here, who do drawdown testing and complex formulas for each water district to determine the ultimate impact on the underlying aquifers.

In 1999 Becker established Apex Drilling, a water well specialist and pump service, 45 miles northwest of Austin in Marble Falls. A Texas Tech graduate with an oil field background, Becker chose the name Apex (the top or peak), which represented the expectations he had for his water well business. Andrew Johnson has been with

him since the beginning as driller and pump installer. Andy's brother Robert joined them shortly after and now runs the pump services side of the company. In those first years, Becker said, they worked from dawn to dusk. "Central Texas was just booming in 1999," Becker said.

One of their first rigs was an Ingersoll Rand T4. Since then they have only had to make a couple of rig choices to dial in which rig works best for their operations. In 2004 they traded in the T4 for a 1999 T3W. "The T4 was just too big for us, both regarding jobsite access and in the cost of running it. The T3W was much more economical."

In February 2013 Apex Drilling traded the T3W in with 9,980 hours on it for an Atlas Copco TH60 packaged with all the options from Venture Drilling in Georgetown, Texas, an authorized Atlas Copco distributor serving a seven-state area from three lo-

cations. Johnson said it took a little getting used to for him, but he really likes the rig. Double-checking his logs, he said in the first six weeks they had drilled 28 wells with it, logging 8,200 drill feet.

Johnson explained the differences: "The engine is much quieter. It just has one. And everything is electronic. There are so many more solenoids, valves. It took some getting used to, but I actually like it better. It's easier to run and easier to drive on the highway."

Johnson added, "It has more power." The TH60 engine generates up to 600 hp (477 kW) and is rated for 40,000 pounds pullback with a 18,000-pound single line winch.

"And the feed rate is just the opposite from the T3W," Johnson said. "On the T3W, it's faster down. The TH60 is faster up."

Atlas Copco had inverted the cylinder so the larger side of the piston would be used for pullback force. The cylinder now ap- »



Andy Johnson knows he's hit the "good stuff" when the water starts to come up pink. The best quality and quantity of water lies in this part of the formation. The coloring is temporary, caused by the fines and chips being made during drilling operations.



» plies more pullback force with the same hydraulic pressure as before. By increasing hydraulic pump flow to the cylinders, the TH60 maximum fast-feed speed is now up to 150 feet per minute (45.5 m/min.).

Johnson also noted the T3W rig's weight was greater because of its extra engine. "In some places, we just weren't able to gain access as easily as we can with the TH60. And I think we just couldn't do before what we can do now."

Crystal Mountain

On this day Johnson was on site at a new home being built in Crystal Mountain, a residential subdivision of Round Mountain, which is 35 miles west of Austin. The water below is in the vast karst system of the Ellenburger Formation, which dips southeast toward Austin. The karst was formed from carbonate deposits that built up during the Ordovician period more than 440 million years ago, back when Texas was a shallow water ocean and the equator ran across Northern Canada.

Texas regulations require water wells to be cemented for the first 10 feet of an 8-inch hole, which Apex would generally continue from with a 6.5-inch drag bit in gray/white limestone. However this water district calls for additional grouting to 50 feet. Apex then continued to 100 feet with the drag bit, switching at that point to a 6-inch Atlas Copco Secoroc QL 60 hammer with Atlas Copco 6.125-inch concave spherical

button bit.

The water here is found in fractures within the dolomitic limestone. "Hit a fracture, there's water," Johnson said. "I'll hit several of them. I log them so when we set casing, I know where the best place to put the screen is."

Johnson was finding the first fracture between 172 and 190 feet (52 to 58 m). That first fracture at this jobsite was producing only about 2 to 2.5 gpm. As he encountered it, the drill string stuttered for a couple of revolutions. "It really grabs at the bit," he said.

Johnson was adding water at a half gallon a minute. "You have to add the water. There's a dry, silty clay that likes to blow up in a big cloud of dust. So we keep it wet the whole way. Plus it helps to keep the hammer and bit cool."

Johnson kept his eye on the cuttings, pointing to the discharge as it turned pink. Tan chips were okay, too, but Apex had learned to associate pink cuttings here with the highest water quantity.

Johnson continued on to 400 feet total depth. As the hole was being cased to the bottom with 20-foot lengths of 5-inch OD (4.5 ID) PVC, he set the factory-slot-



The rock here is mostly dolomitic limestone, some of which comes up as larger chips like the fragments shown here as the bit makes its way through several large water-producing fractures.

ted PVC SDR17 screen at around 300 feet where a fracture was producing up to 17 gallons per minute. Becker said they'd seen bores in this formation produce anywhere from 3 to 60 gpm.

