

April 2018

Volume 15

WorldWide Drilling Resource®

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ENV - Environmental	EXB - Exploration/Blasthole
G&O - Shallow Gas and Oil	GEO - Geothermal
MIN - Mining	WTR - Water

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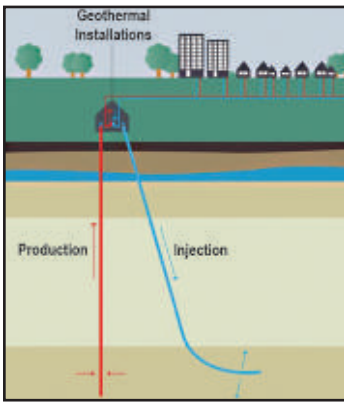


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Partnership Aims to Increase Geothermal Energy in Denmark

Adapted from a Press Release by E.ON

In the coming years, hot water from the Danish underground will supply heat to more cities in Denmark. This is the ambition behind a new partnership between the energy company E.ON and the Geothermal Operations Company (GEOOP), which will unearth the business potential of geothermal power in a number of major cities.

Geothermal heat will be recovered by pumping warm water from roughly a mile beneath the earth's surface. This could potentially provide heating for up to 250,000 Danish households.

Lars van Hauen, E.ON's CEO said, "Almost half of the fuel consumption in district heating comes from coal and natural gas. We must be much better at utilizing the heat that lies a few [miles] under our feet. In Denmark, we have the best conditions for utilizing geothermal heat because of our well-developed district heating, but we are still lagging behind the rest of Europe.

Together with GEOOP, we've been thinking about doing something about it."

Theoretically, geothermal heat can provide all the district heating in Denmark, but its full potential depends on local conditions and the possibility of connecting the geothermal heat to existing district heating.

"As an energy company, we are committed to finding alternative solutions for black energy, and we constantly explore new initiatives and business areas that create value for our customers and the environment. Under many Danish cities, large amounts of underground heat are present, so our first step is to investigate the possibility of utilizing the hot water in areas with greater district heating as in Copenhagen, Hillerød, Roskilde, and Aalborg," explained Van Hauen.

Geothermal heat, along with other renewable energy sources, can make a significant contribution to reducing Danish greenhouse gas emissions, but so far the economic risk associated with particular investigations has hampered development. However, new research is increasing investment security in geothermal drilling.

In 2016, GEOOP was a partner in a research project supported by the Green Development and Demonstration Program EUDP. The project revealed the possibility of using geothermal energy on a larger scale and provided new data on Copenhagen's subsurface geology. GEOOP also participates in the research project Geotherm, supported by the Innovation Fund, which covers the operational aspects of geothermal surface systems.

In addition to reducing Denmark's carbon dioxide emissions, geothermal heat is expected to ensure a low and stable heat price for hundreds of years due to the huge amounts of underground hot water. This cheaper and sustainable district heating is the main ambition for the partnership.

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It's Great Except . . .

by **Britt Storkson**
Owner, P2FlowLLC

In a recent *Wall Street Journal* Internet posting were the following headlines: "German Engineering Yields New Warship That Isn't Fit for Sea." With the subtitle: "[The German] Navy refuses to commission frigate after it failed sea trials; critics cite fiasco in conception and execution."

The *Journal* goes on to say: "First delivered for sea trials in 2016 after a series of delays, the 7,000-ton Baden-Württemberg frigate was determined last month to have an unexpected design flaw: It doesn't really work."

Also, a series of articles by Tyler Rogoway on thedrive.com goes on to explain: "Additionally, the whole automation and minimally manned crew concept is a risky one, especially for a ship that is supposed to operate so far from home for such long stretches of time. If anything, the latest incidents aboard America's top-of-the-line Arleigh Burke class destroyers underlines the personnel and readiness issues that can exist even on constantly deployed ships that are traditionally staffed and have extensive support infrastructure in their operating region."

In a *New York Times* article written by Eric Schmitt and dated September 27, 2017: "Collectively, current and former officers said, the new rules mark several significant cultural shifts for the Navy's tradition-bound fleets. At least for the moment, safety and maintenance are on par with operational security, and commanders are requiring sailors to use old-fashioned compasses, pencils and paper to help track potential hazards, as well as reducing a captain's discretion to define what rules the watch team follows if the captain is not on the ship's bridge."

What can we learn from this? While automation is great, it must be properly applied. Computers can do a lot of wonderful things, but they cannot reason. Computers are not capable of making judgment calls or something we call "common sense". Right now, there is a lot of interest in what is called "machine leaning", which is defined as the machine (computer) being capable of learning. This is all well and good, but if the software framework isn't there to properly organize the information, it's not going to work. The information can be correct (and it almost always is), but if it isn't organized correctly, you're looking at a disaster.

Another factor is the operators often get "insulated" from what's actually going on in the field. They rely too much on their instruments and have little or no concept of how the information - be it a temperature, pressure, or other information - got there. Often, the operators do not know how to verify if the reading they see on their computer screen is actually correct. All sensors output a voltage which reflects the status of whatever is sensed. If the operator does not know the correct voltage output of the sensor for a given condition - or does not know how to measure it - one might as well not have the sensor.

I was particularly struck by the statement: "Commanders are requiring sailors to use old-fashioned compasses, pencils and paper to help track potential hazards." Imagine that! Using just a pencil and paper to track something. Why not use a tablet or smartphone? After all, this is 2018 and we have to use the most up-to-date technology available, right? All jesting aside, the reason this rule was imposed is because it is the most practical and reliable way to do the job. In other words, this approach is best suited to the task. Maybe a computer solution will come along which is equal or better to this approach, but until it happens and is thoroughly proven, we had better stick with what works - especially when human lives are at stake.

To sum this up, I'm not against using computers to do all sorts of things - just use them when there is a demonstrated need. Anything else is inadequate or impractical for the task, and the computer saves you time and money instead of costing you.

Britt

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

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Hot Off the Press

Robots Replacing Humans in Mining

In BDO's *Energy 2020 Vision: The Near Future of Mining* report, BDO's Natural Resources leaders around the world made predictions for the mining industry in 2020. **They include:**

→ Robots will replace more than 50% of miners, and mining accidents will be cut by 75%. Half of the miners will be retrained to run the technology controlling the robots.

→ Technology will drive a 30% decrease in per ton digging costs for global mining companies leveraging Internet-connected sensors and automated drilling equipment.

→ Miners of the Future - As technology companies become more dependent on the security of supply of important minerals, they will take direct stakes in mining companies or in operating mines themselves.

→ By 2020, renewables will account for one-quarter of the world's electricity generation as dependence on coal decreases.

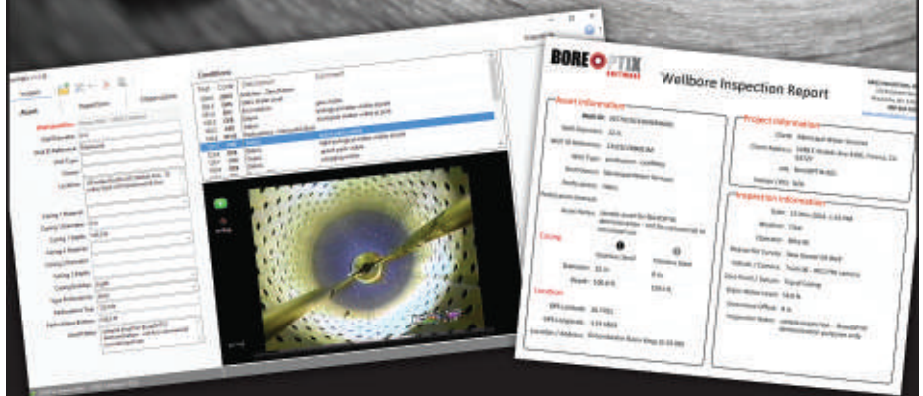
"The value of harnessing technology is clear. Driverless technology increases mining output by 15-20%, while cutting fuel and maintenance costs by 10-15% and 8%, respectively. It also improves mining safety exponentially. At the same time, though, these Internet-connected technologies open the mining industry up to new cyberattack vectors that they must hedge against through proper internal controls. If not, they risk seeing their entire operation crippled by a single attack. We believe that to prepare for success in 2020 and beyond, mining companies must strive to become 'Lean, Green, Digital' machines," said Sherif Andrawes, national leader, National Resources at BDO.



