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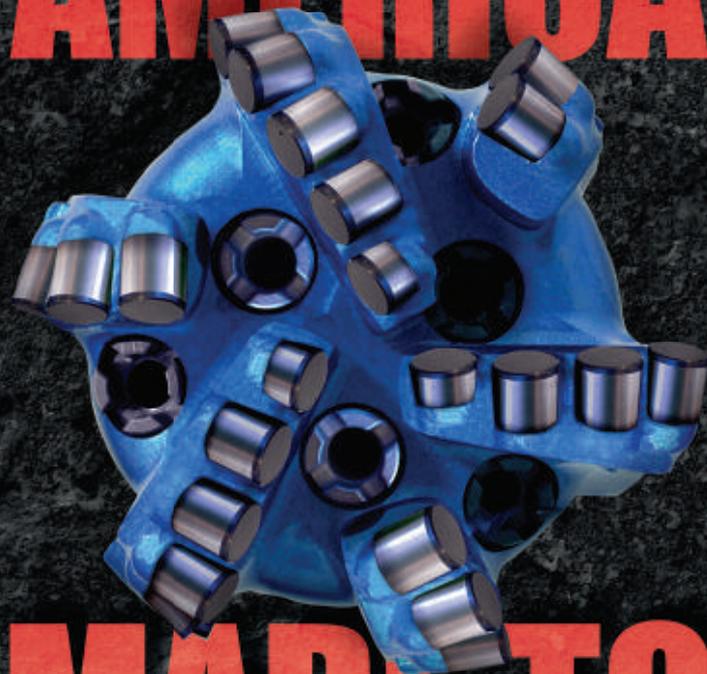


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Short and to the Point . . .



This is a very special month for the United States of America - this is the month we celebrate our independence. What exactly does "independence" really mean to each of us who were born here, grew up here, received our education here, work here, and have raised our families here?

Nowadays it is a notion "I deserve this". Well, I ask why do you think you deserve anything for FREE? What have you done to deserve anything? Did you stand up and fight for your country? Did you work every day of your life? Are you still working hard everyday for your future and that of your family, friends, and others?

With pen (computer) in hand . . .

Ronnie, Managing Publisher
ronnie@worldwidedrillingresource.com

If you answer no to these questions, then I have to say, others did. All gave some, some gave all; and they did that so the rest of us could be free to choose. They allowed us the right to vote, get an education, travel across this great land of ours, raise our families, and not be punished for doing it.

Oh yes, we may not agree with the tally on the votes, or the choices of our education (maybe because we expected it to be handed to us on a silver platter), and maybe we feel we should have a great big house, with a shiny new car, and fancy clothes, just because "we deserve it".

I have to say again, no one owes you anything. So, if you are waiting for a handout, stand in that line and wait. But don't wait on me to give it to you without you working for it, because you will go hungry, be homeless, and be waiting a very long time, if not forever, until someone comes along who feels you deserve what they have worked so hard for, and gives it to you FREE.

(There is more on Page 68 of what we take for granted.)

This is my personal opinion, from my observations for 70 years. No one ever gave me anything I didn't work for, and I'm proud of what I have achieved in life. You should be too. So get up and make yourself proud of YOU.

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by Tim Rasmussen



Photo courtesy Wallenius Wilhelmssen Ocean.

This article written by Jess Pike is reprinted with the permission of Wallenius Wilhelmsen (WW) and first appeared on www.2wglobal.com.

Water For Life

Making clean water a reality in Guatemala: How WW Ocean helped make it happen.

With contaminated water the biggest killer of children in the developing world, charity Water For Life has a mammoth task on its hands. We explore their well-digging endeavours in Guatemala - and WW Ocean's role in helping deliver clean water across the country.

While it might seem unthinkable for western societies, vast swathes of the undeveloped world lack access to clean water, with 844 million people currently in crisis. Put bluntly, dirty water is deadly water: every two minutes, a child somewhere in the world dies from a water-related disease.

The situation is particularly serious in the Central American country of Guatemala, where 53% of the population live below the poverty line and 51% have no access to sanitation - a situation made all the more dangerous by a recent severe drought.

It's against this backdrop that charity Water For Life was set up in mid-2004. Tim Rasmussen, the charity's president, explains that its founder, Gary Bartholomew, was compelled to take action when he visited an orphanage in the Petén region without access to clean water. The first well was drilled in Poptún in 2005 and since then, the charity has drilled 120 wells primarily across the Petén region, supplying water to 30,000 people every day.

The charity's longstanding reliance on container shipping to transport equipment between the US and Central America was tested in 2018, when a rotary rig and truck were donated from a US truck and tractor company.

"The rotary rig is pretty incredible," explains Tim. "With the old rig, we'd be drilling one well every two weeks. With the rotary rig, it's one a day. And the truck, which has been modified with a crane to lift heavy pipe, as well as a generator and drill, is crucial in the well-drilling operations."

"With the container shipping company unable to help with the truck shipment, we were put in touch with WW Ocean, and we were really bowled over when they said they were keen to get involved," says Tim. "And because they thought it a worthy cause, they were happy to waive the shipping fee. The terminal of Tacoma did the same."

Mike Heaney, Head of Sales Support, North America at WW Ocean, explains how the inside sales team in Georgia played a critical role in the project. "One of my reports, Bryan O'Dell, had spent time in Guatemala, so when the request came in, he researched the organisation and realised we were dealing with something pretty special.

"Bryan definitely deserves credit for pushing this forward - and he was absolutely right to. It's the kind of project that ties in perfectly with Wallenius Wilhelmsen's values."

RoRo vessel Oberon was chosen to ship the truck, with the Tacoma terminal team ensuring the generator was properly journey, the truck arrived in Guatemala in February.

And while Mike's team derived a whole lot of personal satisfaction from the project, the biggest joy for Tim has been seeing the impact of the new rig in action: "We went to check on a new well in operation recently, and were told that it was the first year a child hadn't died as a result of dirty water. That's pretty priceless."

If you would like to help, contact Gary Bartholomew at 509-466-5075 or 509-939-1941

Tim

Tim Rasmussen may be contacted via e-mail to michele@worldwidedrillingresource.com

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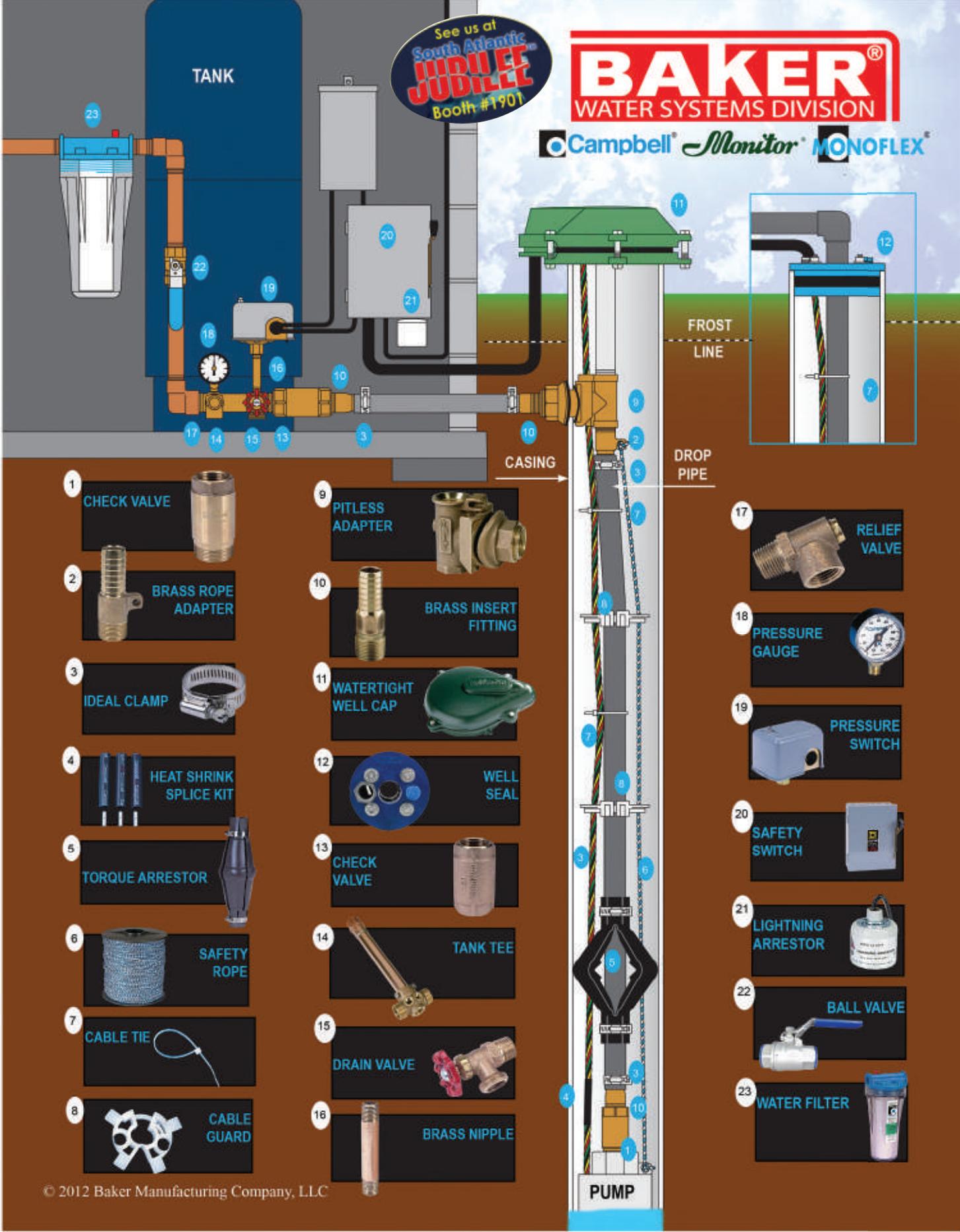
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Hot Off the Press

Acquisition Announced

Wellbore Integrity Solutions (WIS), an affiliate of private equity firm Rhône Capital, and Schlumberger announced an agreement for WIS to acquire the businesses and associated assets of DRILCO, Thomas Tools, and Fishing & Remedial services, along with part of a manufacturing facility located in Houston, Texas. Pending regulatory approvals and other customary closing conditions, it is expected to finalize by year-end.

WIS will operate the businesses as a combined global, customer-focused provider of drilling tubulars services; tubing work strings, rentals and accessories; and fishing and remedial services for drilling, intervention, and abandonment activities for the oilfield industry.

“Our customers will benefit from our expansion as an independent service and product supplier with a strong global footprint,” said David MacNeill, CEO of WIS. “We are very proud to acquire these historic companies that have been delivering quality products and services to the oil and gas industry for over 60 years.”

Kristi Vilay, president, Schlumberger’s Bits & Drilling Tools added, “The DRILCO, Thomas Tools, and Fishing & Remedial businesses will have greater opportunities for growth uniquely positioned within a strategic buyer’s portfolio. This divestiture will enable Schlumberger to focus on its core drilling strategy, including the development of automation technologies that can be enhanced by digital enablement.”

After completion of the transaction, WIS will have close to 1100 employees and operate in 25 countries.



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Thai Bauer executes various specialist foundation engineering works for the new MRT Orange Line in Bangkok.

Orange Line. In the future, the new line will complement the existing MRT network and provide a link between the eastern suburbs of Bangkok and the city center of the metropolis.

Specialist foundation engineering works for the MRT Blue Line, Purple Line, and Green Line extensions is being conducted by Thai BAUER Co. Ltd., the Thai subsidiary of BAUER Spezialtiefbau GmbH. Thai BAUER was also recently commissioned by the contractor, the Joint Venture Ch. Karnchang - Sino Thai, to carry out various specialist foundation engineering works for the construction of the new metro line. More than 370 bored piles are being drilled to a depth of 130-210 feet, and approximately 192,000 square feet of diaphragm wall are being constructed down to a depth of 88 feet. In addition, during the rainy season, the stability of the subsoil and access to the site need to be ensured.