Becker said they average 200 to 250 wells a year, with most of their upcoming jobs between Austin and San Antonio. Apex at times goes as far as 150 miles in its range, but generally jobs are within an 80-mile radius. Since drilling its first wells at Crystal Mountain, Apex has already completed 50 or so for the community, with 20 more to do this year. ☉

Read on about the RD20 XC and its xtra capabilities— from Australia to Texas

The RD20 is highly mobile, rapid to rig up and flexible enough to adapt to almost any location’s requirements. The patented, carriage feed system and detached-table design provide exceptional performance and economy, as well as the structural strength to handle the toughest drilling conditions.

Features and Capabilities	RD20	RD20 XC
120 000 lb (54.4 tonnes)	x	xc
8 000 lbf-ft (10.8 kNm)	x	xc
1 250 cfm / 350 psi (590 Lps / 24.1 bar) compressor on board	x	xc
755 hp (563 kW)	x	xc
125° F (52° C)	x	xc
2 7/8 to 4 1/2 in (73 to 114 mm) upset oil field drill pipe		xc
4 1/2 to 8 in (114 to 203 mm) oil field drill collars		xc
Hydraulic links and elevators on top drive		xc
Hydraulic slips in 17 1/2 in (445 mm) master bushing		xc
Hydraulic make up and break out wrenches		xc
3 000 psi (206.8 bar) mud piping		xc
Nonincendive switches in console		xc
High-Intensity lighting		xc



Top Drive with Elevator Links

A mounting assembly for the links is secured to the top-drive case. Rated for 120,000 lb (54 tonnes)—plus a safety factor—this design enables the links to tip in/out to handle pipe, collars and casing. Cylinders attach to the mounting assembly and each link to tip the links out from hole center and back. The spindle sub includes a floating sub and saver sub. The hydraulic elevators open/close and lock, with cylinders mounted on the elevators. A dual-caliper spindle brake is available for directional drilling. Virtually hands-free pipe handling is easy, from trailer, tubs, v-door or automated pipe loader.



Table and Slips

The standard RD20 table assembly has been lowered 12 in (305 mm) to make additional working space for the elevator system and breakout wrenches. The table has a 26 in (660 mm) opening and is fitted with a 17 1/2 in (445 mm) master bushing and hydraulic slip assembly. This table assembly is a strong, solid base that is supported on all sides to handle tough drilling loads.



Air / Mud Piping

Redesigned RD20 XC mud piping accommodates higher pressures. The air manifold handles auxiliary compressors and a booster system. The main air valve and blow-down valve actuate from the driller’s console. Includes connections for water injection and DHD lubricator. The mud piping is set up for a wide range of oil field mud systems. Includes a manual gate valve, a connection and valve for a mixer line with a heavy-duty mud gauge. Air and mud connections are at the side of the deck for easy access.



Wrenches

The table assembly includes two heavy-duty pedestal mounts on the helper’s side to mount a hydraulic make-up and break-out wrench. Both pedestals are height adjustable—up to 13 in (330 mm) with pin holes every 2 in (51 mm)—to accommodate a wide range of pipe and collar sizes. Both wrenches are heavy-duty chain-type that are adjustable to fit a range of diameters, and are hydraulically activated. The wrenches can be turned over to reverse their function. Both wrenches are individually activated from the driller’s console.

Tapping into a *hot* market

Geothermal drilling in Australia puts RD20 deep hole drilling rigs to use outside the oil and gas market

The drill rig making a name for itself on Queensland's gas-rich Bowen and Surat basins in eastern Australia is now being deployed on a different, deeper errand in the west. If all goes well, JSW Australia's Tim Westcott thinks the company's new Atlas Copco RD20 XC high-powered compact, hydraulic top-drive rig will have plenty of work in the geothermal industry—with future coal seam gas targets not out of the question.

For now Westcott is focusing on geothermal energy, in particular the sedimentary formations about 3,300 feet (1,000 meters) below Hale School in the Perth western suburb of Wembley Downs. Many schools, municipalities and private residences across Australia are using geothermal technology with heat pumps, or heat exchangers, to both heat and cool buildings. In the case of Hale School, geothermal energy will heat the swimming pool.

JSW has just started drilling the first pilot hole at Hale School to assess temperatures and the geothermal potential of the Yarragadee aquifer beneath the school ground. Hale will join a number of other metropolitan schools, including St. Hilda's and Christ Church Grammar, in adopting geothermal for swimming pool heating.

Year-round use of the pool at minimal energy costs and with minimal CO₂ emissions—at a time when state electricity tariffs »





» continue to climb and environmental impact becomes a major concern—is the principal benefit of the project. One of the state’s oldest independent schools for boys, Hale’s current campus is located on a 48-hectare site about 8 miles (13 km) northwest of Perth and a mile from the coast.

The project consists of constructing a deep geothermal bore to procure warm water for the system’s heat exchangers. Once the heat has been extracted from the earth’s water for pool heating, the cooled water will be reinjected back into a shallower part of the aquifer via an injection bore. JSW has been contracted to drill, construct and test both deep bores in a four-month timeframe.