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Mines Testing New Polymer for Mercury Remediation

Compiled by Bonnie Love, Editor, *WorldWide Drilling Resource*®

Thanks to university researchers in South Australia, there's a new tool for cleaning mercury pollution from soil, water, and even the air. Mercury has been a well-known environmental pollutant for decades. It is a neurotoxin and is considered by the World Health Organization as one of the top ten chemicals or groups of chemicals of major public health concern. Mercury pollution threatens the health of millions of people around the world. It has toxic effects on the nervous, digestive, and immune systems. In severe cases, it can even cause irreversible brain damage.



After absorbing mercury pollution, the rubber-like polymer changes color, indicating the job is done. More of the affordable polymer mixture can then be placed in the area to continue to process.

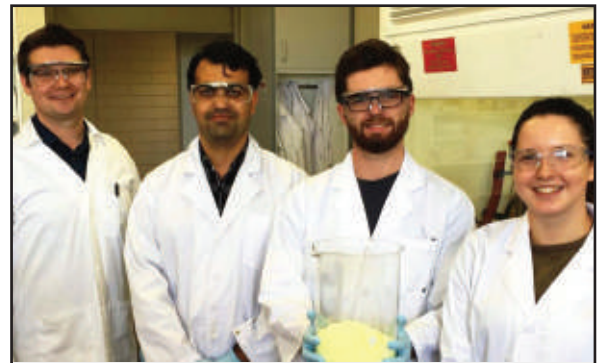
Researchers with Flinders University have discovered a way to use cooking oil and sulphur to extract mercury from the environment.

The new canola oil polymer is capable of trapping the most dangerous and common types of mercury pollution - mercury metal, mercury vapor, and highly toxic organomercury compounds - which harm both aquatic and terrestrial systems. Award-winning scientist Dr. Justin Chalker with Flinders said, "Our previous research studied a single type of inorganic mercury, so this is a significant advance."

In the latest pioneering new technology, Dr. Chalker and fellow researchers from around the world combined second-hand cooking oil and sulphur - a common, low-cost byproduct from the oil and gas industry - to produce a new kind of polymer. The process actually solves two problems, cleaning up mercury pollution and recycling industrial waste.

Currently, the process is being tested in field trials at mining sites and areas where mercury-based fungicides are used. According to Dr. Chalker, the latest development will enhance future sustainability and environmental protection, with few remediation methods readily and affordably available. "Mercury is encountered in several industrial activities including oil and gas refining and coal combustion," he stated. "Alarmingly, mercury and mercury-containing materials are still used intentionally at many chloralkali plants and in artisanal gold mining. Additionally, mercury-based fungicides are still used in certain agricultural sectors."

One of the largest sources of mercury emissions globally is artisanal gold mining. In this practice, mercury metal is used to extract gold from the surrounding ore. The mercury-gold mixture is then heated, often with a hand torch or on a cooking stove, to vaporize the mercury and isolate the gold. The mercury-rich tailings and exposure to mercury vapor threaten the health of the nearly 15 million people involved in this process.



Dr. Justin Chalker with postgraduate students Salah Alboajji, Max Worthington (with sulfur material) and Renata Kucera.

The research was led by Dr. Chalker and Flinders University students Max Worthington, Renata Kucera, and several

researchers from the Flinders Centre for NanoScale Science and Technology. Key contributions were made by senior collaborators at the University of Cambridge and the Institute for Molecular Medicine in Lisbon, Portugal, the Oak Ridge National Laboratory in the U.S., Royal Melbourne Institute of Technology and the University of Melbourne in Australia.

Recently, Dr. Chalker made a business pitch for the commercialization of the new polymer and was awarded \$5000. The mercury-binding polymer is licensed for sale to Kerafast a U.S. company based in Boston. This reagent company focuses on making unique laboratory-made research tools easily accessible to the global scientific community.

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BREAKING NEWS

New Dates for SaMoTer 2020!

Historically, SaMoTer, the triennial international trade fair dedicated to the world of construction equipment, has been held in February. However, the upcoming SaMoTer 2020 will be held March 22-25, 2020 at the Verona Exhibition Centre, in Verona, Italy.

"In designing SaMoTer 2020," said Giovanni Mantovani, CEO and director general of Veronafiore, "we continue the path of upgrading and development initiated with the 2017 edition - as the new claim for the promotional campaign makes quite clear: #FOLLOWTHEBEAT. We have reallocated the date from February to March, in response to the needs expressed by manufacturers to ensure increasingly tailor-made attendance at the trade show. . ."

In addition to the exhibition and business area, the event will also feature a strong focus on technological innovation, contents, and in-depth training for operators.



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WHO'S IN THE NEWS



The Texas Ground Water Association was pleased to present Alex Neely with the Robert "Bob" J. Neely Award. Named for his grandfather Bob, the award recognizes workers for exceptional performance. Alex is a third-generation water well drilling professional.

Additional announcements from the Texas Ground Water Association, Minnesota Water Well Association, Collier Consulting, Atlas Copco, and Deep Foundation Institute Educational Trust are located in our online issue: worldwidedrillingresource.com

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Drilling Into Money Not Boring

by Mark E. Battersby

New Rules for Trade-Ins, Swaps, and Other Like-Kind Exchanges

Most drilling business owners are aware "like-kind" exchanges can be an excellent way to postpone the gain resulting when any of the operation's assets are disposed of. The Tax Cuts and Jobs Act (TCJA) continues to allow businesses to defer the tax bill on the gains from property they are disposing of by the simple strategy of exchanging it for similar property.

Often overlooked as a tax strategy, so-called like-kind exchanges involve swapping or trading one asset for another without receiving strictly cash - or a large, immediate tax bill. Although more a strategy for deferring a tax bill rather than a tax bill reduction, with multiple exchanges, gains from sold or traded business assets can be deferred for decades, ultimately entirely escaping taxation.

Fortunately, the tax rules allow a drilling contractor to postpone paying tax on the gain resulting from sold or exchanged business assets so long as the proceeds are reinvested in similar property, a like-kind exchange. Remember however, gain in a like-kind exchange is only tax-deferred, not tax-free.

Most exchanges must merely be of a like-kind - a phrase which doesn't always mean what many think it does. Under the surprisingly liberal rules, one business can even be exchanged for another, but there are traps for the unwary.

First, both the property given up and the property received must have been held for productive use in a trade or business. Vehicles, equipment, machinery, real estate, etc. used in a business all qualify.

The second basic requirement is obvious: the property exchanged must be of like-kind. A good example is a truck for a truck. With real estate (the most popular type of like-kind exchange), almost any ownership interest in real property exchanged for another interest in real property will qualify.

The tax law's Section 1031 governing like-kind exchanges was modified by the TCJA to limit like-kind exchanges to so-called "real" property (but not for real property held primarily for sale). The redefined like-kind exchanges ensure real estate investors maintain the benefit of deferring capital gains realized on the sale of property.

Last December's TCJA limited the Section 1031 like-kind exchanges to "real" property, eliminating intangible business property, but largely leaving this strategy which has been so helpful to so many within the drilling industry untouched. New, faster equipment and business property write-offs will naturally have an impact, making professional advice and guidance a good idea.

Mark

Mark E. Battersby may be contacted 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



The Four Most Common Causes of Well Problems

As anyone in the well business can attest, there are many problems which can crop up with water supply wells, but they generally fall within four categories.

1) Well Construction Issues - Many ongoing issues related to well performance can generally be traced back to the well design and related construction.

Key well design issues we often see include:

- Screen size is too large or too small, allowing sanding to occur or restricting flow of water into the well;
- Filter pack is mismatched to the screen size, resulting in ongoing sanding issues;
- A smaller well diameter than indicated by aquifer conditions, resulting in high entrance velocities and turbulent flow to the pump;
- Inadequate well seal, resulting in surface water infiltration and potential contamination of water in the well.

2) Well Development Issues - A well which is not developed properly can continue to underperform throughout its entire life. Proper well development is a process which not only removes drilling fluids from the borehole, it also creates an efficient flow path of water from the formation into the well. Inadequate development results in an inefficient well, resulting in pumps which have to work harder and increases operating costs.

3) Aging - Well aging can be affected by well construction and water chemistry factors. Older mild steel well construction does not have the life span a stainless steel well construction does. Similarly, more corrosive groundwater conditions can also shorten the life span of a well by corroding the well screen and casing. While all wells will age at different rates, they all have a limited life span which will result in well performance degradation over time and eventual failure. While well aging is not preventable, its effects can be mitigated to some degree by regular well rehabilitation and maintenance.