Works started in March 2018, and the completion of Thai Bauer's specialist foundation work was planned for this spring. Completion of the new Orange Line is expected to take place in 2022.

"The challenges of this project are diverse," said Mike Sinkinson, managing director of Thai Bauer. "First of all, extremely stringent tolerances for the installation of the bored piles have to be kept, while work is required to be carried out above existing tunnels, so great care and accuracy are essential for the success of this project. Also the logistics between the steel processing locations and the respective application areas must be regulated and access to the construction site via the main road must always be available."

C&G

New Metro Line in Bangkok Adapted from Information by BAUER Group

Thailand's capital city of Bangkok is one of the most densely populated cities in the world with approximately 16 million inhabitants in the Bangkok metropolitan area. Because of the growing population, it has become necessary for the city to find a way to permanently ease road traffic and create a public means of transport.

In 2004, the subway system Bangkok Metro (MRT) opened under the supervision of the Mass Rapid Transit Authority of Thailand (MRTA). The existing metro lines, which are marked with the colors blue and purple, cover 35 stops over a distance of about 28 miles. Current expansion for these existing lines is underway, as well as construction on another line - the MRT

BREAKING NEWS

Donaldson Company to Expand with New Research Center

Donaldson Company, Inc. just broke ground on a \$15 million Material Research Center at its corporate headquarters in Bloomington, Minnesota.



Tod Carpenter, Donaldson's chairman, president, and chief executive officer said, "The investment in this facility supports our commitment to developing new materials, diversifying with new technologies, and penetrating new markets . . . Donaldson has been a filtration solutions leader for over a century. This Material Research Center will help us maintain that leadership position well into the future."

The company currently holds more than 1800 active U.S. and international patents; has over 100 technical laboratories; employing hundreds of engineers, scientists, and technicians.

The new center is scheduled to open in November 2019.



WHO'S IN THE NEWS



Richard Gotsch is retiring from Central Mine Equipment (CME) after more than 36 years of service.

He represented the company in the upper Midwest and parts of Canada for several years.



Michael Hubert has been promoted to outside sales representative. He has been with the company for 16 years and will use his extensive knowledge of CME equipment to assist customers in the U.S.

Send your Who's in the News to:
Bonnie@worldwidedrillingresource.com

You can find additional announcements from **Best in the West, Danos, N-Sea Holding, Tug Valley Mining Institute, Furukawa Rock Drill USA, Numa Hammers, and Shallow Exploration Drillers Clinic** in our online issue at:

worldwidedrillingresource.com



Rob Caho is rejoining the Diedrich Drill Team as director of sales and marketing.

Rob is vice president of the National Drilling Association.

He also served as past chair of the Manufacturers Section Board of Directors for the National Ground Water Association.



After more than 43 years in the drilling industry, Hole Products celebrated the retirement of Ron Zobel.

His unrivaled expertise in core drilling, rig and equipment parts, understanding customer needs in the field, and his eagerness to help will be greatly missed.

SPECIALTY WINCHES FOR THE WELL AND FOUNDATION DRILLING INDUSTRY

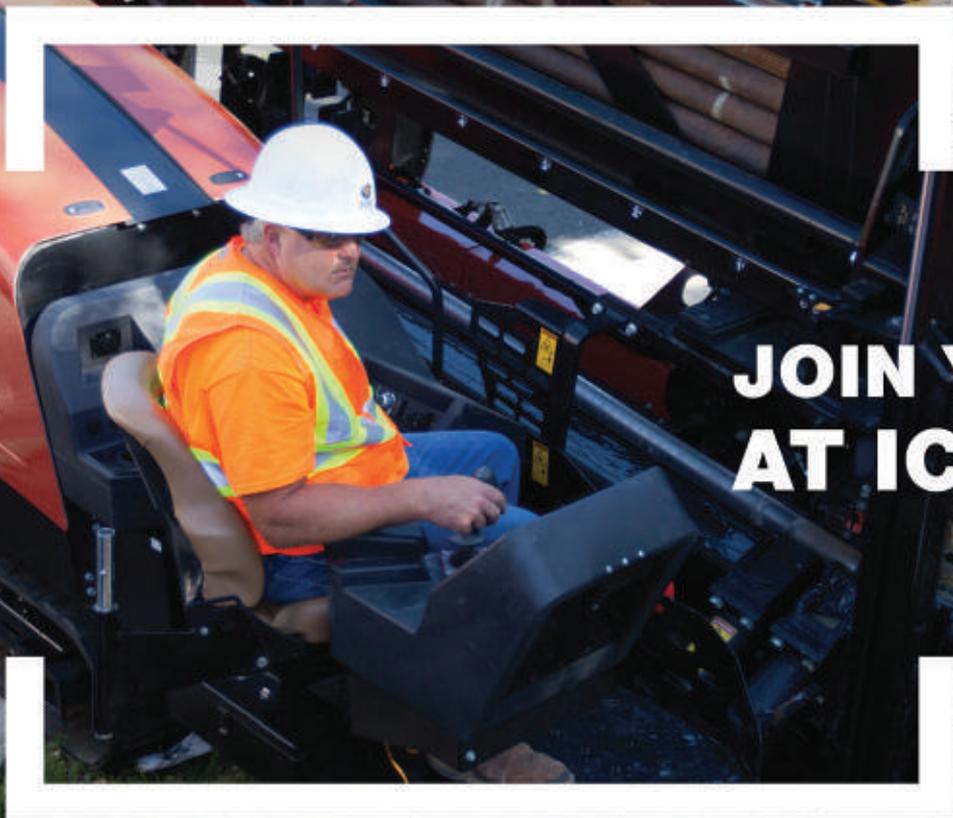
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The World of Minerals

Kaolinite is a layered silicate clay mineral. It forms from the chemical weathering of feldspar or other aluminum silicate minerals, and is usually

white, with an occasional red color impurity due to iron oxide, as well as blue or brown due to other impurities.

Kaolinite is ideal for many industrial applications because it has a low shrink-swell capacity and a low cation (positive charged ion)-exchange capacity. The largest use of kaolinite is in the production of paper, and used to control the gloss in certain grades of paper.

Another common use of kaolinite is in porcelain. Kaolin is the main ingredient of porcelain, which is sometimes known as China because of where porcelain was first made.

Kaolinite is also used in ceramics, light bulbs, paint, rubber, adhesives, smoking pipes, white wash in masonry, absorbents, soap, cosmetics, and toothpaste. Within organic farming, kaolinite is used as a form of pest control. It is an active ingredient within medicines for diarrhea, nausea, and other digestive issues. In some cultures, it has even been used to suppress hunger.



Kyanite is one of the most attractive blue minerals in nature. It is used to manufacture a wide range of products. One important use is in the manufacturing of refractory products such as the bricks, mortars, and kiln furniture used in high-temperature furnaces, as well as the molds used for casting high-temperature metals.



It is present in products used in the automotive and railroad industries where heat resistance is important. Mullite, a form of calcined kyanite, is used to make brake shoes and clutch facings.

Kyanite's heat resistance and hardness make the mineral an excellent material for use in the manufacture of grinding wheels and cutting wheels. While it is not used as the primary abrasive, it is used as part of the binding agent, holding the abrasive particles together in the shape of a wheel.

The properties of kyanite also make it well suited for the manufacture of a high-refractory-strength porcelain - a porcelain which holds its strength at very high temperatures. This type of porcelain is used for the white porcelain insulator on a spark plug. Kyanite is also used in some of the more common forms of porcelain, such as those used to make dentures, sinks, and bathroom fixtures.

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Tales from the Field

by Jeremy C. Wire
Geoconsultants, Inc.



The Missing Water Well

Occasionally, it is necessary to locate an old unused or abandoned well in the field, without much supporting information on its location, and we are usually successful. Remnants of infrastructure may be present, such as old rusty pipelines that once discovered may lead to the well head. Likewise, old power drops with dangling wires provide the clue a well casing may be nearby. Sometimes there is a paper trail which may help, with possibly a map showing the location. However, even on old documents submitted to regulators, the well location may be vague, being written long before more modern times when descriptions are usually accompanied by GPS coordinates.

In one instance, a domestic well had been completed some years before our site investigation and search, and there were records showing where it had been certified for a building permit for a residence that was never built. On our first attempt to find it in the field, using distances carefully measured to its location as shown on a parcel map, no trace of a well could be found. There was no evidence the well had been destroyed, either. Although the site was undeveloped, it was not particularly heavily overgrown by vegetation which might conceal the wellhead. So, back to the office to review the records for something that might have been overlooked in reading the description. The property owner told us, "The well has to be there, nothing has changed at the property for years. So go back out and look again."

We returned to the site for another look, and this time combed through every bit of brush and weeds that could conceal a capped, short piece of white PVC casing sticking out of the ground. This time, success . . . it was evident that over the past years, a shrub with white flowers had completely wrapped itself around the casing, and totally concealed it, making it impossible to see even from a short distance away. In this case, persistence finally paid off.

Recalling a separate incident several years later, we received a telephone call at the office, and the person on the other end of the line asked, "Do you locate water wells?" We acknowledged we did, and briefly explained our exploration methods. Then the person stated in a serious tone, "I think I have a water well somewhere in my backyard, and could you help me find it?" Finding this request somewhat amusing, we can't remember what our response was, but as the well was apparently not obvious and possibly totally concealed by a plant, probably not much help based on our previous experience.

Jeremy Jeremy Wire may be contacted via e-mail to michele@worldwidedrillingresource.com



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The Un-Comfort Zone II

by Robert Evans Wilson, Jr.

**The Movies have it all Wrong ~
People are Good
Despite what is seen on TV**

I was driving to Raleigh one summer night with my car radio blasting rock and roll as I sang along. Suddenly, I heard a helicopter. It was really loud, like it was hovering right over the top of my car. I turned off the radio and stuck my head out the window. It wasn't a helicopter, I had a flat tire, and at 70 miles per hour the loose rubber against pavement was making a tremendous wop-wop-wop sound. I pulled onto the shoulder.

It was the late 1970s, I was in college, and my hair, blonde and curly, hung down below my shoulders. I had just pulled all the luggage out of my trunk to reach my spare tire, when a black pickup truck pulled over in front of my car. Two guys jumped out of the cab and dashed over to me. The first to arrive cried out, "Oh hell, Ricky, it's a DUDE!" I laughed and thanked them for stopping, then said I had everything under control. I suspect, out of embarrassment and the need to save face, Ricky shoved me out of the way, and grabbed my tire. He said, "We stopped; we're changing the tire." Five minutes of awkward silence passed as I watched them work swiftly, then they left as I reloaded my trunk.

I share this story, partly because it's funny, but mostly because I think it represents how helpful people generally are. Now, I've had car trouble on other occasions when the people who stopped to help me were not lured in by my long blonde locks; they just genuinely wanted to help. The point is, I see people helping other people all the time - in all sorts of situations. It is my sincere belief that nearly all people, despite what's in the news every day, are good people. With very few exceptions, the average person is a giving, nonjudgmental, peace lover.

Yet, there are so many books, movies, and television shows depicting a dystopian future where the majority of people are evil, looting, raping, enslaving others, and worse. Many of these books and movies, like *1984* and *The Hunger Games* are written to warn us what will happen if our tyrannical governments continue to grow. Others, like *The Walking Dead*, *The Road*, and *The Time of the Wolf* imply that without government, people will become ruthless predators preying on each other. The message of these narratives is clear, if government breaks down, people will devolve into savagery. I don't believe it for a minute; if society collapses, people will strive to come together even more, and do everything in their power to keep civilization going. However, movies and books about people helping each other rebuilding homes, planting gardens, and sharing stored goods is not nearly as thrilling as having to hide from your neighbors because they will eat you.