The deep drilling requirements of the rising trend of geothermal energy in Australia is buoying the prospects of companies like JSW.

JSW was formed from the March 2010 management buy-out from Ausdrill-Brandrill of the original Strange Drilling business established as a single-rig operation in 1996. JSW’s board and management team, including former Brandrill managing director Jeff Branson, have more than 500 years of collective drilling-related experience.

Already JSW’s 120-person workforce at its fully equipped workshops in Perth, Kalgoorlie, Boddington and Port Hedland enable the company to maintain an expand-



TIM WESCOTT

ing fleet of machinery to high standards.

“We’ve come from being a business that was almost purely mining-related to now operating significant projects in water well and also geothermal activity,” said Westcott, JSW’s veteran water well division boss.

The RD20 XC unit joins three Atlas Copco TH60 water well drills in JSW’s fleet. The TH60 was a proven, versatile rig with its single-engine power source generating

“We’re looking for some success with the rig to promote awareness of its capabilities. There’s certainly no shortage of potential applications for it.”

David Luke

Water well/oil and gas product manager for Atlas Copco Drilling Solutions

up to 550 hp (410 kW) and reducing overall rig weight and improving weight balance. The rig can be set up to handle pullback ranges from 40,000 to 70,000 pounds.

A strong relationship between Atlas Copco and drilling contractor forged during Jeff Branson’s time at Brandrill’s helm and has continued on into his latest venture. It has been a partnership built around not only highly productive equipment but also





the machine supplier's extensive investment in support and service levels around the country.

Arguably the world's most successful shallow oil and gas rig in the 120,000-pound (53 tonne) class, the RD20 has become a fixture on Queensland's coal basins, where coal seam gas drilling has rapidly grown in recent years. More than 250 RD20 drilling rigs are operating worldwide.

Westcott said the highly mobile rig with its rapid set-up capability is flexible enough to adapt to almost any location.

It has a patented carriage feed system and detached-table design for exceptional performance and economy. The table can handle up to a 30-inch drill casing. Overall it has the structural strength to handle tough drilling conditions.

"It's a very good machine," Westcott said.

"You can run Range 3 gear on it. It's got plenty of power at 120,000 pounds of pull-back, so you're good for 3,900- to 4,920-foot (1,200 to 1,500 m) holes. It'll do us for just about everything we want to do at this stage.

"It's obviously a popular rig when you look at all the coal seam gas stuff occurring over east. I'm sure there is going to be scope for that over here, too, at some stage. This rig fits the bill for that type of drilling as well, so it fits with our future direction in that perspective, too."

David Luke, water well/oil and gas product manager for Atlas Copco Drilling Solu-

tions, said JSW's rapid growth had spurred orders for three TH60s and the RD20 XC over the past year or so.

"The RD20 has built a good following over east," Luke said.

"We're looking for some success with the rig here to promote awareness of its capabilities. There's certainly no shortage of potential applications for it."

Westcott has been doing this sort of work around Australia for 30 years or so.

"This (Hale school) sort of project has become fairly commonplace so it's proven technology, so to speak," he said.

"Once the hole is logged, Rockwater [consulting hydro-geologists] works out the depth to set the screens—that's probably the most crucial part of the project."

"The drilling will take three to four months. Then there's the construction side—the pool and the heat exchanger, etc.—which is not handled by us."

Westcott has seen similar projects undertaken in WA, including test work at Kalgoorlie where JSW also has operations. "I'm thinking that geothermal drilling activity is going to keep going for a while," he said.

Geothermal use increases

CSIRO, a government-funded Australian agency, has recently begun construction of a bore-field to supply cool water for the cooling of the new Pawsey Centre supercomputer at the Australian Resources Research Centre in the Perth suburb of Kensington.

The Pawsey Centre supercomputer, expected to be completed later this year, will be one of the world's most powerful computers for the Square Kilometre Array telescope located in Western Australia.

The geothermal cooling project will use heat exchanger technology, with cool water passing through and cooling the building.

The warmed water will then be reinjected back into the aquifer. Savings of up to 10 million gallons (38 million L) of water each year are anticipated with the use of geothermal compared to a standard cooling tower solution.

A leading UWA geothermal scientist, Winthrop Professor Klaus Regenauer-Lieb, said recently that the Perth Basin under the Swan Coast Plain had the ideal geological settings to aim for the goal of "a zero emissions geothermal city."