4) Neglect - Just like you would not drive your car for 200,000 miles without ever changing the oil, neither should you operate a well for 50 years without ever performing maintenance or doing a rehabilitation on the well. Where conditions exist which can cause incrustations or bacterial plugging of wells, timely rehabilitation of wells is critical to maximizing the life cycle of the well.

Recognizing and understanding these factors can be an opportunity to assist our clients beyond just the well installation phase and build a business relationship which lasts throughout the life of the well.

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

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Rio Tinto was one of the first in the industry to adopt automation. Unlike its human counterparts, AHS trucks can run almost 24 hours a day, 365 days a year, only stopping for maintenance and refueling. By 2019, the company expects to have more than 140 AHS trucks in its fleet.

Mines of the Future are Being Driven by Technology

Adapted from Information by Rio Tinto

Rio Tinto's Mine of the Future™ is changing what was once considered science fiction, into normal everyday business at three of its iron ore mines in the Pilbara region of West Australia. The company's Yandicoogina, Hope Downs 4, and Nammuldi mines are the first in the world to move all of their iron ore using fully-automated, driverless haulage trucks.

Since introducing its Mine of the Future in 2008, the company has become the world's largest owner and operator of autonomous haulage system (AHS) trucks with more than 80 in its fleet.

In addition to AHS trucks, the company also operates seven fully-autonomous drill systems (ADS) to drill production blastholes. Drones are also being tested for measuring stockpiles and assisting with environmental and maintenance activities. The project's nerve center is

located more than 900 miles away; a team of about 400 people monitor the business' entire Pilbara operations in real-time.

The AHS trucks are built with special advanced computers performing the normal tasks associated with driving a vehicle, such as starting the engine, accelerating, and braking. The computers then respond to GPS directions, supervised remotely by operators, to ensure greater operational safety.

The entire mine is mapped and put into a system; the system then figures out the most efficient way to maneuver the trucks through the mine. Since the driverless vehicles are designed to deliver their loads more efficiently, delays are minimized and costs associated with maintenance, tire life, and fuel consumption are reduced. The trucks are also fitted with proximity detection and collision avoidance systems to identify and avoid hazards.

AHS isn't the only advanced technology on the company's radar. At Rio Tinto's West Angelas mine, also in the Pilbara region, the world's first fully ADS has drilled more than 8.5 million feet since it was introduced in 2009. One of the key advantages of ADS is removing drill operators from the mine pit, as well as reducing workers' exposure to dust, noise, and vibration.

Another innovation getting attention is the RTVis™, which works much like ultrasound and delivers real-time 3-D pictures of ore deposits far beneath the surface. Combining this technology with the driverless trucks and autonomous drills has led to greater ore recovery and lower costs. This is because it enables more accurate drilling and blasting, reduced explosive use, and better waste classification, so the trucks are carrying less waste material and more ore.

Recently, Rio Tinto's fleet of autonomous haul trucks achieved a significant milestone by moving their one-billionth ton of material. On average, each autonomous truck is estimated to have operated about 700 hours more than conventional haul trucks during 2017. More importantly, there have been zero injuries attributed to autonomous haul trucks since deployment, highlighting their significant safety advantages.

The company plans to expand its fleet of autonomous haul trucks by more than 50% by 2019, through agreements with Caterpillar Inc. and Komatsu Ltd. to convert traditional trucks to autonomous vehicles.

Rio Tinto Iron Ore Chief Executive Chris Salisbury said, "We are excited to be starting a new chapter in our automation journey with a valued long-term partner in Caterpillar and we are proud to be extending our successful partnership with Komatsu on this world-first retrofitting initiative. Rapid advances in technology are continuing to revolutionize the way large-scale mining is undertaken across the globe. The expansion of our autonomous fleet via retrofitting helps to improve safety, unlocks significant productivity gains, and continues to cement Rio Tinto as an industry leader in automation and innovation."

What about the workers? The company has been working closely with its employees to introduce them to opportunities for new roles, redeployment, retraining, and upskilling.

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Tales from the Field

by Jeremy C. Wire
Geoconsultants, Inc.



Horizontal Water Wells

In the gas and oil fields, drilling vertically, then turning horizontally and drilling several thousand feet in an extended reach to recover gas and oil from a fractured formation is a common operation. However, drilling horizontal water wells into hillsides in our area is out of the ordinary, although drilling horizontal dewatering wells in highway cut slopes or landslides to stabilize them has been a common practice for many decades.

Many years ago, there were parts of our region where geology of vertical beds of saturated sandstone lent itself to development of wells by horizontal drilling, when vertical wells were not successful in capturing much water. Many of these wells were drilled for domestic supply before water from a utility became available, but now have either been abandoned, or used only for stock or irrigation water supply.

One enterprising homeowner who owned a machine shop built his own horizontal drilling rig out of miscellaneous parts and mounted it on an old car chassis. This rig actually worked successfully, and he could drill 100 feet or more into a hillside in search of water. If not enough was found, the whole contraption was turned at a slight angle, and drilling commenced again.

This operation was repeated, if necessary, resulting in a "fan-shaped" pattern of boreholes (as viewed from above). Usually, enough flow could be found in several tries, and sometimes as much as 30 gallons per minute or more could be developed by this method in a favorable geologic setting. When water was found, the drill stems and bit which were expendable, were left in place as "casing". Several horizontal wells were drilled by this homeowner on both his and neighboring properties.

Later, a more ambitious project involved the drilling of two horizontal wells with a tractor-mounted rig made for the purpose and operated by a professional drilling contractor. This project was for a golf course which could not develop much irrigation supply from vertical wells completed in steeply dipping formations. The horizontal borings were drilled into the side of a hill for a distance of 1000 feet to potentially intercept a target layer of steeply dipping sandstone which supplied many springs in the region. Although some water flow was developed along the way in both borings, the target sandstone was apparently never reached. In drilling with air rotary, the primary air compressor, working against difficult drilling conditions, finally overheated, and caught fire, ending the operation.

We never knew whether another 100 feet of drilling in either of the boreholes might have brought success. Reality prevailed with mounting costs of the difficult drilling, and as far as we know, no additional attempts were ever made to develop a water supply for this golf course by horizontal drilling.

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Urban Construction Blasting Adapted from Information by Orica Mining Services

Southport Central is a large, three-tower residential and commercial precinct developed by the Raptis Group in Queensland, Australia. Tower 1 was completed without the need of blasting. While excavating the basements for Tower 2, the earthmoving contractor encountered rock which could not be excavated using a bulldozer or excavator, so the call for blasting was made. With the delay in excavation causing the project schedule to slide, there was intense pressure to get blasting started as fast as possible.

Blasting in a busy urban environment requires special techniques to reduce adverse effects on the public and surrounding worksite. Conventional blasting methods would have required firing one small blast every afternoon. Using this method, over 120 blasts would have been required to complete the excavation, increasing the project duration by several months. Additionally, each blast would require road closures and portions of the worksite to be shutdown, causing considerable and costly daily disruption to workers and neighbors.

To reduce delays and costs, Orica Mining Services developed unique methods to fire one large blast a week instead of a small blast every day, thereby reducing the overall number of blasts required to complete the project. The innovative method involved loading blastholes with up to five individual explosive decks. To control vibration levels, each charge fired separately. Electronic detonators were employed to allow large, complex blast geometries and guarantee the security of loaded blastholes.

Martin Adam, Orica’s principal blasting engineer remarked, “The largest blasts were loaded over the course of five days, so we had to be sure nothing could happen to the explosives in the ground each night. Electronic detonators are virtually impossible to activate unintentionally once in the ground, so they were the best choice in this case.”

Blast vibration levels were managed to minimize the overall impact on the neighboring residents and businesses. This meant not arbitrarily targeting the lowest vibration levels, since it would have increased the number of blasts and duration of persistent drilling noise by several months. Instead, higher limits were used without impacting safety. Each blast clearance involved up to 20 blast sentries, clearing workers from the towers under construction, stopping traffic on two streets, and temporarily closing the busy Gold Coast City Council Library across the road.

Adam said, “By talking to the neighbors, we found that as long as they knew exactly when the blast was going to occur, the blast effects were not upsetting. Therefore, we aimed to fire one big blast a week, making absolutely sure everyone knew exactly when it was going to occur, and then sticking to that time, even if the blast was ready a day early.”

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New Pipeline Integrity Management Solution on the Horizon

Adapted from Information by OneSoft Solutions, Inc.