We are naturally motivated to help others because we have empathy for people. We have all experienced hardship - or will - and it is because we know how it feels to be vulnerable, we want to help others in need.

The average person gives of his or her time and treasure generously. Some, of course, with a little nudging. According to the National Philanthropic Trust (NPT), Americans gave \$410.02 billion in 2017, which was a 5.2% increase over 2016. NPT goes on to report approximately 77 million Americans, 30% of the adult population, volunteer their time, talents, and energy to making a difference. It reports the top four national volunteer activities are fundraising or selling items to raise money (36.0%); food collection or distribution (34.2%); collecting, making or distributing clothing, crafts, or other goods (26.5%); and mentoring youth (26.2%). I suspect these numbers are too low and don't account for cash donations to individuals and hours volunteered which seem self-serving - such as working with youth if the volunteers' children are involved, i.e., coaching sports, scout leadership, school lunchroom, and classroom help, and so forth.

Evil people are rare, although they do tend to be attracted to positions of power, which is why so many of these movies predict the rise of tyranny. It seems too often, when government tries to fix things, it only makes things worse. People have already figured out how to get along with each other in good times and bad. Perhaps the solution to creating more good times - and even more giving and volunteering - is simply less government.

Robert

Robert is an author, humorist, and innovation consultant. He works with companies that want to be more competitive and with people who want to think like innovators.

For more information on Robert, visit www.RobWilsonSpeaker.com or contact him via e-mail to michele@worldwidedrillingresource.com



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Industry Announcements

Headwater Companies has acquired two Indiana groundwater distribution companies, Tri-Valley Supply Company in Mishawaka and Kokomo Pump Supply in Kokomo. Both companies will become part of Valley Farms Supply.



Glenn Jandernoa, president of Valley Farms Supply said, "We welcome Tri-Valley Supply and Kokomo Pump to our already best-in-class groundwater distribution organization. These companies have built their reputations on providing first-class products and service to Indiana contractors and will be a welcome addition to the expansion of Valley Farms Supply in the Midwest. As always, Valley Farms Supply and Headwater Companies

are committed to the long-term survival of the groundwater industry across the U.S.A."



Valley Farms Supply, based out of Lansing, Michigan, serves water well professionals in Michigan, Indiana, and Ohio. Celebrating its 60th year, Valley Farms is the largest water well supply distributor in Michigan and has built a solid reputation with its emphasis on service, support, and inventory availability.

Headwater Companies is a collection of groundwater distributors delivering quality products and leading brands to the industry.

U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) is requesting information about possibly updating the lockout/tagout (LOTO) standard.

The agency would like to learn how employers have been using control circuit devices, including information about the types of circuitry and safety procedures being used and the limitations of their use. OSHA is also seeking to understand under what conditions control circuit-type devices could be used safely; new risks of worker exposure to hazardous energy as a result of increased interaction with robots; and whether the agency should consider changes to the LOTO standard to address these new risks.



Technological advances since the standard was issued in 1989, suggest control circuit type devices may be as safe as energy-isolating devices, at least in some circumstances. OSHA is seeking information, data, and comments which could assist the agency to determine under what conditions control circuit type devices could safely be used for the control of hazardous energy.

Comments must be submitted on or before August 18, 2019.

For more information, or to submit your comments electronically, visit www.regulations.gov



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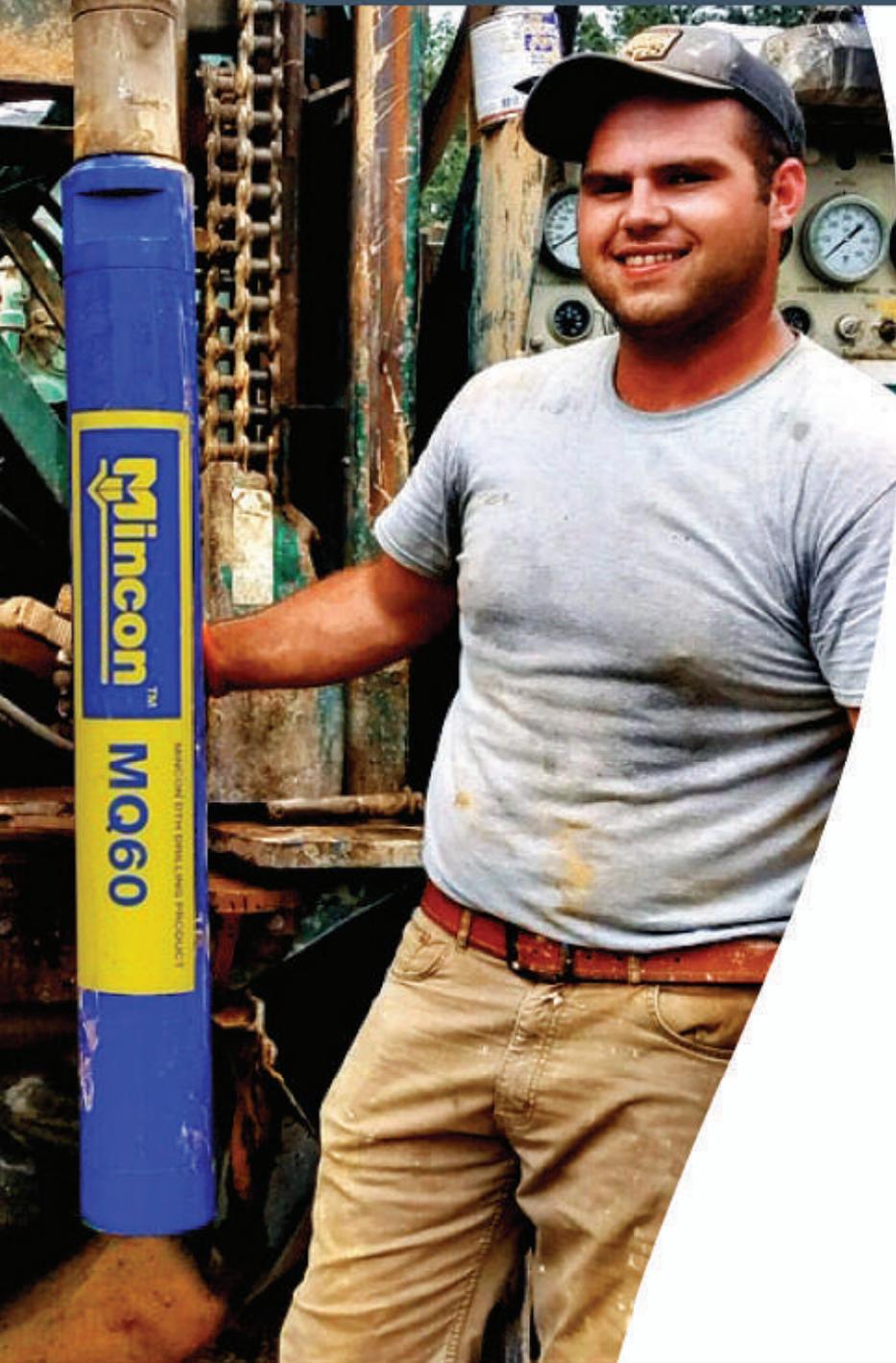
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HDD Market Forecast through 2025

Adapted from Information by Grand View Research, Inc.

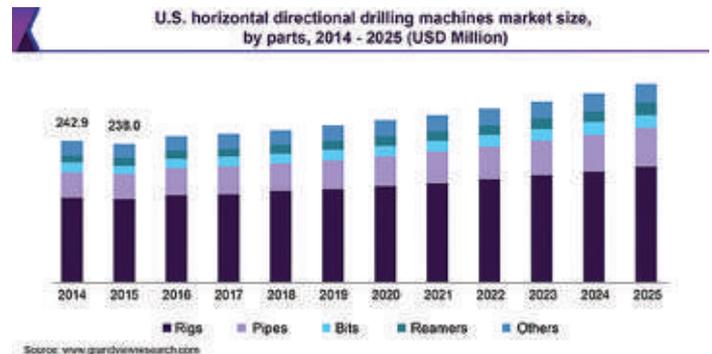
Horizontal directional drilling (HDD) is a drilling process used primarily in underground utility installation. It is also used for soil mapping, sewage disposal, geothermal energy distribution, and even the gas and oil industry. A recent report by Grand View Research, Inc. estimates the global HDD market size will reach \$17.6 billion by 2025, a sizable increase from the \$7.37 billion in 2018. This environmentally-friendly trenchless method is quickly becoming one of the most important underground construction methods for developing, maintaining, and replacing underground infrastructure.

HDD has also proven to be more convenient than conventional vertical drilling and trenching methods. It is used for installing cables, conduits, and pipes with minimal damage to the surrounding area. In addition to requiring fewer boreholes, HDD is great for installing multiple pipes through a single surface location while requiring a smaller set-up space. This makes it an ideal solution for drilling in congested public areas where projects have to be finished in a short amount of time, keeping inconvenience to the public at a minimum.

In the gas and oil industry, HDD rigs are able to help increase the output of reservoirs, located up to 10,000 feet underground, while causing a minimal impact on the environment. It is a vital step in the hydraulic fracturing process which has increased the output from gas and oil reserves in the U.S.

HDD is also beneficial in avoiding some of the risks associated with conventional drilling methods, such as groundwater contamination. It is preferred over auger boring and microtunneling for drilling boreholes less than six inches below the ground, such as small water pipes, electricity cables, fiber-optic lines.

The market has been divided into rigs, pipes, bits, reamers, and others with the rigs segment accounting for more than 55% of the HDD machines market revenue in 2018. The reamers segment is also estimated to have significant growth over the forecast period. The report revealed North America lead the global market in 2018, with the highest revenue share of over 35%. This is largely due to the growing number of gas and oil, utility construction, and infrastructure development projects and is unlikely to change throughout the forecast period.



Oil/Water Exploration

by Harold White

My son Sean and our crew members are willing to help other drill crews keep running when a sickness occurs or they are temporarily down. This would be similar to my experiences with my grandfather Ed on his farm in Nebraska. Farmers next to him, or in the area, would farm a whole year or longer for another farmer. They all got together, prepared the fields, and did everything - including the marketing. I mentioned to my grandfather I thought it must cost a lot, and he said they always did it for free.



Earth Exploration, Inc., A Terracon Company in Indianapolis, Indiana, was pleased to take delivery of a new B29 from Mobile Drill Intl, also located in Indianapolis.

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I have helped my grandfather and Uncle Warren when they were helping other farmers. They just did it, and everyone was happy. People used to help each other. Since insurance takes care of some of the loss, people are not as dependent on their neighbors as they used to be. Their dependence on each other gave them a feeling of strong appreciation and feeling for others everywhere. The little towns had what they called "town night" and it seemed like everyone from everywhere came that night to visit and meet friends.

Today, I am writing in my pickup, taking a break from looking for underground creeks in a cow pasture. There are natural gas veins and saltwater wells in this field, and I have to test the water veins and make sure there is no salt in those I choose for a well site. I have found a lot of good water veins. Now I find out which veins are carrying the most water and where they come across each other so I can drill six or more at one drill site. Being able to do it saves time and money, and a lot of drilling.

Harold

Harold White may be contacted via e-mail to
michele@worldwidedrillingresource.com

In Memoriam

Ray Clifford Beasley



Ray Clifford Beasley, age 61, passed away at his residence in Statesboro, Georgia, on April 20, 2019. Born in Bulloch County, he was a 1975 graduate of Statesboro High School. He worked with Edward Motes Bulldog Trucking for many years, then went into well drilling at Lane Atlantic. After returning to Bulloch County, he owned and operated Georgia Well Drilling for 35 years. He loved bluegrass music and spending time at his river house.

Ray is survived by his sons Phillip (Felicia) and Buddy; stepson Lance (Angie); and nine grandchildren.

Paul Andrew Destin (1960~2019)



Paul Andrew Destin, age 59, passed away unexpectedly April 24, 2019. He was born in Coral Springs, Florida, in 1960. He was owner/operator of Destin Well Drilling in St. George, Georgia.