"The new CSIRO Geothermal project will help to establish Perth as the first geothermally cooled city, and we will work to advance the geothermal industry to make this vision a reality," the WA Mines and Petroleum Minister Norman Moore said. ☉



JEFF BRANSON

Beach baby

RD20 III XC proves how it fills the gap in Carizzo sand

(Left to right) James Forehand, manager of Water Well Services; Leo Quintanilla and Hector Quintanilla, co-owners of Water Well Services; and Brad West, President/CEO of Quintanilla Management Co. Photo by Leon Zabava / Pleasanton Express





The Atlas Copco RD20 III XC is a big rig. With a 755 hp engine, 120,000 pounds of pullback and equipped with bails and a hydraulically activated elevator for oil field pipe, it's a self-contained mobile deep hole drilling rig designed for hard duty in the oil patch.

Yet the RD20 XC is the smallest rig in the fleet for Water Well Services Inc. in Pleasanton, Texas, whose next smallest drill is a double jackknife rig that takes 18 flatbed trailer loads to mobilize and a week on site to drill a one-day hole. The range III RD20 rig's XC designation stands for "Xtra Capabilities" and that's exactly why Water Well Services wanted it.

Boom time investment

James Forehand, vice president of Water Well Services, said the company is investing in equipment for the future, buying rigs that will fill any gaps in their fleet's market range.

Water Well Services' bread and butter jobs have been drilling water for some of the major oil producing companies. Forehand explained, "In the deeper drilling market, we don't have as much competition. What is a shallow drilling job for us is right at maximum depth for most of the truck-mounted water well rigs."

“The RD20 offers safety. Other water well drilling companies can't compete.”

James Forehand

Vice President of Water Well Services

But when it comes to some of the municipal jobs, it can be tough to bid competitively without a truck-mounted rig, he said. So Water Well Services purchased its RD20 XC at the end of 2012 as an investment for the future, increasing its capabilities in several ways.

First, Forehand said, the RD20 XC is compact enough to get them in the tight spaces of many municipal water well jobsites: "You can back this RD20 up in a 200-square-foot space and go to work."

Yet the RD20 is no one-trick pony. Water Well Services can also use it for some of its agricultural irrigation projects and to support development and production of its

Richard Bartosh, drilling superintendent for Water Well Services Inc., discusses with his sales representative from of Venture Drilling Supply how the RD20 III XC performed drilling a 450-foot, 17.5-inch diameter well on the Carizzo-Wilcox aquifer 30 miles south of San Antonio.

Eagle Ford Oil Field customers' oil wells. And buying a rig capable of working in the oil patch should have a huge payoff if a March University of Texas study proves true. The study announced that while in this region there were currently 5,400 permitted oil wells, the area should see more than 24,000 wells permitted over the next 10 years.

Forehand explained that all oil well developers and producers need water to drill and for hydraulic fracturing.

"In this region almost every oil well you drill, you will drill a water well," Forehand said. While there is very little surface water in the area, ground water here is plentiful. »



This Atlas Copco file photo shows the ease of pipe handling with the RD20 XC.

» The RD20 gives them a respectable advantage with their oil field customers, especially for its modernized safety features.

Forehand said, “Today’s oil field customers are all about safety. They don’t want to see ’70s-style rigs, with spin chains and all that manual labor. Retrofitting those with pipe spinners, trying to reduce manual labor, they are still more cumbersome, hazardous.”

Forehand said the RD20 works with a smaller crew, and there’s no climbing, no derrick man, so there’s lower labor and overall operating costs. “The RD20 offers safety. Other water well drilling companies can’t compete.”

Carizzo sand

Water Well Services broke in its RD20 on a job drilling and casing a 450-foot-deep water well near Poteet, Texas, about 30 miles south of San Antonio. Here they were set up on the Carizzo-Wilcox aquifer, a part of the larger Texas Coastal Uplands Aquifer System. The system’s outcrop is a relatively narrow topographic feature running parallel to the Gulf Coast from the Rio Grande at

the Mexican border northeast to Louisiana.

The Carrizo portion starts as a beach-like sand. Richard Bartosh, Water Well Services’ drilling superintendent, said they used a bulldozer to tow everything into position: “You can’t walk in this big sand bowl let alone drive in it.”

The RD20 is almost completely self-contained. Once the five-man crew towed in pipe and casing trailers, a water truck and big pumps—they were ready to drill.

From the outcrop, the 800-foot-thick Carizzo downdips beneath the surface toward the coast at 100 feet per mile on average, though it ranges from 24 feet to more than 400 feet at points. “Most wells we drill here the customer wants about 1,000 gpm, but a well can yield up to 3,000 gpm, depending on how it’s developed,” Bartosh said.

The loose ground conditions here make the area ideal for peanut and strawberry farmers. Poteet is known for its annual strawberry festival. But it’s not conducive to drilling. This well required a 17.5-inch hole for 12.75-in steel casing with a 12-inch IO steel screen. Bartosh said they really had

to hold back. The weight of the string was enough to drive the hole. Average ROP was kept to less than 45 feet per hour with bentonite at 10 barrels a minute to adequately cake the sides. Chips were coming out at 10 feet per minute.