OneSoft Solutions Inc. announced its wholly-owned subsidiary, OneBridge Solutions, Inc., has entered into a technology license and joint development agreement with Phillips 66 to create an advanced pipeline integrity management software application. The plan is to take Phillips 66's current pipeline data management system (PT-DMS) and place it in Microsoft's Azure Cloud Platform and Services to create Integrity Management Solution (IMP). The IMP will be designed to integrate with OneBridge's Cognitive Integrity Management™ (CIM) solution to be used by gas and oil pipeline operators globally.

"This development project with Phillips 66 represents an important milestone for OneBridge," said Tim Edward, president. "Our vision at the outset was to develop a cloud application that enables pipeline operators to manage their pipeline assets as smart infrastructure. CIM's machine learning and data science components made achievement of this objective possible, and integration of these components to leverage the high level of industry expertise embedded in PT-DMS will further evolve our vision."

PT-DMS is a comprehensive software solution developed by Phillips 66 as a key tool for its pipeline infrastructure management process.

The software addresses numerous key functions including:

- Assessment plan tracking
- Maintaining assessment attributes
- Integrity management process planning, based on multiple tool technologies
- Planning and scheduling activities for internal engineers, field teams, and tool vendors
- Anomaly worklist tracking which accommodates specific actions on a per anomaly basis
- Analyses of data integrity in compliance with API 1163 regulations, general industry standards, internal company policies and priorities
- All reporting associated with these functions

PT-DMS also addresses supporting functions including:

- Data ingestion tools
- GPS & data maintenance utilities
- Workflows
- Job process queues
- Integrated security
- Other peripheral features and functions which further supplement data management and tasks addressed by PT-DMS

"We are pleased and encouraged that Phillips 66 chose OneBridge to help advance their pipeline integrity platform," said Brandon Taylor, CTO of OneBridge. "PT-DMS is one of the most comprehensive and sophisticated pipeline management solutions within the industry today, which will ease migration to the cloud and reduce time-to-market for IMP. Microsoft continues to provide strong technical, marketing, and sales support for OneBridge products, and we will continue to leverage the latest Azure and data science technology in the development of IMP. We are grateful for both Phillips 66's and Microsoft's collaborative efforts to assist us to create software to advance the pipeline industry's collective objectives of operating cost reduction and zero pipeline failures."

The development project will begin immediately, with a private preview for customers to provide input and feedback beginning the second quarter of 2018. Commercial availability of the initial version of IMP is expected by the end of the year.

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Ronnie's Real World

Learning and putting what you have learned, and having to learn even more to "get the job done", is exactly what Justin had to do and is doing it very well . . . Remember as you read his report, this is a young man, just beginning his adult journey, but so wise for his age.

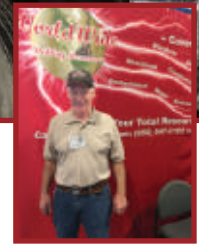
Future & Current Landscape of Water Well Drilling Chapter 3 Justin Hammond, Martin B. Hammond Co. Ltd.

Continuing on this journey with Justin, he said . . . "As I learned more about business, the more I became interested. I often find myself studying various businesses and industries, numerous business landscapes of different countries, the political environment of many countries, and the continuous innovation of technology, and the impact it has on our lives, our world, and of course, our industry. Now, I know there's even more than well drilling and the associated skills needed to survive. Now more than ever, we all need to be aware of what's happening on a global scale. We need to keep pace with global trends. This mainly entails being more socially responsible, workplace and worker friendly, connecting with customers on more levels, being as environmentally friendly as we can, thinking about the future of gas and oil, and adapting to new technology. All while turning a worthwhile profit.

To survive and thrive in the future, we need to focus on being a high-quality business. Apple, Google, and Johnson & Johnson are examples of such high-quality businesses. They constantly create products and service that stand out from the crowd, premium products and services that customers pay more money for, then they integrate more services that compliment what they already offer. They are businesses that focus on development, outpacing competition, providing customers the best, and profit. They are excellent examples of how even the small guys like us should act.

In the water well drilling industry, we need to shore up our weaknesses and capitalize on our strengths. We need to focus on our business. For example, today in Newfoundland, the benchmark prices for drilling per foot of a six-inch water well is [the same as it was ten years ago]. That's absolutely ridiculous. Inflation averages about 2% per year, and wages have risen several dollars per hour, per employee, in the same time frame. Our business has had to absorb 100% of the extra costs we face year after year. We have had to succeed through excellent capital management, superior work and service, optimal efficiency, and rigorous cost cutting."

This truly is, Ronnie's Real World . . .



To be continued next month . . .



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A New Way of Looking at Things

Compiled by Bonnie Love, Editor, *WorldWide Drilling Resource*[®]



WWD photo.

The drilling industry is known for looking beneath the ground, however, the latest technology can actually help by looking at things above the ground - WAY above the ground!

Unmanned aerial vehicles (UAV), better known as drones, have been used by the military, police departments, and even weekend enthusiasts to get a unique aerial view of the world around them. It didn't take long for the drilling industry to discover new ways to utilize drone technology to improve

performance and safety on the jobsite.

Although these robotic flying machines got their start as a tool of war, today's drones are used in several applications. The data collected by drones helps reveal what isn't necessarily visible at ground level, and keeps workers out of inaccessible, often dangerous, locations. Drones can be equipped with several different types of cameras capable of collecting a great deal of data. The data can be analyzed through various software programs to provide a wealth of information for operators, maintenance, designers, and others on the ground.

Here are just a few ways these unmanned aerial systems are impacting the drilling community:

Agriculture - Drones offer a low-cost aerial camera view of crops. Seeing crops from the air allows farmers to spot potential irrigation problems, soil variations, and even pest infestations. It also has the potential to reduce water use.

Blasting - After blasting, data collected can reveal material movement, delineations between ore and waste rock, and provide fragmentation analysis.

Construction - Monitoring and surveying construction sites is made easier with drone technology, which is also used to calculate moved masses without interrupting the site's workflow.

Gas and Oil - Frequent inspection and maintenance ensures safety for the nation's gas and oil industry. Instead of shutting down operations and sending an inspector into hazardous areas with a camera, a UAV can be used to deliver high-quality aerial data for inspections and maintenance without causing operational down time. Inspecting for leaks and spills can also be handled quicker and more efficiently with drones.

Geothermal - Drone technology can be used to find thermal features in difficult terrain and provide an estimate of surface heat loss from thermal water in the survey area. In fact, researchers used a thermal infrared camera attached to a UAV, to capture nearly 6000 thermal images, recording temperatures of the Waikite geothermal area in New Zealand, including an inaccessible lake. The images were used to create an extensive thermal map of the area.

Mining - Data from highwalls, stockpiles, waste dumps, muck piles, and tailings dams, can be collected and converted into information quickly and safely using drones. Since UAVs can pretty much go anywhere, mapping sites including hard to reach, or dangerous off limit locations can be handled in a safe and efficient manner.

Solar - Mapping topography and finding the right location for each solar panel normally takes humans multiple trips to chart the site's terrain. Drone technology has eliminated those trips and gives designers the ability to select the best spot. In Cook County, Oregon, the Gala Solar Power Plant is one of the first solar farms designed using drone technology.

Wind - Collecting wind farm data can be complicated. Climbing more than 250 feet up to wind turbine blades for inspection is not only time consuming, but also dangerous. Once up there, some inspectors have only their cell phone camera to take photos of damage or maintenance issues. Drones take the danger out of the equation and offer a more efficient way to inspect turbine blades. The inspection process which used to take months, can be done in hours. In the future, the data collected from wind farms may be used to create better, more efficient blades.

This affordable, accessible technology is making waves in the drilling industry. Have you used UAVs at any of your jobsites? Maybe you have some tips for those looking to implement a drone program. We would love to hear from you!



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Springs of Hope in South Africa

Adapted from Information by A Spring of Hope

In the summer of 2005, mother and daughter, Joanne and Brittany Young, visited South Africa. Circumstances landed them at Beretta Primary School in Acornhoek, South Africa. Beretta had over 1200 students and no running water, which is a reality



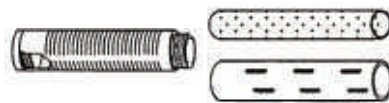
many rural schools in South Africa must face. Life at Beretta was extremely difficult because of the lack of nearby running water. Many students were provided their only source of fresh fruits and vegetables from the school garden; however, the garden would only grow during the rainy seasons. Volunteers would have to walk several miles each day to retrieve water from a government pump to prepare lunch for the children. Sanitation, hygiene, and water access are some of the greatest obstacles for rural schools not only in South Africa, but across the entire continent.