Paul is survived by his children Jennifer and Jeremy (Dana); grandchildren Bryce, Leila, Kora, Cole, and Rose.

Debra Lynn "Debbie" Schumacher (1953~2019)

Debra Lynn "Debbie" Schumacher, age 65, passed away May 10, 2019, with her family by her side. Born in Lynnvill, Indiana, she was a long-time resident of Boonville. After high school, Debbie graduated from Ivy Tech with an interior design degree. She was employed at Peabody Coal Company where she was the warehouse technician, proudly celebrating 45 years this past April.

In 1983, Debbie helped start the Kentuckiano Chapter of the Women In Mining association. She served as the national president for two terms, and received both the Hall of Fame Award and Distinguished Service Award. In 1993, Debbie and three others wrote the bylaws and objectives of what would become the Women In Mining Education Foundation. She enjoyed spending time with family, her cats, the outdoors, and projects.



Debbie is survived by her mother Ima; several nieces and nephews; and many great nieces and nephews.

The management and staff of *WWD* extend their sympathies to Ray, Paul, and Debbie's family, friends, and colleagues.

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Frequently-Used Geological Terms Part 83

Glossary Adapted from the Dictionary of Geological Terms

R

Richter Scale - A numerical scale of earthquake magnitude. It was created in 1935, by seismologist C.F. Richter. Very small, or microearthquakes can have negative magnitude values. In theory, there is no upper limit to the magnitude of an earthquake, but the strength of earth materials produces an actual upper limit of slightly less than 9.

Riebeckite - A blue or black monoclinic mineral of the amphibole group. It occurs as a primary constituent in some acid- or sodium-rich igneous rocks.

Rigidity - The property of a material to resist applied stress that would tend to distort it. Fluids have zero rigidity.

Rimrock - An outcrop of a horizontal layer of resistant rock, such as a lava flow at the edge of a plateau or mesa. It typically forms a cliff or ledge. Could also be used to describe the bedrock forming or rising above the margin of a placer deposit.

Riprap - Large fragments of broken rock, thrown together irregularly or fitted together. Its purpose is to prevent erosion by waves or currents and thereby preserve a surface, slope, or underlying structure. It is used for irrigation channels, river improvement, spillways at dams, and seawalls for shore protection.

Road Metal - Crushed and graded stone used in the foundation or base course of paved highways.

Rock - An aggregate of one or more minerals such as granite, shale, and marble. Or a body of undifferentiated mineral matter like obsidian. Solid organic material such as coal is also referred to as a rock.

Rock Bolting - A method of securing or strengthening rocks in mine workings, tunnels, or rock abutments by inserting and firmly anchoring rock bolts in predrilled holes. A device on the leading end expands when the bolts are tightened.

Rock Burst - A sudden and often violent breaking of a mass of rock from the walls of a tunnel, mine, or deep quarry, caused by the release of accumulated strain energy. It may result in closure of a mine opening, or projection of broken rock into it, accompanied by ground tremors, rockfalls, and air concussions.



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The Martha Underground and Mine Life Extension

Adapted from Information by OceanaGold Corporation



OceanaGold Corporation received its resource permits to commence operations on the Martha Underground Project in Waihi, New Zealand. Mick Wilkes, president and CEO said, "Receipt of the permits at the Martha Underground represents a tremendous outcome that will benefit the company, its shareholders, the town of Waihi, and New Zealand. The Waihi operation has had a long, rich history of operating to the highest of environmental and social standards globally while contributing significant socioeconomic benefits to Waihi and the country. We are excited to be granted the consents and for the opportunity to continue over 140 years of gold mining history at Waihi."



The company is preparing management plans and detailed mine designs, allowing mining operations to begin, including stope and infrastructure development. At a full underground mining rate, the company expects the operation's production to return to more recent historic levels. During the ramp-up phase, the company will continue drilling the Martha Underground targets with four diamond rigs from the two underground drill drives located beneath the Martha open pit to further discover and add resources.

In August 2018, the Martha Underground hosted a measured and indicated resource of 140,000 ounces of gold and an inferred resource of approximately 339,000 ounces of gold, which was based on only one-third of the planned drilling program. The company has continued

to drill and budgeted an additional 13,000 feet in 2019, to further test the exploration target.

Wilkes added, "OceanaGold has been proudly operating in New Zealand since 1990, and the Waihi mine has been in operation in its current form since 1988. We have a strong, dedicated, and values-driven workforce that are proud Kiwis making a significant positive impact in their respective communities. New Zealand is a template for responsible hard rock mining, clearly demonstrated by the success we've had at Macraes, Waihi, and Reefion gold mines."

Struggle - Is it normal?

by Tim Connor



Is struggle a normal part of life? Any time you try anything difficult or new, you are bound to experience some type of struggle. Exercise requires struggle. Changing an opinion, belief, expectation, or attitude requires struggle. Anytime you attempt growth in any area of your life, you will struggle.

Why is it then, that some people seem to go through life with no apparent struggle, while others seem to attract it into their life with every breath? I have known struggle in every area of my life: my career, relationships, financial situation, and my willingness to let go and surrender.

Struggle is not in our genes, but in our reaction to life and in our minds. It is not in our environment, but in our expectations. It is not in the circumstances or people in our lives, but our desires or lack of them. I believe struggle is a signal from life - to act, change, fix, let go of, etc. something or someone. It is one of life's best teachers to give us the opportunity to learn, grow, and become better and wiser.

Live wisely this year,

Tim

To receive Tim's weekly FREE motivational booster articles contact him at www.timconnor.com with "please add me to your free booster e-mail subscriber list" in the subject line. Or contact him via e-mail to michele@worldwidedrillingresource.com

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Notes from the Groundwater Guy

by Thomas E. Ballard, P.G., C.H.G.
Southeast Hydrogeology, PLLC



What Makes an Efficient Well? Part 1

Technically, well efficiency is calculated as the actual drawdown in a well versus the theoretical drawdown. Therefore, if a well has an actual drawdown of 40 feet and theoretical drawdown of 30 feet, the well efficiency would be 75%. In actual practice, you will never get a 100% efficient well, but 70-85% is considered an efficient well. When all is said and done, well efficiency really boils down to how easily groundwater can flow into the well, to be extracted by the pump. Well efficiency can be determined by monitoring drawdown in the well with a comparison to nearby monitoring wells or by using step test data.

It should be noted, excess drawdown can occur as a result of pumping an aquifer at a rate which exceeds the yield of the aquifer, and is unrelated to well efficiency. Pumping tests should be conducted in new wells and periodically in existing wells to determine the capacity of the well. The well should be operated accordingly, to not exceed the established capacity.

So what factors determine how freely groundwater from an aquifer can flow to a well? There are certain friction losses that occur within the aquifer, which are generally unavoidable. For instance, a finer grained aquifer will result in a less efficient well than a coarser grained sand and gravel aquifer, due to the larger friction losses to the more numerous smaller grains and the more twisted path the water flow to the well must take.

Head losses in a well results from the flow of groundwater through the disturbed area around the well borehole; the gravel pack and the screen can be controlled to a great degree. These inefficiencies can result from drilling fluid being left in the hole, formation damage from drilling activities, a poorly designed gravel pack, or a screen with limited open area. A quality screen with a relatively high open area, surrounded by a properly designed gravel pack, surrounded by an aquifer that has had drilling mud and formation damage removed through a proper well development process will minimize head losses and maximize well efficiency.

These are all factors which can affect head losses in the well and, when taken together during the well design and construction process, can significantly enhance the efficiency of the well.

Tom

Tom Ballard may be contacted via e-mail to michele@worldwidedrillingresource.com

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A PERSONAL MUNICIPALITY FOR THE HOME

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Adapted from Information by Better Water Industries, Inc.

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process, getting rid of odors and killing bacteria. The water flows into the bottom of the first chamber, then flows over into the second chamber where the submersible pump pressurizes the water to the home.

This system is often described as a personal municipality for the home, providing 24-7 protection. It comes complete with the chlorinator, bypass, bladder tank, pump, regenerative blower, and is prewired for easy installation.

ENV

Environmental Monitoring

by Thomas Kwader, Ph.D., P.G.

Monitor Wells - A Different Type of Well

I suspect most people reading this article are interested in "supply" type wells, which provide a required minimum pumping rate (gallons per minute) at a water quality suitable for human consumption. Most of my articles in *WWR* focus on how we drill and develop water wells to obtain the best quality drinking water at pumping rates sufficient to meet our needs 100% of the time.

The theme for this month's *WWR* issue is water well supplies and remediation. This article will focus on wells used for remediation, or specifically, monitor wells (MWs). MWs are designed and built to sample groundwater in a specific zone or level in the subsurface. Monitor wells are usually two inches in diameter or less, and typically have a short screen (2-10 feet in length). Construction of an MW requires great care to ensure contamination is not allowed to be introduced (oil, grease, fuels, metals, etc.), which would affect the parameters or compounds to be analyzed as part of the monitored program for the particular site.

Monitoring wells became popular in the mid-1970s when the Environmental Protection Agency required a minimum of four MWs to monitor shallow groundwater quality around pits, ponds, and lagoons. MWs were also installed to monitor shallow water quality around buried petroleum storage tanks. MWs have been responsible for the founding of hundreds of new drilling

firms specializing in this type of well.

MWs typically have very low yields, often less than one gallon per minute. The frequency of well sampling can vary greatly from daily to quarterly (three months). Usually, some specified amount of water is removed from the well before a sample is obtained (often 2-4 well volumes).

During the construction of MWs, well development is very important - not so much to increase well yield, but to remove as much turbidity (such as suspended particles of silts and clays) than can affect the laboratory results, particularly dissolved metals.

Tom

Tom Kwader may be contacted
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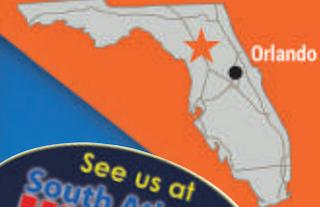


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Extracting Clean Irrigation Water from Hydraulic Fracturing Wastewater

Adapted from Information by Michigan State University



Michigan State University (MSU) will share nearly \$3 million with Oregon State University and the University of Nevada Reno to develop a fresh-water recovery system to extract clean irrigation water from hydraulic fracturing wastewater. The reclaimed water could help irrigate crops and livestock, especially in dry western states.

Because of the amount of fracking wastewater produced, finding a way to reuse this water is important. MSU's goal is to use low-grade solar or industrial waste heat to develop a new process of extracting clean water from the wastewater. Researchers hope to create a system which is modular, portable, scalable, and easily deployable in the field.

Andre Benard, associate professor of mechanical engineering, will serve as MSU's lead investigator. He'll work with MSU Foundation Professor James Klausner, chair and professor of mechanical engineering. "MSU's focus will be designing the novel multiphase heat exchangers needed for the process," Benard said. "We're working on a system that will efficiently separate, condense, and reclaim purified water from wastewater . . ."

Klausner mentioned there is a strong focus on delivering a low-cost wastewater treatment solution, fabricated with low-cost materials, adding that the new system would have a positive environmental impact.

The collaboration is funded by the U.S. Department of Energy's Advanced Research Projects Agency - Energy.



DOE Invests in Advancing Geothermal Drilling Technology

Adapted from Information by the U.S. Department of Energy

The U.S. Department of Energy (DOE) is planning to fund projects researching innovative geothermal drilling technologies. With plans to invest up to \$7 million into research and development (R&D), DOE's Geothermal

Technologies Office (GTO) plans to focus on one of the key issues in unlocking geothermal potential, the cost of drilling operations, which can account for up to 50% of geothermal exploration and development expenses. More specifically, they will concentrate on two of the most significant barriers: state of stress and lost circulation events (LCEs).