In this case it is not desirable to drill with air, which would quickly blow out giant voids. And since they will sometimes drill to 1,200 feet, the deeper wells can run into methane pockets. Therefore, mud drilling is the method of choice. But Forehand and Bartosh warned that drilling too fast with mud, especially the size bores that they make, risks collapsing the hole.

It took three days to set up and drill the well, Bartosh said, “I was OK with going slow on the first one, because we had a new crew on an unfamiliar rig, in a sand bowl you can hardly walk in.”

He was pleased with the rig and anxious for its next job. “The connections are fast.” He said he sees where times will improve as the crew gets used to working on the “little” rig, the baby of the Water Well Services fleet in a region with a busy 10-year forecast. ☉

Larger wells for **Muncie**

Municipal wells in rock call
for Dilden Bros. T2W and
QL 120 hammer

To make sure the casing was still seated in the limestone, Findlay set the hammer's bit on timbers over the casing and gave it some love taps.



When contractors of large commercial and municipal projects need a helping hand to drill quickly through rock, Dilden Bros. Well Drilling often gets the call. The company's Atlas Copco Secoroc QL 120 down-the-hole hammer gives Dilden Bros. access to a niche market in the multi-state geography within reach of their Lafayette, Ind., headquarters.

Brothers Wayne and Don Findlay have co-owned Dilden Bros. Well Drilling since they bought the company from Jude Dilden back in 1985.

Wayne Findlay said when he first started using pneumatic technique on the occasional rock he encountered, he never dreamed he'd eventually be hammering 15-inch diameter bores with his Atlas Copco T2W water well rig. But after acquiring an auxiliary compressor to help their T2W rig run its first 8-inch (203 mm) hammer, Findlay said, "We were doing so well that we knew we had more than enough air to go bigger." That's how Dilden Bros. worked its way up to the 12-inch QL 120.

Bigger holes faster

On this particular job Bastin-Logan Water Services of Franklin, Ind., subcontracted Dilden Bros. to help with two replacement wells for Indiana-American Water Co., the company providing water services for Muncie, Ind.

Delford Dunn, the Bastin-Logan project manager on the site, said: "We do have our own rigs for large diameter sand and gravel drilling. But on jobs like this it just makes sense to call Dilden because they can get through rock so much faster with their hammer."

Delford said in comparison it might take Bastin-Logan three to four weeks to complete a well without bringing in Dilden's QL 120. In spite of the soggy conditions, Dilden spent just three and a half days on this hole, start to finish.

Findlay explained that drilling large well bores with air is really a sideline. It works for his company because they made the investment in tooling, and they have a rig with sufficient torque and pullback for tools this size.

In Dilden's case, he said, a new T2W Series III water well rig was working fine. Torque was no problem for them, either for 24-inch rotary or 15-inch percussion. The three-speed rotary head has 12,000 foot-pounds of torque at 80 rpm, 8,000 foot-

pounds at 120 rpm, and 3,500 foot-pounds at 275 rpm.

With the rig's 410 hp (372 kW) engine, 30,000-pound (13,607 kg) pullback capability and 15,000-pound (6.9 metric ton) hoist, Dilden comfortably bores to 24 inches as part of their normal well services repertoire.

Dilden driller-helper John Baker guided the QL 120 as it was hoisted into position. Smiling broadly, he said the company has had the QL 120 for six years now without any trouble and without having to rebuild or repair it.

Muncie's primary source of drinking water is actually the White River. Whereas these water wells will produce hundreds of thousands of gallons of water a day, the river can supply millions. The groundwater is blended with water from the river prior to Indiana-American's treatment process. Treatment of this blended source water results in improved water quality at lower cost for customers.

The aging 8-inch wells needed a size upgrade to keep up with demand. Dilden's assignment was to drill two 320-foot well profiles that began at 24-inches in diameter. These were to be cased with 18-inch steel through sand, clay and gravel layers and sealed 3 feet into limestone. Once into limestone, the profile would narrow to 15 inches and continue down to shale lying just past 300 feet (90 m).

Drilling in a flood plain

It had rained a couple of days prior, and the forecast was calling for more. The site was just a few feet above river level and only a few dozen yards from the bank. Any more moisture could threaten completion, as the spongy, saturated ground constantly wanted to swallow them. Findlay had stopped once already to add more ground support under the rig.

(right) Project manager in the field Delford Dunn gives a tour of the completed first well Dilden Bros. did earlier. The raised deck gives an indication of what water levels along the White River were during its "150-year flood." Groundwater from both wells will be pumped to the nearby treatment facility where it will mix with water from the river. Indiana-American Water Co. blends the water before treatment, having found they can improve quality with lower cost to the customer.