Seeking to aid the school, Brittany and Joanne teamed up to fundraise for a borehole. In 2006, a well was completed with the help of two South African friends. The new source of water significantly helped improve student health and nutrition at Beretta through a thriving garden. Success at the school serves as a primary model for A Spring of Hope, which was founded in 2007 and has grown into a professional nongovernmental organization (NGO) with an ambitious and unique nonprofit mission to combine clean water access with economic and social development programs.

Brittany serves as president of A Spring of Hope, while Joanne holds the position of executive director. The organization is currently the only NGO in South Africa which partners with rural schools to deliver fresh, clean water and sustainable permaculture programs. They begin by drilling boreholes at schools, ensuring each school has access to a clean and sustainable source of water for drinking, sanitation,



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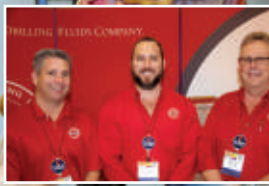
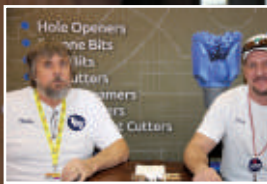
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tion, irrigation, and food preparation. In 2016, boreholes were drilled at nine schools, changing the daily living conditions for many as the provided water had an impact on learners, teachers, and community members. Sanitation facilities were built for multiple schools, and permaculture programs were expanded to provide nutritious lunches and resources to the schools.

In 2017, A Spring of Hope continued to build on the progress they have made over the past decade. They have nearly 40 partner schools in the Limpopo and Mpumalanga provinces of South Africa. The organization has grown into a team of highly motivated young activists, engineers, and thinkers seeking to combat severe poverty in rural South Africa. They believe if rural schools have the appropriate resources, students can be better equipped to fulfill employment and leadership in and out of the workplace. A Spring of Hope intends to continue investing in the development of South Africa's future leadership so they can, in turn, address pressing problems in their communities and their countries.



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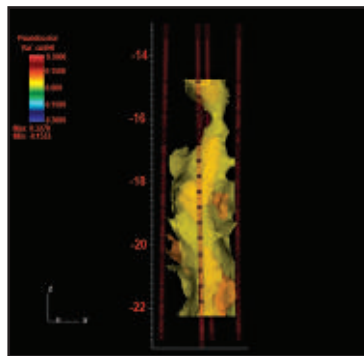
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Always Seeking a Better Look

Adapted from Information from the U.S Department of Energy

Over 80% of total U.S. energy needs originate from beneath the earth's surface, and a key energy challenge is ensuring safe, sustainable, and affordable availability of these natural resources. Before drilling crews can reach these resources locked underground, they must first know if the location contains energy resources or at least have good reason for an exploration well. A key issue with the process, is being able to "see" what is in the subsurface. There are several technologies which can help with this issue, and the Department of Energy (DOE) is funding research and development to advance these technologies. They are pursuing these advancements through the SubTER crosscut - a DOE initiative, uniting five key DOE agencies in a collaborative effort to ultimately improve our nation's energy security and availability.

SubTER's objective is to provide solutions to these subsurface challenges by rapidly accelerating technology development. Their aim is to achieve mastery of subsurface processes, so next generation subsurface technologies can enable increases in domestic energy supplies, including more than 100 gigawatts of renewable geothermal energy from conventional hydrothermal and enhanced geothermal systems (EGS), which are reservoirs created by drilling wells thousands of feet below the earth to access hot rock at the earth's crust.



A view underground utilizing E4D-RT.

However, before the widespread development of EGS can occur, there must be a substantial reduction of the initial high exploration and installation costs. Researchers at the Pacific Northwest National Laboratory (PNNL) successfully developed a "tool" called E4D-RT processing, which has the ability to better image the subsurface and give a glimpse of what resource potential might lie there. The tool was developed through a research and development project funded by DOE's Office of Science and Office of Environmental Management. E4D-RT's main advantage over other technologies is it provides faster, more accurate interpretations of data from simulation models, and improves the cost competitiveness of EGS development.


Subsurface conditions are viewed through the collection of measurements made at the surface or by electrodes inserted in boreholes which pass an electrical current through the material being studied and record how difficult it is for that electrical current to move through the material. The models produced from these measurements reduce uncertainty and help to more accurately target where geothermal wells should be drilled, which is important for geothermal energy investors, decision makers, and stakeholders.

PNNL scientist Timothy C. Johnson, who invented the E4D-RT said, "It's very much like medical imaging. One of the unique things that we've done is bring high-performance computing to this problem. We have sensors in the field that are monitoring, and then this information is sent to the super computers that process it. Then, they deliver data back to the field in near real-time. That's really, really powerful. We can do big imaging problems, and we can do them really fast."

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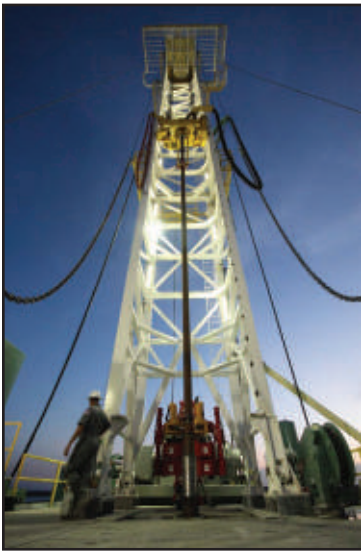


Although the U.S. has only 4% of the world's population, it consumes 25% of the world's crude oil.

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Layne Christensen Signs Monumental Agreement with Texas Land Office

Adapted from a News Release by PR Newswire



Layne Christensen Company and the Texas General Land Office (GLO) have formed a long-term agreement which allows the company to drill for nonpotable water on GLO properties across Reeves and Culberson counties. The water will be used for gas and oil drilling and completion activities in the heart of the Delaware Basin of Texas.

Layne estimates there are about 58 gas and oil drilling rigs operating within three miles of the GLO acreage. These potential customers would most likely use the nonpotable water for hydraulic fracturing operations.

Michael J. Caliel, president and CEO of Layne commented, "We are honored to partner with the Texas General Land Office and are proud to utilize Layne's 135 years of experience in water sourcing, drilling, and treatment to create significant revenue streams from the GLO's expansive land position and water resources in the Delaware Basin . . ."

Under the five-year agreement, which includes several renewal options, the company will not only develop and construct water infrastructure for the venture, they will also own and operate the project to produce and sell the water to exploration and production companies. Layne's water infrastructure assets will most likely include water wells, storage ponds, pump stations, treatment facilities, and pipelines, as well as delivery points. Revenue from the sales will be shared between the company and the Texas Permanent School Fund, while the land and mineral assets will be managed by GLO.

J. Michael Anderson, CFO and president of Layne Water Midstream said, "We intend to responsibly develop GLO water resources to create a long-term revenue stream for the State of Texas, while remaining committed to the preservation of the freshwater San Solomon Springs as GLO acreage that could impact the springs have been excluded from this lease. Further, we will develop and produce only nonpotable water from the GLO lands for energy use. We believe that Layne is expertly positioned to develop, construct, and manage water infrastructure assets, and create long-term, sustainable income streams for both Layne and the GLO."

Layne will immediately begin marketing water to producers in the region and serve as GLO's sales and marketing resource for the produced water. The company expects to begin generating revenue this year.



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Through the Back Door!

by Jim Kuebelbeck

I have often been asked how water dowsing “works”. I am still at a loss for a completely satisfactory explanation. As I have mentioned before, many years ago when I first began to take an interest in this unusual human faculty in certain individuals, I read everything I could get my hands on about the centuries-old practice. Because of my inborn skepticism about anything not easily explained, my initial intent was to attempt to discredit the many unbelievable stories about so-called “water finders”. I could not imagine the possibility any human could sense the presence of an underground water source from the surface. For me, at the time, it defied all logic.

After locating many hundreds of satisfactory water wells by the dowsing methods I have developed over the years, my success as a water dowser can no longer be attributed to any laws of chance or “dumb luck”. How can I provide a satisfactory theory or explanation about how water dowsing works, when I know more about what water dowsing isn't than what it is? Although I still have more questions than answers, what I do know about the ability of certain individuals to sense underground water sources is not what many people have been led to believe.