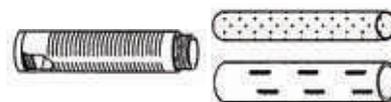
Understanding the state of stress will lead to being able to select better sites for drilling. The subsurface state of stress dictates the fracture networks providing the permeability necessary for a geothermal reservoir. Without prior knowledge of the subsurface stress, wells could be drilled in locations that aren't the best for accessing existing geothermal resources. GTO is funding research for the development of technologies which can characterize, monitor, and predict the state of stress.

LCEs occur when fluids pumped from the rig through downhole drilling equipment are lost and end up flowing into geological formations instead of returning to the surface to complete a circulation path. LCEs cost the gas and oil industry more than \$1 billion per year in rig time, materials, and other financial resources. In fact, according to one study, lost circulation added roughly \$185,000 to the cost of an average geothermal well. Since most geothermal drilling operations are in areas with highly fractured and altered material, lost circulation is more common in geothermal drilling than in other applications. Severe LCEs can prevent the drilling fluids from being able to clean the hole, leading to cuttings building up on the bottom-hole assembly causing the drill string to become permanently stuck. Many geothermal wells have been abandoned prior to reaching their target depth due to LCEs. The GTO plans to invest in research for developing technologies to anticipate and mitigate LCEs in geothermal drilling.

With more than 3.8 gigawatts of geothermal power online, the United States is a world leader in installed geothermal capacity. Developing technology to tackle state of stress and LCEs will reduce geothermal exploration and drilling costs, which will hopefully lead to the widespread development of geothermal resources across the country.



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Iowa's Hidden Potential May Be Its Geology

Adapted from Information by The University of Iowa

University of Iowa (UI) geologists are leading an effort to determine the age of an underground formation encompassing a ten-county region in northeast Iowa. They are hoping to determine if it is similar to a geologic complex beneath Duluth, Minnesota, which has minerals valued as high as \$1 trillion. If the Northeast Iowa Formation is found to be roughly the same age as the Duluth Complex, it could mean the Iowa region contains similar economically valuable deposits, such as copper, nickel, platinum, and other metals, but a final determination won't be made until a second core is drilled in the region.

These minerals matter because they are used for industrial, medical, technological, and energy-generation purposes. Platinum is used in catalytic converters for vehicles and may have a potential use in hydrogen fuel cells. Lithium is used in batteries which power a host of electronic devices. Global demand for such minerals is increasing, straining existing known supplies.

The U.S. Geological Survey's (USGS) Mineral Resources Program has started preparing a new national assessment of mineral resources. An area of particular interest is the Midcontinent Rift System, a formation more than one billion years old extending from Kansas to Michigan. Within this stretch, the USGS is interested in the northeast Iowa region. In 2012, they conducted the first airborne survey of the terrain around Decorah, which yielded a more detailed picture of the underlying geology, including the identification of the horseshoe-shaped Decorah Complex. They conducted a second survey over a larger area which included Elkader, Manchester, and Vinton. This survey also showed geologic features such as rings and horseshoe shapes. Neither survey dated the Northeast Iowa Formation, which meant both were unable to verify whether it's related to the Duluth Complex.

Since August 2018, Allison Kusick, a UI junior and geology major, has spent each Tuesday at the Iowa Geological Survey's warehouse at the UI's Oakdale Research Park to study a core drilled near Elkader by a mineral prospecting company in the 1960s. Under the direction of Earth and Environmental Sciences Department Professor David Peate, Kusick takes a segment of the nearly half-mile-long core and aims a series of beams from a portable X-ray fluorescence analyzer at it. The instrument almost instantaneously produces a summary of the type and concentration of minerals in the area of the core illuminated by the X-ray.



Allison Kusick holds a piece of the core sample.

In a section of the core obtained around 2410 feet belowground, Kusick found the mineral compound zirconium, which generally contains a mineral called baddeleyite. This mineral can be used to date the rocks by calculating the decay of uranium trapped inside. Kusick and Peate took the sample to the UI's Electron Microprobe Laboratory, where a more in-depth analysis of the crystals produced another surprise - the presence of the mineral zirconolite. The zirconolite also provided a precise method of dating, meaning UI geologists had two reliable age-dating candidates for the core. Samples will be sent to a USGS facility in Colorado for dating.

"I think it's cool," said Kusick. "I'm learning a lot more, not just about elements and minerals, but I'm learning about the instruments that geologists use every day. And, there could be an economic piece to this as well."

If the core drilled near Elkader is shown to be of the same age as the Duluth Complex, geologists would like to seek funding to drill a second core in the Northeast Iowa Formation.

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Through the Front Door!

by Jim Kuebelbeck

I probably have thousands of nuts, bolts, and screws in every type and size in my shop, but the one I need is never among them! ~Jim

Between the usual humdrum, day-to-day happenings in life, a little humor is sometimes a welcome relief, and I would like to share something with the readers of *WorldWide*.

My wife Carol and I were both in our home office recently. She was doing bookwork and I was on the computer when the phone rang. I told her I'd answer it.

In a heavily accented foreign voice, the male caller said, "Congratulations Mr. Kubbledabeck. I'm from Publishers Clearing House Sweepstakes, and your name was drawn! You have just won \$1.2 million and a new Mercedes-Benz automobile. Congratulations!"

Having never registered for the sweepstakes, I hesitated for a few seconds then said to him, "I'm speechless. I can't believe this. I've never won anything like this before in my life. This is unbelievable. This is just too good to be true. I just don't know what to say."

"Well," he said, "I'm glad to be able to give you this news. As a representative of *Publishers Clearing House*, the most satisfying part of my job is to notify the big winner that their name was drawn, and you now happen to be the big winner. Congratulations Mr. Kubbledabeck!"

I told him I was still in shock and didn't know what to say. Then before he could respond, I said to him, "I just gotta tell you that my great-grandmother was just promoted to Chief Flight Instructor in the Cuban Air Force."

After a few long seconds he said, "Why are you telling me this?"

I responded by saying what I just told him was about as believable as what he was trying to tell me! It took about three more seconds, then to my surprise, he responded with a long string of vulgar words and told me "where to go"! Before I could respond in kind, the phone went dead. Having overheard only my end of the conversation, Carol asked what all that was about my great-grandmother and the Cuban Air Force. I relayed the conversation and we both had a good laugh. (The caller never got to the point where I was to send him a certain amount of money, for the processing of my "claim"!)

*The statements and comments in this article are based on information and references believed to be true and factual. If you have any questions or comments, please forward them to me in care of **WWR**.*

Jim

Jim Kuebelbeck may be contacted via e-mail to michele@worldwidedrillingresource.com

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Terex Utilities Seeks to Raise Awareness for Beds for Kids

C&G

Adapted from Information by Terex Utilities

In Charlotte, North Carolina, thousands of children sleep without a bed or on the floor every night. The mission of Beds for Kids, a 501(c)3 organization, is to provide beds and essential furniture to families transitioning into permanent housing. Earlier this year, Terex Utilities team members took a break from their annual sales training to assemble new dressers for Beds for Kids.

"Each year, Terex Utilities team members seek to partner with the local community where we hold our annual sales training by assisting an organization serving people in need. One of our core values at Terex is citizenship - and reaching out like this allows us to work together to

make a small difference in the lives of people who are struggling," said Joe Caywood, director of marketing.

Beds for Kids spokesperson Kevin Warren said, "We strive to serve thousands of children and their families each year. Without the support of our community, we would not be able to continue advancing our mission of providing beds and essential furniture to children and their families in need. We appreciate Terex and their help with these dressers."





Ghana Drills Deeper

Adapted from Information by Boart Longyear



Boart Longyear's crews drilled the deepest hole ever in Ghana, reaching a depth of over 6800 feet. The team installed a wedge, and started navi drilling the hole on track at a depth of 2000 feet. The directional drilling project for Golden Star was completed safely and ahead of schedule.

Division Manager West Africa Jonathan Madigan said, "Our drilling crew in Ghana on this project worked safely and diligently in directionally drilling the hole to the target depth. I couldn't be more proud of the team that completed the project. Boart Longyear's consistent hazard- and risk-focused safety culture is embraced by the crews here in Ghana, and they appreciate that the field level risk assessments, preshift meetings, and other safety programs are designed to get them home safe to their families."

The client gave recognition to Boart Longyear for their safe, on-target, and ahead-of-schedule completion of the deep coring exploration drilling project. Boart Longyear in turn acknowledged the participation, collaboration, and contributions from every employee within Ghana, especially the team that drilled the record-breaking hole.



Editor's Note: In between our print issues, the *WWD&R* Team prepares an electronic newsletter called *E-News Flash*. Based on readership, this was the most popular *E-News Flash* article of the month. Get in on the action and subscribe today at: www.worldwidedrillingresource.com



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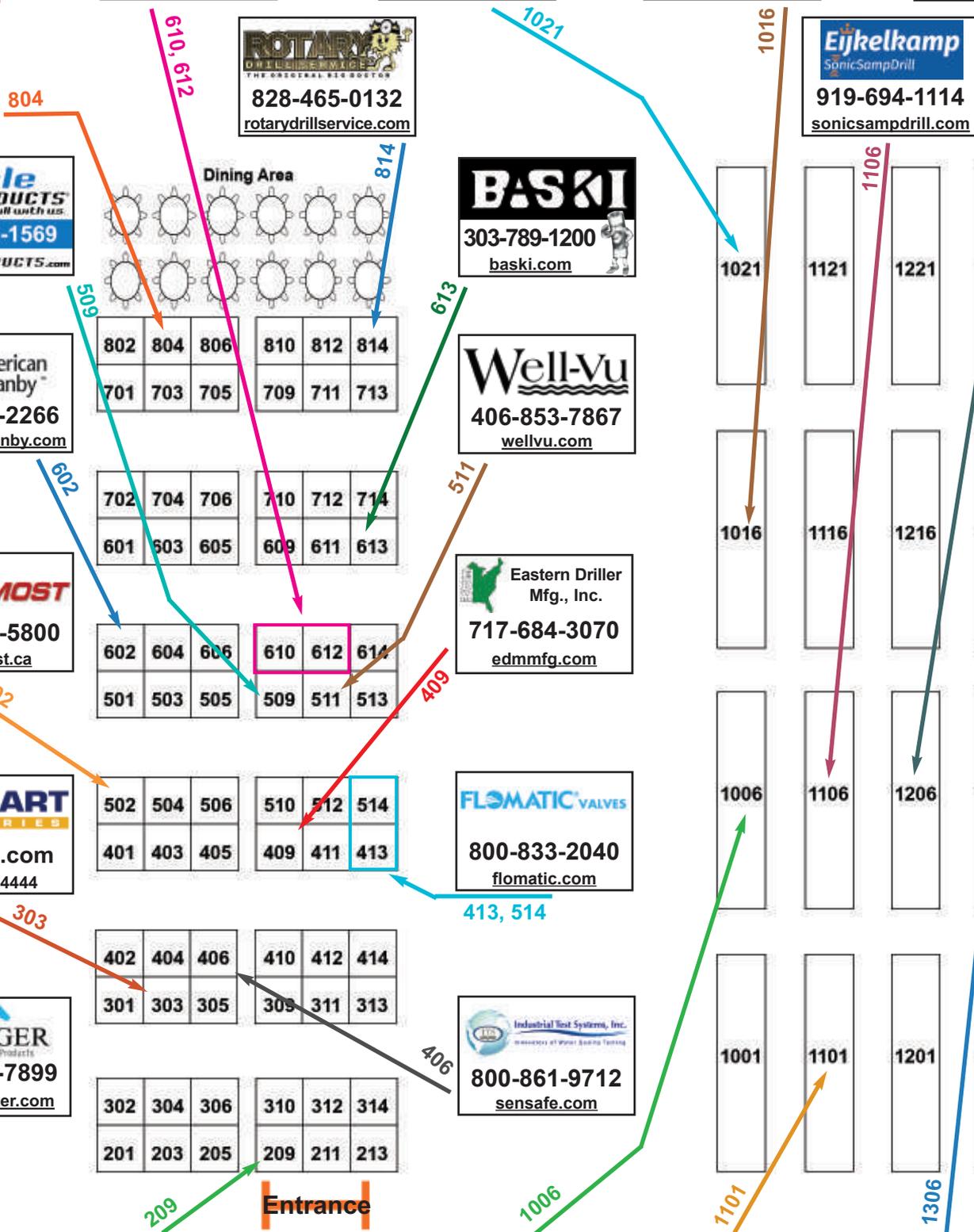
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The "Idiots" Corner

by "Billy Bob Smith"

Opinions About Miracles

During my life, I have seen many situations which were difficult, and some even impossible, to explain. Over time, I just accepted the simple truth there are miracles in the world every day. The problem is, many people don't agree with this idea or concept. I thought I would share a few of the stupid things some people have said about miracles - and there are a lot more, but neither you nor I have the time.