Once a 15-inch socket is created in the limestone, Wayne Findlay switches from mud to air to put the QL 120 to work. With a 15-inch concave bit, rate of penetration was anywhere from 10 to 15 inches per minute in fractured limestone.



(below) Helper Mike McCaw prepares the QL 120 with 15-inch bit for hoisting. The crew will use both the main and auxiliary lines to guide the big hammer into place. Then two collars totaling 7,000 pounds will stand between the hammer and 6 5/8 inch pipe.



» Findlay cleaned the cased top portion of the well and sent down a stepped tri-cone starter bit into the limestone. This was an 18-inch diameter reamer of bit thirds with a 15-inch tri-cone extending ahead of it. The pilot bit created a perfectly centered rock socket to start the QL 120 with a 15-inch bit.

When chip samples from the discharge convinced him the pilot hole was cleanly cut into the limestone, Findlay withdrew the piloting bit and switched the T2W over to air.

Once in the hole, the hammer was followed by two collars, one 12 inches and the other 8, to give it about 7,000 pounds of weight. Then a sub adaptor connected the lower part of the string to 20-foot lengths of 6 5/8-inch pipe.

A veteran driller, Findlay tuned weight-on-bit by ear and string vibration. "We're holding back some, but I couldn't give you a set number," he said. "I just listen and see how it's acting. It's drilling really well."

The 1070 cfm (505 L/s) auxiliary compressor boosting the rig's 500 cfm (236 L/s) compressor was set to about 225 psi (15.5 bar). Findlay added water at 4 gpm. No adjustments were necessary during the completion of 15-inch hole to 320 feet (97.5 m). Twenty-foot pipe lengths descended out of sight at rates of 20 to 25 minutes each, with drilling progressing at 10 to 12 inches a minute (255 to 305 mm/min.) from start to finish.

"I'm very pleased with the rate of penetration," Findlay said.

The drill's progress also impressed Dunn: "That hammer is just amazing."

Also on Findlay's crew that day was new-hire Patrick Taylor. This was Taylor's first time seeing a hammer run. He had been working a Kelly rig for the past 20 years. "Dilden Bros. is introducing me to top head operations," Taylor said. "And I'm impressed. It's so smooth."

As for the hammer, Taylor said, "I just can't believe how fast it is. I mean, look at that, that large a hole, and in rock. I've never seen anything like that."

The first well drilled by Dilden on this job already had its head on and its decking set up. Forty feet of 18-inch casing was set 5 feet into limestone, and then it was bored by hammer to 324 feet total depth. Dilden completed all but 40 feet on this second hole by dark and returned to finish it the following morning.

Initial estimates judged the wells to be producing at about 800 gpm each prior to testing. Formal testing was scheduled later. ☉

“Dilden Bros. is introducing me to top head operations. And I’m impressed. It’s so smooth.”

Patrick Taylor
Driller, Dilden Bros. Well Drilling

With 20 years' experience on table drive rigs, but new to top head rigs and percussive drilling, new-hire Patrick Taylor said, "I just can't believe how fast it is ... that wide a hole, and in rock. I've never seen anything like that."



Atlas Copco says new method for directional drilling can cut deep hole time, cost by more than half

Atlas Copco Secoroc has patented a revolutionary method for directional pneumatic drilling. The new method has the potential to cut directional deep hole drilling time by half and to cut costs by more than 50 percent by increasing penetration rates, reducing vibrations, eliminating equipment damage, and enhancing bit performance.

Jeff White, an Atlas Copco down-the-hole oil and gas product specialist, said, "The solution is beautiful for its simplicity. Generally speaking, the method strategically places a jet sub in the drill string and uses specifically modified hammer components to control flow."

White said, "Previous to using a jet sub, the flow required to effectively clean the hole had to pass through the hammer/motor assembly. That caused the motor to over-rotate, resulting in inefficient drilling with excessive wear and damage to the bit."

"With the new method, excess flow is released through one or more jet subs above the bottom hole assembly. This manages airflow through the motor when the hammer is in operation and allows the bit to turn at the correct speed. The result is a better penetration rate with reduced vibration levels."



Modifications incorporated into the Atlas Copco Secoroc TD 90 DT, QL 120 DT and QL 60 HF HC hammers keep the hammer flow/pressure profile the same on bottom as they do off bottom, which maintains constant rotation speed. This prevents "whipping" of the bottom hole assembly caused by the sudden increase in motor rotation due to high airflow rates while off bottom, which can lead to motor damage. Vibration levels caused by whipping could also destroy expensive tools such as an electromagnetic measurement-while-drilling (EM/MWD) system.