The ability to sense the presence of an underground water source is certainly not mental delusion. It is definitely not witchcraft, sorcery, or divination in the biblical sense of the word. A water dowser does not sense subsurface moisture. A water dowser does not sense a magnetic, electromagnetic, electrostatic, or any other type of electrical field. A water dowser does not sense any type of emanation rising from the earth or any type of radiation, or some type of solar reflection. A water dowser does not sense any type of varying gravitational field, atmospheric influence, or lunar gravitational force!

What is it then, that causes an intramuscular reaction in certain individuals to cause a dowsing instrument to respond in some manner? From my experience, I have come to the conclusion what triggers a dowsing reaction is a combination of a physical and mental focus. I have come to this conclusion because I can walk around all day and never sense an underground water source. Only when I concentrate and try to focus on a satisfactory groundwater source, do I receive a dowsing reaction of any kind.

Perhaps I will have all of my questions answered someday, but I don't believe it will be during my time here on earth! We are all individuals, endowed with differing talents and abilities. Some of us are sensitive to many different things in varying

degrees. Some are sensitive to heat, some cold, sunlight, poison ivy, or pollen. Some people have an acute sense of hearing while others have an especially acute sense of smell. Regarding having an acute sense of smell, I truly believe my wife Carol happens to be such an individual - because sometimes when I call home, I swear she can smell beer over the telephone!

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 *WDR*.

Jim

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

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Boring Thoughts

by *Todd Tannehill*
Owner, *Mud & More, LLC*

The Polymer Pour Challenge

Looking for a drinking game? I'm sure you could make one out of this! Try the Polymer Pour Challenge at your next event. Here are the rules:

- Give everyone an empty red Solo® cup.
- Provide a large pitcher of liquid (water or adult beverages work).
- Have each player pour 4 fluid ounces into their unmarked cup.

Measure twice, drill it right.

- Empty the contents into a measuring cup.
- The winner is the person who comes closest to a 4 fluid ounce pour - on the nose!

If I had a crystal ball, I would predict almost everyone would overpour. I know this because this is a mud school activity where we challenge drilling professionals to the Polymer Pour Challenge in class. Most of the time, all contestants overpour in the exercise. By the way, in case you were wondering, we use water.

The point of the challenge is, polymers and additives are designed to work at a certain strength. Too much and you can overtreat the drilling fluid; too little and you depreciate your expected results. It doesn't matter if it is dry or liquid, an unmeasured pour will miss the mark every time.

Dunkin' Donut cups in the U.S., Tim Hortons cups in Canada, or McDonald's cups all over the world can be marked up and used in a pinch. The key is, you must measure out the first pour to get your cup marked correctly the first time. Afterward, each tank of drilling fluid you mix using the cup will be consistent. If you are working with a drilling fluid mix and it is working well, the only way to duplicate it each time is to measure your product.

Drilling fluid manufacturers' research and development teams design dosage rates to maximize results with the least product use. They track, on a graph, the dose and effectiveness, and at what point the product will max out. This is the point where adding more product yields no or negative results.

In the field, I have experienced adding too little product and getting negative results. I know of a polymer which can thicken the mud if you use too little and, against all commonsense thinking, you have to keep adding to the recommended dosage to reduce viscosity.

Proper dosing saves money for the drilling company. A friend of mine wrote, "A Mud Engineer with a measuring cup can save the drilling company money by reducing the overall product use." I agree, polymers and additives are the costliest products in the drilling fluid if not applied correctly. However, they are the best bargain in getting the job done, done right, and done on time when used as directed.

Sometimes the person on the mixer is the newest member of your team. This is the person we need to train and have understand the products being used. Carpenters say: "Measure twice, cut once." We should say: "Measure twice, drill it right."

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A lunch cup can work like a measuring cup.

Todd

Todd Tannehill may be contacted via e-mail to michele@worldwidedrillingresource.com



Drilling for Lithium Brine in the Paradox Basin

Adapted from a Press Release by Anson Resources

Anson Resources is making progress at its Utah-based Paradox Lithium Brine project. Anson is on schedule to produce its first batch of lithium in April. The company intends to collect many rich brine samples from the deepest part of the Paradox Basin in close proximity to Moab, Utah.

It submitted an application to the State of Utah School and Institutional Trust Lands Administration, to lease 15 acres of industrial land at the site of its lithium brine project. Successfully securing this industrial site will enable the company to fast track the development of an in-field pilot plant later this year, and begin to distribute its lithium

The drilling program commenced with the reentry of the historic Gold Bar Unit 2 well by drilling to a depth of 7280 feet to sample brine from four separate clastic zones (sediment made up of fragments of preexisting rocks). Three cement plugs, which sealed the well following oil drilling in the past, were drilled out to reach the targeted zones. After reaching the desired depth, the drill pipe was pressure tested and found to be in good condition.

Sampling involves sealing the well casing below the target zone. This prevents fluids from mixing with the targeted brines, which are to be extracted from the clastic zones before perforating the well casing for the samples. The process is repeated for each clastic zone being sampled on the way up the well casing. The program will now progress to collecting samples from clastic horizons known to contain supersaturated brines.

"Extracting brine is now extremely close, and Anson remains firmly on schedule to produce its first lithium carbonate in April 2018," said Anson Managing Director Bruce Richardson. "In addition to having samples to assay, the likely economics of the Project can begin to be understood as further metallurgical test work will also begin on the possible economics of the other mineral products in addition to lithium in the brines, including boron, bromine, iodine, and magnesium, as preparations and planning begin to progress to feasibility stage."

Editor's Note: In between our print issues, the WDR 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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Program Schedule

Wednesday, May 16, 2018

2:00 - 5:00 pm Drill Rig Staging and Vendor Set-Up
6:30 pm Dinner and Social at Salt Fork Lodge

Thursday, May 17, 2018

7:30 am Registration Opens
8:00 am Vendor Displays, Coffee, and Donuts
9:00 - 10:45 am Classes by Brian Siwinski and Andrew Jalbrzikowski
11:00 - 11:45 am Outdoor Demo by Eijkelkamp Sonic Drill
Noon - 1:00 pm BBQ Lunch
1:00 - 3:45 pm Classes by Greg Safran and Sarah Ghezzi
2:00 - 2:45 pm Outdoor Demo by Geoprobe®
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FROM THE MINE TO THE HISTORY BOOKS

Compiled by the Editorial Staff of *WorldWide Drilling Resource*®



Composite reconstructions of a skull from the site based on scans of multiple original fossils, courtesy of Philipp Gunz, MPI EVA Leipzig.

Fossils recovered from an old mine on a desolate mountain in Morocco have impacted an established theory stating *Homo sapiens* arose from a cradle of humankind in East Africa 200,000 years ago.

In 1961, miners searching for the mineral barite stumbled on a complete fossil skull at Jebel Irhoud, near Morocco's west coast. With its big brain but primitive skull shape, the skull was initially assumed to be an African Neanderthal around 40,000 years old. In 2007, researchers published a date of 160,000 years based on radiometric dating of a human

tooth, which suggested the fossil represented a lingering remnant of an archaic species.

In fresh excavations at the Jebel Irhoud site, scientists found more remains, including a partial skull, a jawbone, teeth, and limb bones belonging to three adults, a juvenile, and a child about eight years of age. The remains, which resemble modern humans, were recovered from the base of an old limestone cave with a smashed roof from mining operations. Alongside the bones, researchers found sharpened flint tools, a good number of gazelle bones, and lumps of charcoal, perhaps left over from fires which warmed those who once lived in the cave.

Scientists knew the remains were old, but were stunned when dating tests revealed the tooth and stone tools were about 300,000 years old, prompting the original skull from the same sediment layer to be redated to the same period.

Jean-Jacques Hublin, a senior scientist on the team said, "When we found the skull and mandible, I was emotional. They are only fossils, but they have been human beings, and very quickly you make a connection with these people who lived and died here 300,000 years ago."

Researchers compared the freshly excavated fossils from Jebel Irhoud with those of modern humans, neanderthals, and ancient human relatives. The lower jaw was found to be similar to modern humans, but much larger. The most striking difference was the shape of the braincase, which was more elongated than humans today. The face's closest match was with modern humans. Hublin said, "The face of the specimen we found is the face of someone you could meet on the tube in London."

According to the theory, East Africa has been thought to be the birthplace of modern humans. Until the latest findings from Jebel Irhoud, the oldest known remnants of the species were found at Omo Kibish in Ethiopia, and dated to 195,000 years old. Other fossils and genetic evidence in support of the theory also point to an African origin for modern humans; however, the new findings could push the theory's origin date back 100,000 years, while shifting the geographic focus to North Africa and across the entire continent.