So what are miracles? Official definition:

- a surprising and welcome event that is not explicable by natural or scientific laws and is therefore considered to be the work of a divine agency.
- a highly improbable or extraordinary event, development, or accomplishment that brings very welcome consequences.
- an amazing product or achievement, or an outstanding example of something.

So here are a few I thought were the most idiotic:

- "Fables should be taught as fables, myths as myths, and miracles as poetic fantasies. To teach superstitions as truths is a most terrible thing. The child mind accepts and believes them, and only through great pain and perhaps tragedy can he be in after years relieved of them." *Hypatia*
- "The very idea of supernatural magic - including miracles - is incoherent, devoid of sensible meaning." *Richard Dawkins*
- "I don't believe in miracles because it's been a long time since we've had any." *Joseph Heller*
- "In those parts of the world where learning and science has prevailed, miracles have ceased; but in those parts of it as are barbarous and ignorant, miracles are still in vogue." *Ethan Allen*

Okay, how about a few positives:

- "I keep my heart and my soul and my spirit open to miracles." *Patrick Swayze*
- "Seeing, hearing, feeling, are miracles, and each part and tag of me is a miracle." *Walt Whitman*
- "I believe that miracles happen every day. Every person is a miracle. Every moment is a miracle. If only we can open our eyes, we'll see God's love everywhere." *Bo Sanchez*
- "Miracles happen every day, change your perception of what a miracle is and you'll see them all around you." *Jon Bon Jovi*

Now go experience a miracle today . . .

Billy Bob

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Purple Line Construction Ramps Up

Compiled by Caleb Whitaker, Associate Editor, *WorldWide Drilling Resource*®

EXB



Photos of Purple Line construction, courtesy of Traylor Bros., Inc.

The Purple Line is a 16-mile light rail line in Maryland, which will extend from Bethesda to New Carrollton. It will provide a direct connection to the Metrorail Red, Green, and Orange Lines; at Bethesda, Silver Spring, College Park, and New Carrollton. The Purple Line will also connect to Amtrak and local bus services. It is one of the first U.S. rail projects to connect suburbs without requiring riders to travel through a city, and will operate mainly in dedicated or exclusive lanes, allowing for fast, reliable transit operations.

Installation of erosion and sediment control measures, clearing and grubbing, grading, and building demolition is in progress. At the Bethesda Station South Entrance, which encompasses a shaft and cavern in rock, drilling of soldier piles for the support of excavation in the overburden has also begun. The extensive utility work includes water, sewer, and power lines. Underground portions of the project will be excavated by cut-and-cover and the New Austrian tunneling method (NATM).

Work on the Bethesda station and the direct elevator connection to the Red Line platform means blasting at the site of an old Apex building. The construction team is excavating what will be a 150-foot shaft for an elevator bank, improved ventilation for the Metro station, and the connection to the cavern which will serve as the Purple Line stop's mezzanine. The shaft will also be the



connection for a second entrance to the Bethesda Metro station, far below the Purple Line tracks. When crews hit bedrock, explosive blasting is planned for the shaft.

Crews will try to blast early in the morning every day throughout most of 2019. Like the work along the entire Purple Line route, this construction is being done right next to, and across from existing buildings with offices, apartments, and hotel rooms. The project has promised to remain within tight limits on vibration and noise to prevent any damage to the buildings or Metro line below, as well as to reduce the significant inconvenience of five years of construction work.

For now, crews are digging a tunnel about 20 feet high and 40 feet wide. After the tunnel breaks through at the other end, crews will go back through to dig another 10 feet down, making room for the concrete which will eventually hold the tracks. All work on the tunnel, including the tracks, is scheduled to be finished in 2021, and the rail line would open in 2022.

The tunnel is below the water table, so sump pumps are in place to get rid of water coming in through drainage holes drilled to relieve pressure. The water is pumped into a settlement tank to remove solids, before the treated water is put into a storm drain. Once the tunnel is completed, a waterproofing membrane will be installed. The drain holes will be sealed, and a permanent liner will be added with the goal of keeping the tunnel completely dry.



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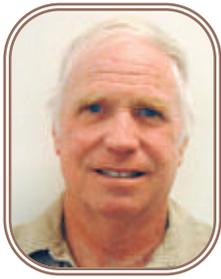
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Common Cause

by **Britt Storkson**
Owner, P2FlowLLC

Consider Air France Flight 447, Asiana Airlines Flight 214, Lion Air Flight 610, Ethiopian Airlines Flight 302, the USS McCain, the USS Fitzgerald, and many others.

Question: What do all of these aircraft and military ships have in common? Answer: All have been suspected of having computer control systems that were flawed in such a way as to cause death and considerable property damage.

These failures were not failures in the classic sense; meaning something disconnected or disintegrated, which in turn caused the crash or collision - what could be called equipment failures. These could be described more accurately as system failures. That is, not flaws in the equipment itself, but flaws in terms of how this equipment was put together and implemented. These include system overcomplexity, expecting the computer to do things the computer wasn't programmed to do, not fully understanding how the various systems interact with each other, and inadequate testing before putting the computer controls into service. This could be called a "mix" of issues.

With the above scenario, often one problem compounds the other problems within the systems. Software and hardware overcomplexity greatly increases the time and cost of testing this equipment. Since product testing doesn't generate immediate cash flow, it is often relegated to minor status when it should be a major issue. I spend far more time testing products than making them, and that's the way it should be.

I've observed well-known and highly regarded "cutting-edge" companies spending huge sums of money on flawed computer systems that, while costing the company huge sums of money, did not result in injury or loss of life because human lives did not depend on these products working properly. When human lives depend on these systems working correctly, when these systems malfunction even for an instant, lives are lost.

Often, these system operators must "cover for" the flawed computer. They have to remember this function doesn't work or that function causes the computer to "lock up", so don't use it. Why? Because it's cheaper to place the burden of making the equipment work right on the operator than it is to fix the computer. This begs the question: If the operator must "cover for" the flawed equipment, why have the equipment in the first place?

Most operators are highly qualified and are up to the task, but no human can learn and recall everything instantly with perfect memory retention. This problem is compounded by vendors constantly changing how the equipment works so the operator has to be "up to speed" on version 1, and then version 2 a few months later, and on and on. Constantly changing the system operation sets up the operator for failure, which is something we don't want.

After an incident which resulted in the failure of a system or process, often companies will write a "postmortem" detailing the problems leading up to this failure and recommending "fixes" so they won't happen again. This is a great approach that should be practiced everywhere.

Britt

Britt Storkson may be contacted via e-mail to michele@worldwidedrillingresource.com

The important thing is to never stop questioning.

~Einstein

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Earwigs, fire ants, spiders, and other creepy-crawlies living in the well, eventually die. As their decaying bodies land in the water, they become a food source for the bacteria living in the well. When provided with all of this grub, the bacteria grow and multiply quickly. Soon, the safe levels of bacteria explode into a high coliform bacteria count, making the well unsafe.

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A good well cap also protects it from surface contaminants. According to the National Ground Water Association, a properly sealed well cap is the first line of protection against nonpoint source pollution, which is the leading cause of groundwater contamination. This includes runoff from pesticides and herbicides, soil erosion, and elements from the street.

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Directional Drilling Site in UK Releases Environmental Data

Adapted from Information by Cuadrilla Resources Ltd

In the UK, shale gas exploration company Cuadrilla Resources Ltd is making use of its website, or ePortal, to share environmental data from its Preston New Road (PNR) drilling project, near Blackpool, Lancashire. Cuadrilla's ePortal, featured in the [August 2018](#) issue of *WWDN*, allows members of the public to track the status of environmental monitoring. The data includes hundreds of thousands of separate air quality readings taken continuously for more than a year.

A baseline was established using data collected during monitoring of the area between February 2016 and January 2018. The British Geological Survey (BGS) observed baseline levels, before site construction, and recorded ambient methane levels of up to 70 ppm (parts per million). Since the beginning of 2018, a group of independent specialists have conducted continuous air monitoring, including recording methane and nitrogen dioxide levels. As part of the project's environmental permit conditions, methane levels above 7.1 ppm must be relayed to the Environment Agency (EA).

There are hundreds of thousands of readings from each stage of the process including the drilling of two wells and hydraulic fracturing operations. Monitoring between mid-October and mid-December 2018, indicated the following results:

- There have been four separate instances of elevated methane levels recorded since May 2018, when a continuous methane detector was installed. Periods of elevated readings were less than 0.3% of the time, and the EA was notified of each occurrence.
- 99.7% of the time, methane levels in and around the site were below the 7.1 ppm standard. This included operational activities and during hydraulic fracturing and flaring.
- Three of the methane spikes were recorded in January 2019. The highest was due to a controlled release of methane through the flare during the well testing phase; it spiked at 30.5 ppm, which is still less than half of the highest level recorded during the baseline period.
- Methane was mixed with nitrogen gas for a short time which formed a noncombustible mix in the on-site flare. The flare pilot light was ignited to try and combust the mixture, and propane was also added for the same purpose, but the methane and nitrogen gas mixture could not be burned.
- The fourth instance of elevated methane emissions was in October 2018, when a reading of 12.1 ppm was recorded for about ten minutes. This was due to methane gas in the flow-back water stored in tanks.

The continuous monitoring site is only part of the monitoring network at PNR. The Lancashire County Council described the network as, "highly detailed and professional monitoring" which has made this the most monitored site in Europe.

Nick Mace, environmental manager at Cuadrilla said, "We are very proud of the extensive monitoring program . . . It has worked exceptionally well and the data set is probably the most comprehensive ever gathered at a shale gas exploration site. It shows how seriously we take our environmental responsibilities at Cuadrilla. The absolute level of methane emissions over the 12-month reporting period is reassuringly tiny. While there were four instances of somewhat higher methane levels detected at Preston New Road, let me put these into context to reassure people. The instances were short in duration, very low in absolute volume, and naturally-occurring background methane at this level was also detected before the site existed, so it is not uncommon to see short-term spikes in data. In addition, there are no health consequences whatsoever from very short-term emissions of methane at these low concentrations."



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A One-Two Punch in Cleaning Contamination

Adapted from Information by the U.S. Environmental Protection Agency



Removing contaminants belowground is challenging. However, when you combine soil vapor extraction (SVE) and air sparging, you have a safe and effective way to help clean contamination. So, how does it work? Let's start by taking a look at the processes and how they work together.

SVE works by extracting vapors from the soil above the water table using a vacuum to suck the vapors out. Air sparging involves pumping air underground to help extract vapors from groundwater and the wet soil beneath the water table. When used together, the addition of air makes the chemicals evaporate quicker, which makes the SVE process work even better.

These methods are typically used in areas contaminated with chemicals that evaporate easily, such as those in solvents and gasoline; chemicals known as volatile organic compounds, or VOCs.

Let's dive a little bit deeper into the process beginning with extraction. SVE involves drilling extraction wells into the contaminated soil to a depth above the water table, which must be deeper than three feet below the surface. Blowers or vacuum pumps, which are used to pull out the air and vapors, is then attached to the wells.