Atlas Copco's EDGE drill monitor plays a part in the new method as well. Mounted on the rotary head, the EDGE sensor

can detect and translate hammer percussion through vibration signals into data and easy-to-read graphics on its display screen. The driller sees changes in operating characteristics of the hammer in real time, making instantaneous adjustments in operating parameters to optimize rate of penetration and avoid damage to the bottom hole assembly.

Some contractor companies have plans to use this new method for vertical drilling as well as horizontal.

"Atlas Copco Secoroc has designed a very simple and reliable drilling system," White said. "It's a game-changer. In 12 months, I expect every operator in the Appalachian Basin will be using this method."

Bit faces on Atlas Copco oil and gas line are standardized

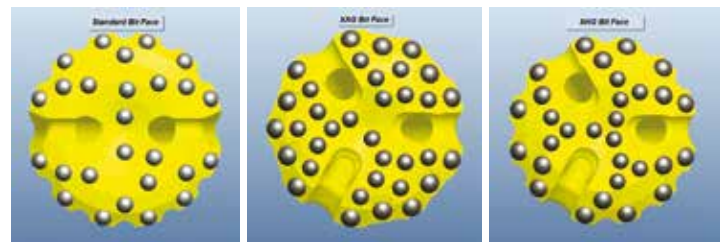
Atlas Copco has a standard assortment in its oil and gas bit line. All bits are available with the "R4" one piece retrieval system or standard head with fishing threads. There are three face designs to choose from: Standard Face, XHG Face, and XAG Face.

The Standard Face uses all 3/4" (19 mm) inserts with two blow holes. An XHG Face is designed for more robust rock conditions and uses 7/8" (22 mm) inserts on the gage and second row with 3/4" (19 mm) in the face. These bits are a three-wing, blow-

hole design.

The toughest rock conditions and the newest design to Atlas Copco's offering is the XAG "Assisted Gage" face design. This design uses 7/8" (22 mm) inserts on the gage and gage assist row with 3/4" (19 mm) on the second row and face. This is also a three-wing, blow-hole designed bit.

All three bits are available in Q8, T9



and Q12 shanks. The most common insert configurations on oil and gas bits are diamond gage row inserts or full-face diamond inserts, but other insert configurations are available. These configurations also come with or without gage protection inserts.

Versatile T2W

Around the world, water well rig owners and operators appreciate the Atlas Copco T2W truck-mounted drilling rig for its application versatility, high productivity and ability to get in and out of even the most rugged conditions.

The T2W rig's three-speed rotary head has 3,500 foot-pounds at 275 rpm and 12,000 foot-pounds of torque at 80 rpm. Onboard air comes in a variety of options, which include up to a 900/350 air compressor. Coupled with a 500 hp for 900 air (372 kW) engine, 30,000-pound (13,607 kg) pullback capability and 15,000-pound (6.9 tonne) hoist, and you have an incredible range of capability from a rig designed for both air and mud applications.

That's why it's not unusual to find a T2W contractor one day rotary drilling the top 24-inch diameter of a municipal water well's profile, setting 18-inch steel casing, and finishing that well to depth with a 15-inch pneumatic hammer—and then the very next day find him in a residential district slipping his rig in between two houses to drill a geothermal loop field where larger truck-mounted rigs won't fit.

The T2W rig's characteristic versatility and robust design have not changed in three generations of the model, but more features have been included in the new Series III upgrade than any machine in its class. That the rig is so popular is no surprise, as most of these features came directly as a result of driller feedback and recommendations.

12-rod carousel with backloading capability from a 12-rod box

With applications such as geothermal loop field drilling in mind, the Series III carousel capacity was bumped up to 12 rods. Together with a rig-mounted rod box, which carries another 12 sticks of 3.5-inch rod, total depth capacity is 480 feet without having to bring a pipe trailer to crowded jobsites.

The carousel itself is a swing in/swing

The T2W rig's characteristic versatility and robust design have not changed in three generations of the model, but more features have been included in the new Series III upgrade than any machine in its class.

out type. During transport the carousel folds over the derrick to lie balanced over the truck's center line for improved road handling. The carousel has backload capability during operation, so it allows easy single-person operation, depending on the situation.

Since the carousel brings pipe to the top head, the top head only has to travel in one direction to clear the way for handling pipe with the main hoist, auxiliary hoist or sand reel. Consequently, this gives operators the utmost confidence of perfect alignment every time they bring the top head back to center against a positive stop.

Head options

One option is a gear-driven head constructed with oversized gears, shafts and bearings for large torque applications. The other is a smaller, more compact hydraulic vane-driven head for lower torque operation. Both are three-speed designs.

Single tube derrick

T2W owners who experience its wide-open workspace and uncluttered deck offered by its tubular derrick prefer it over lattice-style derricks, especially during large-hole work and case welding. Though lighter in weight than traditional lattice derricks, the tubular tower provides superior strength and resistance to linear and torsional deflection and accommodates





casing hammer, dual wall or drill and drive systems.