Some of the stone tools from the site, courtesy of Mohammed Kamal, MPI EVA Leipzig.

Scientists don't have enough fossil evidence to hypothesize whether modern humans had spread to the four corners of Africa 300,000 years ago, but as new observations are made, the theory will continue to evolve with the findings. The speculation from the new discovery is based on what scientists see as similar features in a skull dated to be 260,000 years old in Florisbad, South Africa.

Hublin explained, "The idea is that early *Homo sapiens* dispersed around the continent and elements of human modernity appeared in different places, and so different parts of Africa contributed to the emergence of what we call modern humans today."



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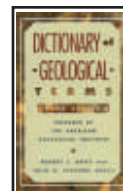


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WDR will continue to cover the Frequently-Used Geological Terms next month!



by Tim Rasmussen



The village of Nuevo Santa Elena presented some challenges for drilling. It was hard to find a suitable place. There seemed to be no ideal property available for a well. Finally, some church-owned land was located and made available. The church committed to making the well water available without cost to anyone in need. The drilling site rose steeply from the roadway and while not perfect, it was the only place to be found. Adrian and Seth started the hole and soon reached the limestone beneath the soil. The limestone was fairly soft and drilled easy, but in some areas the stone was very hard and the drilling was slow, just a few feet per day.

In the two weeks they had been there for Water For Life (WFL), Seth and Adrian had seen the interest of the villagers grow as the hole got deeper and deeper. More and more people stopped for a few minutes to watch. When he was bailing and a lot of water was coming up, the folks took notice and were excited.



Finally it seemed there was a significant amount of water in the hole. He was at about 138 feet down. Seth bailed for some time, removing ten gallons per minute, but the static water did not drop below 118. This was about good enough. He talked to Gary, and he came. A four-inch PVC liner was put in, and a hand pump was set the next day. The locals were very excited and happy as they worked the pump and saw their buckets and jugs fill with clean, safe water for their homes and children. This was so much better than carrying buckets of water from open barrels, and they thanked the WFL crew over and over again.

Gary took Seth to the island town of Flores as they waited for the time of Seth's plane. They walked around the old town for a while, then Gary took him to the airport in Santa Elena. As they parted, Seth thanked Gary for the experience saying, "Having completed that well, I couldn't be happier. Neither could the villagers."

I later asked Seth if he had a good time. He said, "It was not fun, but rewarding." I asked him if he would go back again. He replied, "Yes, but next time with a rotary. By the way, I have been thinking that I want to sell this Mayhew drill I have. Would you be interested in it for a good price? We could get a new mud pump for it and then I would come down next year and put it to work. We could get a lot done." I like it when a volunteer talks about the future and uses the word "We."

Seth is right. With your help, WE could get a lot done. Water For Life is excited to consider the prospects of moving forward with a rotary program to complement the four cable rigs we now have in Guatemala.

If you want to make people happy, we have the opportunity. Volunteer to go with us for a season. It will change the lives of people, maybe your own. Contact Gary Bartholomew at 509-466-5075 or 509-939-1941

Jim

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



A Two-Well Project and One Safe Rig

Information Provided by Huisman Equipment B.V.

Huisman Equipment B.V., a worldwide specialist in lifting, drilling, and subsea solutions, along with construction company Züblin, was awarded a contract from Wayland Energy for the delivery of two geothermal wells in Bergschenhoek, Netherlands. The two wells will be drilled directionally to planned depths of approximately 8200 feet and 9200 feet.

The Huisman LOC 400 drilling rig will be used to drill the wells. It is a fully containerized modular rig outfitted with a fully automated pipe handler and rig floor. This will be the sixth project for the LOC 400 in Europe.

The drilling process does not require personnel on the rig floor for casing and conventional drilling. This aspect of the project enhances safety for the rig personnel. The pipe handling and making of connections can be controlled from the drill operator's cabin. The pipe handler can manage pipes without risk of damage to thread, enabling the protectors to be removed and the pipe to be doped while on the horizontal pipe rack. The top drive, stabbing arm, and power tong make connections easy and reliable. In addition, the LOC 400 is easy to transport because 27 ISO containers guarantee fast and cost effective rig moves.

This is not Huisman's first encounter with the geothermal market. A prestigious project in the city of The Hague, Netherlands, previously used the LOC 400. During this project, the rig executed the drilling of two wells in front of a hospital to depths of approximately 7800 feet and 8800 feet. The selection of the LOC 400 for these projects in the Netherlands shows how Huisman's drilling rig is living up to its expectation of being efficient, safe, and environmentally friendly.

Protecting Yourself in Permit-Required Spaces

Adapted from a Press Release by the Occupational Safety and Health Administration

Permits are required for confined spaces in work environments because such spaces have limited openings for entry or exit, and they aren't designed for continuous employee occupancy. Confined spaces include underground vaults, tanks, storage bins, manholes, pits, silos, underground utility vaults, and pipelines.

The confined spaces defined as permit-required may contain a hazardous or potentially hazardous atmosphere. There could be walls which converge inward or floors which could trap or asphyxiate an entrant. It is possible the spaces could contain other serious physical hazards such as unguarded machines or exposed wires. The spaces must be identified by the employer who is charged with informing exposed employees of the existence and location of such spaces and their hazards.

Workers should not enter permit-required spaces without having a permit to enter and first being trained. The employer's procedures, including how and when to exit, should be reviewed and understood prior to anyone entering a confined space, which requires a permit. Before entering the space, all physical hazards should be identified. Both prior and during entry, a test should be done to monitor for oxygen content, flammability, toxicity, or explosive hazards as necessary. Equipment should be in place for fall protection, rescue, air monitoring, ventilation, lighting, and communication. There should be constant contact with a trained attendant either visually, via phone, or radio. This monitoring system enables the attendant and entry supervisors to order workers when to evacuate and to help alert trained personnel to rescue entrants when needed. Together, these practices help maintain a safe working environment for all involved.



Horizontal Directional Drilling on the Beach

Information Provided by Clear Solutions

In 2016, the TRG / L&R Joint Venture began a large-scale horizontal directional drilling (HDD) project to install a brine outfall pipeline for a desalination plant, which is under construction in an area known for its natural beauty within an ecological protection zone on the east coast of South Africa.

Phase one of the project involved positioning the drill rig on the beach and drilling a horizontal borehole more than 1000 feet out to sea where a high-density polyethylene (HDPE) pipe was inserted, by pushing the pipe with a specially designed and constructed pushing head. They encountered unconsolidated beach sand, shattered rock, boulders, shales, and sandstones, which finished in a reef formation out at sea.

A range of complex directional, operational, and logistics factors meant the initial directional drilling under the sea took a total of 18 days. The borehole was then left open for an additional 24 days, with drill pipe, bit, and bottom hole assembly left within the hole, until inspections were complete. When the specially modified and fabricated push ring was delivered to the site, the drill bit was easily tripped out of the borehole. The product pipe installation encountered a range of highly challenging geological formations, but proceeded smoothly and easily.

The drilling fluid used for the project was Ultrabore®. This bentonite fluid is specially developed by Clear Solutions to generate exceptional hole cleaning and borehole stability in challenging formations, while also being resistant to common drilling fluid contaminants. From the start of the borehole to final pipe installation, a total of 47 days were taken, demonstrating the fluid's ability to provide long-term borehole stability.

In the second phase, the drill rig was rotated 180°, and a 1000-foot borehole was drilled, which connected to a previously built chamber. The drilling started at just over 10 feet above sea level, and went uphill to a height of over 130 feet above sea level. Drilling this uphill borehole to the desalination plant presented a variety of challenging geological conditions, including unconsolidated sand dunes, and took 18 days, minus a 17-day delay waiting on special replacement parts for the surface plant. Despite the delay and challenges, drilling progressed without any hole problems, and the HDPE product pipe was installed easily.

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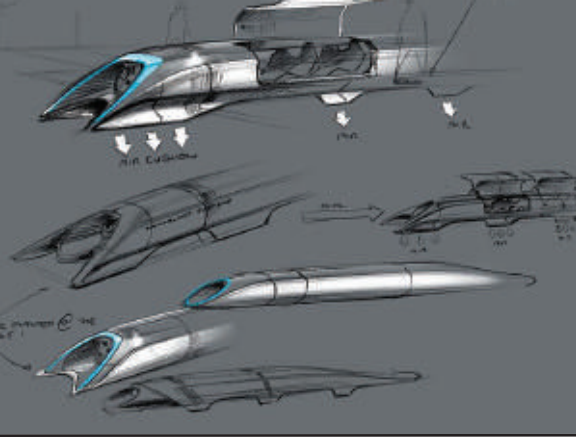
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Conceptual design of a Hyperloop passenger pod.