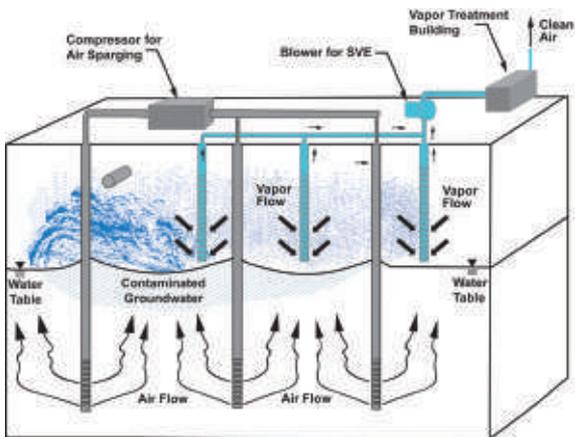


Pipes carry vapors from the underground SVE extraction well to treatment.

To prevent vapors from escaping into the air aboveground, the treatment area may be covered with a tarp, or even paved. This also prevents the vacuum from pulling in the air from aboveground, which would reduce the efficiency of the cleanup.

Air sparging tackles the problem by drilling injection wells into the groundwater-soaked soil below the water table. Using an air compressor at the surface, air is pumped underground through the wells. As air bubbles through the groundwater, it carries contaminant vapors into the soil above the water table. The mixture of air and vapors is then pulled out of the ground using SVE.

The next step is treating the extracted air and vapors, more commonly called off-gases, and there are a few different methods. First, the off-gases are piped from the extraction wells to an air-water separator to remove moisture. Then, the vapors are separated from the air, usually by pumping them through containers of activated carbon.



The chemicals are captured by the carbon while clean air exits to the atmosphere. Another method, called biofiltration, adds tiny microbes (bacteria) to break the vapors down into gases, like carbon dioxide and water vapor. The final way to treat the off-gasses is to use high heat to destroy the vapors.

When properly designed and operated, SVE and air sparging is safe for workers and the community. The vapors are completely contained from extraction to treatment so they can't be accidentally inhaled by anyone. Only clean air meeting air quality standards is released into the atmosphere.

SVE and air sparging are efficient ways to remove VOCs above and below the water table. The methods can help clean contamination under buildings while causing little disruption to nearby activities when in full operation. It is being used, or has been selected for use, at Superfund sites around the country.

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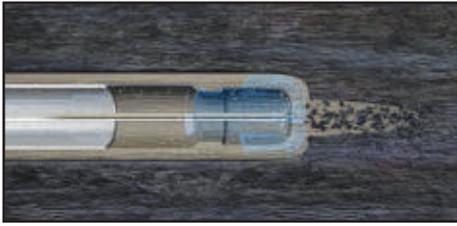
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Adapted from Information by HyperSciences

GEO



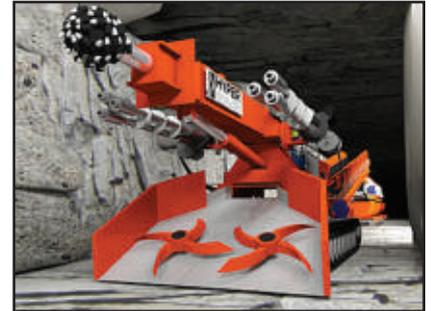
HyperDrill.

HyperSciences is a technology company which has created an innovative hypervelocity propulsion system for major industries such as fast tunnelling, energy drilling, and aerospace. The company is commercializing its robotic HyperCore tools for HyperDrill which is designed to allow low-cost access to deep energy, including both conventional gas and oil use, as well as their "Energy Anywhere" geothermal system.

HyperCore uses low-cost chemical energy to robotically load and then accelerate projectiles to hypersonic velocities, allowing projectiles upon impact to break and pulverize hard rock faster, deeper, and through a wider range of conditions. HyperDrill is a downhole energy drilling solution, which is compatible with existing

drilling systems. HyperCore 100 is the four-inch inner tube bore diameter version of the HyperCore system, which can be employed in many different ways, including vertical or horizontal integration into existing equipment, enabling rapid and efficient energy deposition.

For the construction, mining, and tunnelling industries, the company has HyperBreaker - a near surface rock breaking solution, which reduces costs and time to break rock. The same technology was used to create the Hyper Tunneling Boring and Mining system (HTBM), which is a robotic mining and tunnelling solution that uses continuous hypervelocity repetitive projectile impacts. This improves performance (speed), eliminates dangerous explosives, and reduces high capital and operating costs. HTBM includes some ancillary equipment specifically developed for underground tunnelling and mining, including robotic steering and acoustic damping.



HyperBreaker - HTBM.

Energy Anywhere Geothermal leverages high-speed drilling and patent-pending scalable direct thermoelectric power generation technologies to provide a cost-effective solution for power plants. The technology is designed to drive projectiles through tough environmental conditions to quickly and efficiently reach untapped geothermal resources. By reaching these deep geothermal deposits, heat energy will be conducted to the surface where it will be converted into electrical energy.



"Energy Anywhere" geothermal system.

HyperSciences is pursuing partnerships with key industry leaders for paid research projects, while targeting a deep energy drilling joint project. Once successful field trials have been achieved, they believe the geothermal plant systems will have been matured, and complete systems will be ready for operation. They are estimating first plant installations in seven-megawatt increments starting in 2021 after full funding.

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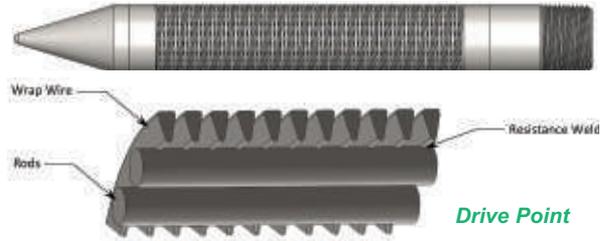
Well Screens ~ Keeping it Clean

Adapted from Information by Alloy Machine Works, Inc.

Every day, 83.3 billion gallons of groundwater are pumped in the United States. In fact, nearly half of the U.S. population depends on groundwater for its drinking water supply. One issue many wells contend with is sand and gravel intrusion. Well screens can help alleviate those problems by acting as a filtering device, allowing water to move into the well, while keeping out gravel and sand.

Alloy Screen Works, a division of Alloy Machine Works, Inc. has been producing industrial-quality screens since 1998. The company's Drive Point Screens are rod-based, wedge-wire wrapped screens. The large inlet area provides maximum water flow, while the continuous slot allows more open area than conventional gauze-type drive points made on pipe.

The nonclogging slots are formed by wedge-shaped wire, wrapped spirally around preset vertical base rods, and specially welded at each point of contact. The wire wraps are precision spaced giving uniform slot tolerance throughout the length of the screen. Wedge-shaped wire forms "V" shaped openings between wraps, which provide self-cleaning action and greatly reduce flow friction. Small particles are easily passed through the continuous slot, while larger ones are held out without inhibiting the total inlet area.



Alpha

A. Support Rods

The structure and number of support rods provide strength. The rods are made of the same material as the wrap wire to prevent corrosion.

B. Screen Wrap Wire

V-shaped wire welded at each junction with a support rod provides a self-cleaning action for better flow and less chance of plugging.

C. End Fittings

All standard and custom-made fittings are rigidly secured to the screen body.

The Alpha rod-based, wedge-wire wrapped sand screen provides more open area than other well screen designs. It is versatile and easily adapted to several types of industrial and water well applications. Its continuous slot design reduces encrustation and helps prevent plugging while preventing sand from damaging pumps.

The wire-wrapped design produces flow rates almost three times higher than bridge-slot screens, and almost ten times higher than slotted pipe.

These screens are customized to exact specifications using a sophisticated, electronically-controlled fusion welding process. It provides maximum flow, improved well efficiency, and superior tensile strength for dependability and long well life.

With over 150 years of combined industry experience, the company's technical staff has knowledge specific to the screen industry. Their unique problem-solving skills have assisted companies in the gas and oil, water well, environmental, and other industries.

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Longest Known Lateral in the Permian Basin

Adapted from Information by Surge Energy US Holdings Company

Based on IHS and Drillinginfo databases, the longest known lateral in the Permian Basin was drilled earlier this year by Moss Creek Resources Holdings, Inc., a wholly owned subsidiary of Surge Energy US Holdings Company. The Medusa Unit C 28-09 3AH was successfully drilled 100% in zone of the Wolfcamp A Formation to a total measured depth of nearly 24,600 feet (total vertical depth of around 7100 feet). The record-breaking well was drilled with a total horizontal displacement of 17,935 feet.

Surge Energy partnered with Latshaw Drilling & Exploration's Rig 10 and Pro Directional for directional drilling services. It took 18 days for this technological accomplishment to be executed from surface to total depth. The drill crew utilized conventional mud motor and measurement-while-drilling (MWD) technology. The well is expected to be completed and brought online later in the year.

"This industry milestone in the Permian Basin is our latest example of the innovation and technical expertise being executed by the Surge Energy Team," stated President and CEO Dexter Burleigh. "We are extremely proud of our drilling team for this significant achievement."



Drilling Into Money Not Boring

by Mark E. Battersby

Avoiding Potential Payroll Pitfalls

Payroll taxes withheld by employers account for nearly 72% of all revenue collected by the Internal Revenue Service (IRS). IRS Commissioner Charles "Chuck" Rettig recently issued a stern warning against employment tax fraud, which occurs when a drilling business withholds federal income tax from employees' pay yet fails to send it to the IRS.

When employers fail to pay/send the required employment taxes, not only are they cheating the system, they're cheating future generations relying on those taxes to help build the future. Employers know, or should know, the rules - they must deduct, deposit, and report employment taxes accurately and in a timely manner.

There are also state and local requirements where deposit and reporting dates should be checked. Late payments may come with penalties and accrued interest from local, state, and federal agencies. Naturally, every employer should be registered with the proper authorities and tax identifying numbers obtained.

And, don't forget other potential payroll problems. The Fair Labor Standards Act (FLSA), for example, requires the payment of a premium for overtime. Calculating overtime can be confusing since state and local wage and hour laws may come into play.

When those payroll taxes due the government are not paid, are paid late, or are paid but don't follow the correct guidelines, employers can face severe penalties, as well as accruing interest. Utilizing a payroll service eliminates worries about submission guidelines, accuracy of payment, and getting taxes paid on time. However, monitoring of the payroll service is important as the drilling company remains responsible.

Failure to comply with any of the three components of direct deposit - timely, correct, and in the right manner - subjects an employer to the dreaded Failure to Deposit (FTD) penalty. One of the nastiest and most feared taxes currently imposed is the "Trust Fund Penalty Tax," a whopping 100% penalty on payroll taxes withheld from a drilling operation's employees, but not forwarded to the federal government.

Obviously, every employer must withhold the right amount of taxes from the paychecks of all employees, as well as understand the amounts the drilling business must contribute. In fact, understanding the basic rules for withholding payroll taxes, and paying over withheld amounts on the wages of all employees in the drilling business is a good start. Guidance and advice from a competent, qualified advisor is virtually a necessity.

Mark

Mark E. Battersby may be contacted via e-mail to
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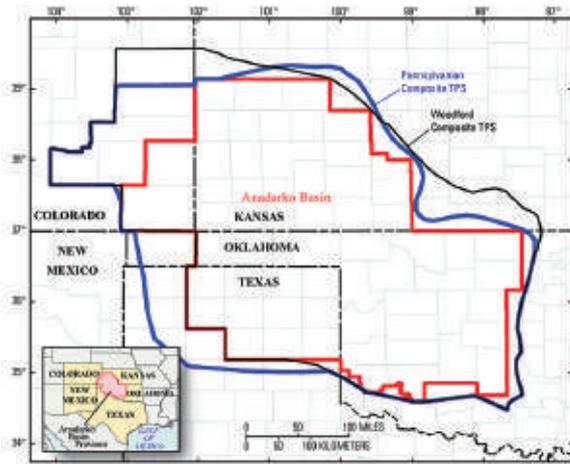
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New Kind of Oklahoma Land Rush

Adapted from Information by IHS Markit

G&O



Map showing boundaries of the Anadarko Basin Province, courtesy of U.S. Geological Survey.