Improved feed

The single-cylinder cable feed system’s major components have been engineered to be larger and more mechanically efficient, reducing maintenance and part fatigue.

The cable feed is contained within the derrick, which protects its moving components from exposure to the typical drilling environment and rod handling operations.

Customer-inspired options

An optional 15,000-pound winch

with two-part line matches the pull-back of the rig. This allows the operator to trip out of the hole with the winch or the head.

Optional hydraulic front drive assist turns the rig into all-wheel-drive vehicle.

An automatic transmission provides reduced fuel consumption, simplified operation and training, and better shifting performance in conditions such as freshly plowed or sloppy fields.

An optional 550 horsepower engine is available. A split-shaft PTO drive system selects drill or drive mode. Ⓞ



TECHNICAL SPECIFICATIONS

Compressor Pressure	350 psi (24.1 bar)
Compressor Flow	900 cfm or 1070 cfm (425 L/s or 505 L/s)
Deck Engine	Caterpillar C15 ▶ 475 hp (354 kW) at 1800 rpm ▶ 575 hp (425 kW) at 1800 rpm
Pullback	40,000/ 70,000 lb

As always, adding to the value of the T2W is the after-sales support provided by Atlas Copco

A photograph of an Atlas Copco trade show booth. The booth features a large blue and white world map on a wall with the text "Serving the Oil and Gas Industry in 180 countries". A yellow Atlas Copco Predator Drilling System is displayed on a platform. A curved blue banner with the Atlas Copco logo hangs from the ceiling. A white pillar with the Atlas Copco logo and a screen is also visible. People are walking through the booth.

Atlas Copco

Serving the Oil and Gas Industry

Atlas Copco focused on its overall offerings to the oil and gas industry during the Offshore Technology Conference May 6 to May 9 in Houston.

Attendance at the conference reached a 30-year high of 104,800. The exhibition was the largest in show history at 652,185 square feet of show space featuring 2,728 companies from 40 countries.

The Atlas Copco booth included a display of the Atlas Copco Predator Drilling System, a more cost-efficient and safer way to set up holes or to reach total depth to 7,870 feet (2,400 m). The Predator is a three-part system consisting of a mobile hydraulic top drive rig, a substructure and a pipe handling skate.

The Predator's hookload capacity of 200,000 pounds (90,910 kg) gives it the strength and capacity to drill vertical, directional and horizontal wells in today's

oil, CBM and natural gas basins. It reduces non-drilling time and cost, improves performance and energy efficiency and greatly enhances worksite and operational safety.

Much less time is spent mobilizing, rigging up and handling pipe than in traditional rigs. Performance and safety go hand in hand with the new Predator innovations. For instance, a hydraulic floor crane eliminates heavy manual lifting and removes the person from physical proximity to heavy equipment associated with greatest injury potential. The Predator's single 950 hp (708 kW) engine powers both carrier and drilling rig.

Other Atlas Copco products featured at the booth included

▶ Rig safe and Zone 2 compressors and steam boilers as well as high pressure compressors, boosters and nitrogen gen-

erators for offshore fleets from Atlas Copco Rental.

- ▶ iACCESS (intelligent Atlas Copco Equipment Satellite System) module. This allows service teams to communicate and exchange information for faster response time and proactive service interventions.
- ▶ The new XAS 375 Zone 2 compressor. This is designed to meet Zone 2 regulations for the offshore industry. Atlas Copco also announced that the XATS 1600 Zone 2 compressor will be available this summer.
- ▶ Atlas Copco Secoroc Matrix Body and Steel Body PDC bits.
- ▶ Secoroc EDGE drill monitoring system allows drillers to see the bottom of the hole while drilling.
- ▶ Secoroc QL series hammers, Jet Sub and Hydrocyclone

AtlasCopcoMarketplace.com

PRE-OWNED DRILLS



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 TH60/2003 sn:6840
 Location: Milwaukee, WI
 Tower: 38 ft.
 Drill Engine: CAT C15, 525 hp
 Drill Hours: 7,288
 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

NEW EQUIPMENT IN STOCK



Atlas Copco T2W/2013 sn:21414
 Location: Milwaukee, WI
 Tower: 37 ft.
 Drill Engine: International MaxxForce, 550 hp
 Compressor: 900 cfm / 350 psi



Atlas Copco TH60/2013 sn:21397
 Location: Milwaukee, WI
 Tower: 36 ft.
 Drill Engine: Cummins QSK 600 hp
 Compressor: 900 cfm / 350 psi

INCOMING TRADE

Atlas Copco TH60/2006 sn:21047
 Location: Milwaukee, WI
 Tower: 32 ft.
 Drill Engine: Cummins QSK, 565 hp
 Drill Hours: TBD
 Compressor: 900 cfm / 350 psi

Call for pictures

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