The Greater Anadarko Basin has been a prolific source of conventional U.S. gas and oil production since the 1950s. According to new energy research from IHS Markit, a leader in critical information, analytics, and solutions, the basin holds an estimated 16 billion barrels of oil and more than 200 trillion cubic feet of gas in unrisks, technically recoverable resources in unconventional reservoirs.

"The Anadarko Basin has long been a major contributor to U.S. production, but it is just getting started in terms of delivering on its unconventional production potential," said John Roberts, executive director, global subsurface operations and coauthor of the IHS Markit Anadarko Basin research. "We are now witnessing a new kind of Oklahoma land rush. But unlike what happened in 1889 when lands were opened to settlement, this time the competition is for access to the energy resources that lie below the surface."

The analysis shows the basin is pushing toward new all-time production highs long after conventional gas and oil production peaked in the 1970s and 1980s. Since 2008, horizontal drilling in the Anadarko Basin has increased sharply, and annual basin production volumes have already set new peak records.

The IHS Markit Complete Play Analysis of the Greater Anadarko Basin, Texas, Oklahoma, and Kansas is the first phase of a comprehensive, 18-month-long project to model and interpret the basin's key geologic characteristics, including 3-D geologic models of 41 plays to better estimate its remaining hydrocarbon potential.

Among the most surprising results was the vast potential of the Simpson Shale Formation, which IHS Markit now believes could be one of the biggest yet-to-be-developed shale plays in the U.S.

"The Simpson has long been among the largest historical producers of vertical production in the Anadarko Basin," Roberts said. "But our new analysis shows that there is also significant Simpson potential as a major driver for horizontal shale production."

Overall, the new results underscore Anadarko Basin's renewed attractiveness. It has 41 stacked plays, which overlap in many parts of the basin. For operators, this means multiple targets can be accessed from one well pad.

"As it stands now, only about 20% of the Anadarko Basin's STACK [Sooner Trend oil field, Anadarko basin, Canadian and Kingfisher counties] sweet-spot locations have been drilled or developed," Roberts said. "The play is still in its early stages of unconventional development. We can easily envision an additional 4000 to 5000 horizontal wells drilled."

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The advertisement features a collage of various drilling tools and equipment, including drill bits, drill pipes, and drill collars, set against a dark background with a red grid pattern. The text is prominently displayed in white and red.

New Rig for Shallow Water Wells Gets into Tight Jobsites

Information Provided by Kejr Inc.

DRILLMAX® has been a well-known and respected manufacturer of geothermal and water well rigs for nearly 34 years. Based in Ocala, Florida, the company's success has been directly tied to the quality of work, as well as the many relationships forged over the years.

The DM250 model is the smallest of the lineup and is known for being a high-production rotary rig capable of handling 20-foot drill pipe while maintaining its compact size for mounting on a non-CDL truck chassis. The simple goals for the NEW DM250 product were to enhance current operator features, simplify manufacturing, improve serviceability, and reduce rig weight.

With a compact size, it's great for residential work where limited access is a priority. No more worrying about tearing up driveways or yards makes this rig a smart choice for everyday use. Carry up to 300 feet of drill pipe on this rig for 2-6-inch shallow water wells. The Dodge 5500 chassis is equipped with a Cummins diesel engine, automatic transmission, and 4X4.

Using the helper side controls to operate the jib and winch controls, the helper loads the drill pipe in the single rod loader. This makes the DM250 easy to operate with a two-man crew. The neatly laid out control panel includes engine monitoring, a safety E-stop, hydraulic pressure gauges, friction control levers for mud pump and rotation circuits, and electronic throttle controls.

The tophead carriage uses rollers instead of slides, providing smoother travel, easier maintenance, and longer life. The DM250 table assembly has clearance for 12-inch PVC casing, while the holding fork and hydraulically operated adjustable breakout wrench make tripping out fast and safe. It can be set up with a centrifugal or piston mud pump and development air to meet your job needs. Mud pump and air compressor options include 3L8, 5x5 duplex, centrifugal pumps, and 85 cfm (cubic feet per minute) development air compressor.

For customers, the DM250 is appreciated as their most productive and versatile rig for use in water well and environmental drilling. A valued byproduct of the simple operation is the easy training of new operators. Whether drilling a 25-foot screen well or a 400-foot artesian rock well, customers appreciate the added benefit the DM250 brings to their fleet.



The DM250 is the only truck-mounted rig under class A/B CDL requirements able to handle 20-foot pipe.

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The Road to Guts & Glory 2019

Adapted from Information by Grundfos



The 2019 Grundfos WaterPRO Championship sends contestants barreling toward victory on the Road to Guts & Glory - a timed virtual reality (VR) game testing both industry and Grundfos product knowledge. Contestants will complete a virtual reality challenge in which they answer a customer call for installation of a new SQ pump. Each contestant starts with 250 points, and points are lost based on time and how they respond to challenges, and points are gained for answering Grundfos product-related knowledge questions.



The contest is a two-stage competition open to all water well contractors in the United States and Canada. The first stage of the contest will consist of approximately 75 local qualifying events. One of these qualifying events will be held July 27-29, at the upcoming South Atlantic JUBILEE, taking place at the Myrtle Beach Convention Center in Myrtle Beach, South Carolina. In qualifying events, the top two scorers will receive a Visa® Reward Card - \$100 for first place and \$50 for second place.

In the second stage, contestants with the top nine scores from among all U.S. contestants, and the contestant with the top score from among all Canadian contestants, as well as two “walk-on” contestants, will qualify to compete for the championship at Groundwater Week in Las Vegas, Nevada, currently scheduled for December 2-5. They will receive round-trip airfare to the event, a Groundwater Week 2019 show pass, and three nights’ accommodations for themselves and one guest.

At the championship event, the first place winner will take home \$10,000 and the 2019 WaterPRO Championship title; second place will receive \$3000; and the third place will get \$1500.

To compete in the contest, you must be a professional water well contractor and meet one of the following requirements: be a registered WaterPRO Dealer in the U.S. or Canada at time of the qualifying event; and become, or be employed by, a registered WaterPRO Dealer in the U.S. or Canada by December 2, 2019 to play in the finals.

Want to get ahead of the competition? Every week, Grundfos will post hints for the knowledge-testing portion of the VR game in the WaterPRO Portal. Do you have what it takes to receive all the glory and win \$10,000 by becoming the 2019 Grundfos WaterPRO Champion?

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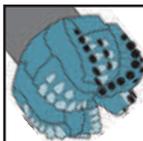


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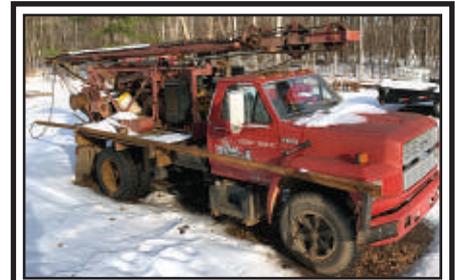
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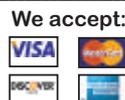
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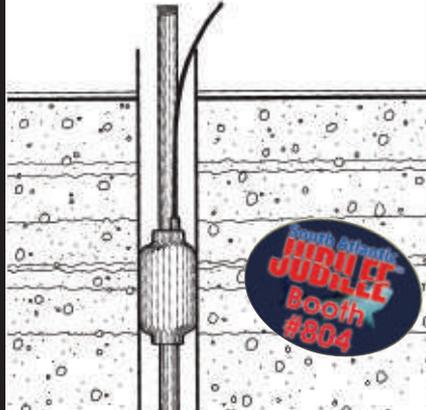
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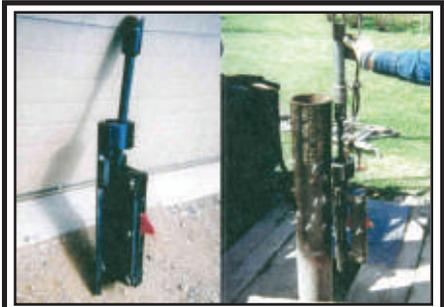
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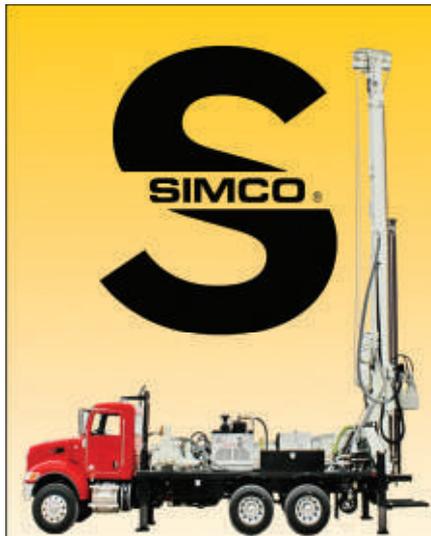


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**WDR wishes everyone a
great Independence Day.
The WDR office will be
closed on July 4, 2019.**



Ronnie's Real World is back . . .

I read a great deal. What really peaks my interest are the many newsletters we receive from state associations. Some articles are kept because I want to share them with you. It may take some time for me to get around to them, but there is a lot involved. It has to be the right time. This particular article came from the Second Quarter - 2018 NJGWA Newsletter and was written by Ron Barber - Master Driller / Summit Drilling.

“Things We Take For Granted

What made me think of writing this was our last snowstorm. I had gotten home a little early that day because of the snow and I took a nap. When I awoke, I had no power. I have lived in my house for 32 years and can count the number of times I've lost power, for more than 5 minutes, on one hand.

Today, my neighbors had another tree go down. The last time we lost power was when one of their trees tore down the power lines, snapped the pole in half, and brought the transformer down. It ripped the electrical meter right off his house into the street. We were without power for 4 days.

The Fire Department wouldn't touch the tree because it had a power line in it. The power company estimated 4-5 days to get out there, so the neighbors and I went out and cut it up. The tree had fallen across the cul de sac trapping us in. Little things like having power really is just something you take for granted!

Being able to leave your house when you want to is something you take for granted.

I started to think about other things we take for granted. Most of us in the business started drilling when we were young. Our youthful vigor and enthusiasm is something we always thought would be there, but then old age starts to creep up on us. We still think a good game, but sometimes our bodies don't work like they used to. Most of us in the drilling business started fairly healthy. Then small or sometimes big ailments come into play. Joints go bad, your hearing starts to go. You get arthritis in places you never knew you had, and unfortunately sometimes more serious illnesses. We tend to take our health for granted!

After many years, we sometimes take our jobs for granted. A lot of drillers are in family businesses. They are fairly safe, but for others, they could get laid off, hurt, fired, or the company shuts down. You just never know what the future brings.

Your friends and family are something you can take for granted. Friends move away or you just lose touch because of the hectic world we live in or for a variety of other reasons. Your family members are just there, you never think much about it, you just take it for granted.

Then the kids grow up and go out on their own and then one day they're not there like they used to be.

A lot of you know that I just lost my wife to cancer. That's something I took for granted. One day we were planning our retirement and what we were going to do later on in life, and the next day she's not there anymore.

I guess the point I'm getting at is that it is easy to take things for granted. Wake up and appreciate what you have, you just never know when it or they won't be there. I now have a new perspective on life. Not to be cliché, but slow down and smell the roses. You'll be better off for it!"

I just want to say thank-you Ron for sharing this with us. It really does hit home for so many of us - whether we are drilling contractors or what our lot in life is. Life is too short ~ enjoy what you have, while you have it.

Veronica J. "Ronnie" Jones, WorldWide Drilling Resource, Inc., Managing Publisher

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