IS FUTURISTIC TRAVEL CLOSER THAN YOU THINK?

Compiled by Caleb Whitaker, Associate Editor

WorldWide Drilling Resource®

Typical modes of transport tend to be relatively slow (road and water), expensive (air), or a combination of relatively slow and expensive (rail). In 2013, Elon Musk, cofounder of PayPal, Tesla Motors, and founder of Space X, proposed an ultra-high-speed transportation system called Hyperloop, which is seeking to become both a fast and inexpensive option for the transportation of people and goods.

Musk's design for an electromagnetic transportation system consists of pods traveling in a low-pressure tube. The system achieves its speed and cost-effectiveness from the tight vacuum seals of its tubes, which allow magnetically levitated pods to glide through the frictionless environment.

Musk's original Hyperloop proposal was for transportation between Los Angeles and San Francisco, California. His idea was for pods to depart as often as every 30 seconds from each terminal, carrying 28 people each. If ever built, the 350-mile ride would take approximately 35 minutes, reaching speeds in excess of 700 miles per hour.

After Musk released his idea to the public as an open source transportation concept, numerous groups and companies were formed to spur innovation of the concept while exploring the technical challenges of the Hyperloop system. Small-scale tests have been successful, proving the technology works when deployed for short distances at lower speeds; however, the concept has yet to be implemented on stretches of land extending hundreds of miles or at the desired ultra-high speed.

Tubes carrying the pods could be built aboveground on columns alongside a current highway corridor or potentially underground. Due to the speeds of the Hyperloop, the tubes need to be constructed in a straight line. In areas with a lot of current infrastructure, it's difficult to buy enough of the land needed to travel in a straight line, so this has become one of the biggest obstacles.



Courtesy of The Boring Company.

Musk's start-up company, The Boring Company, is looking to tunnel along the northeast U.S. corridor with a tunnel boring machine (TBM). The Washington, D.C., Department of Transportation recently issued a permit to Musk's company to start tunneling underneath an abandoned parking lot near the Bureau of Alcohol, Tobacco, and Firearms. Musk's vision is to build an underground Hyperloop connecting New York City, Philadelphia, Baltimore, and Washington, D.C.

Increasing tunneling speed and dropping costs by a factor of ten or more is the goal of The Boring Company. This would make Hyperloop adoption viable and enable rapid transit across densely populated regions, enabling travel from New York City to Washington, D.C. in less than 30 minutes. One day, the abandoned parking lot in Washington, D.C. could become a Hyperloop station, where people would get on and off the futuristic pods speeding through a tunnel on a cushion of air.

Look for more information in an upcoming issue.

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Companies Merge to Pump Up the Industry

Adapted from News Release by SIMFLO

Two of the county's top providers of industrial, agricultural, and municipal pumps, Simmons Pump LLC and Simflo Pumps Inc. have merged. The combined company will operate under the SIMFLO name and brand.

In addition to retaining all employees from both companies, David Pickering, Jay Pickering, Don Pickering, and Gene Alexander of Simmons have been named executive officers of the new company, which will be headquartered in Lubbock, Texas, with offices in Willcox, Arizona (Simflo's former headquarters) and in Garden City, Kansas.



The new company plans to capitalize on the experience and knowledge of current Simmons and Simflo employees while increasing its workforce by 10% this year. Additional plans include opening new locations in other U.S. markets in the near future.

"We are thrilled to join forces and merge with our highly regarded peer, Simmons Pump," said Bob Denton, senior project manager at Simflo. "With Simflo's renowned engineers, R&D [research and development] labs and testing facilities, combined with the leadership of Simmons' highly successful management team and industry-leading pump technologies, we are bullish in our ability to seize the greenfield opportunity ahead and become the market leader in our segment."

The company will engineer, manufacture, source, and deliver its pump products and technologies for municipal water services, agriculture, manufacturing, mining, chemicals, hydrocarbons, and saltwater extraction customers. The company's offerings will continue to be made and manufactured in America.

"The combination of Simmons and Simflo is a highly strategic, value-enhancing step that brings together the unique strengths of two great companies to deliver best-in-class pump technologies and services to our customers across the U.S.," said Troy Pickering, vice president of sales and marketing at Simmons. "We are a company built on not just quality, but principle. Our founder, Raymond Pickering, believed that each product we produce should be made stateside by American workers with the utmost attention to detail - and that holds true today. From our involvement with the foundries, to our manufacturing and assembly facilities, virtually every aspect of a SIMFLO pump is created in-house to provide the highest level of performance in the industry. Simply put, the new SIMFLO exists to *keep business flowing.*"



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Is Technology Stealing the Quality of Your Life?

by Tim Connor



Let me be perfectly clear from the outset - I am not against technology, change, artificial intelligence, transformation, or the steps we take into the future. Also, I'm sure many of you will take issue with some of my points - remember - truth is not what you or I think it is - but what it is. Let me also be clear, I believe not all of these advances will improve humanity's ability to deal with many of its core issues such as conflict, separation, loneliness, uncertainty, decision making, inner peace, fear, the need for love and acceptance, life meaning, and purpose.

Trust me - your latest smartphone, social media connection, and apps are not going to solve your issues of patience, the need for control, or stressors. The age-old questions for thousands of years have still not been answered - where did we come from, why are we here, and where are we going still plague most of humanity and yet every year more and more technological progress is made. Yes, technology may make some cures more successful and rapid, it may improve transportation and our ability to more quickly grab vital and valuable information. But consider - stress is still increasing and the divorce rate is the same as it was in the 1950s.

You might think I'm being negative, but no matter where you look, in some segment of society, technology may have many advantages, but it isn't solving many of life's critical issues and, trust me, it never will. There are more books, videos, motivational speakers, psychiatrists, and life coaches today than at any time in history and yet we still have many of the same problems people have faced for years - such as impatience and how it leads to stress and then death; conflict and how it leads to separation and loneliness; fear and how it contributes to illness; uncertainty and change and how they lead to insecurity.

Ever been to a social media site and seen an old flame, buddy, or friend who is now more successful, wealthier, better looking, or more connected or famous than you? How did it make you feel? Ever received an e-mail, text, or voice mail from someone wanting to end a relationship? Ever gotten lost because your GPS lady was in a bad mood? Just kidding, but I'm sure you get my point. Yes, technology has and will continue to solve many of life's challenges and needs as it continues to advance, but my question is simply this - are you letting it replace the vital human elements in your life, relationships, career, or business? Do you spend more time on your tablet, phone, or computer than you do talking with or to friends, your spouse, employees, children, or customers? Statistics now say the average person spends 6-9 hours a day looking at a screen!!! I'll let this speak for itself.

A few things to consider:

Words are important. Words matter - the ones you say to others and the ones you say to yourself.

Intent is critical. There are two types of intent - real and stated. One is what you say; and the other is what you do.

Beliefs are the foundation. Everything you decide, do, say, feel, and have or don't is the result of your foundation of beliefs. If you want something in life to change, you have to start there.

Gratitude vs. ego. People who come at life with gratitude and appreciation instead of self-gratification live longer and are healthier than those who don't.

Everything is perception and mindsets. No one looks at anything the same. Everything you think, believe, feel, decide, is driven by your mental interpretation (perception) of others, circumstances, and life.

Closeness and connection. Yes, solitude is valuable, but no one wants to spend all of their time separated from others. We all want, once in a while or more often, to experience the human touch (connection).

Humility is the difference. You will never be the best-looking, smartest, most clever, best, wealthiest, etc. person in the room. Maybe once in a while, but it will all depend on which room you are in.

Conflict is normal. Why? Because we all have our own personal version of good and bad, smart or stupid, etc.

Change is constant. Change has been happening for over 250 million years and it will never stop. Consider though, it is happening faster every day now than at any time in history, and as we move into the future this trend will not change.

Uncertainty is everywhere. Nothing is certain. Oswald Chambers once said, "The only thing in life that is certain is its uncertainty." Period!

Character matters. Who you are speaks so loudly. What you do means more than what you say.

How is technology improving any of the above? Think about it. Yes, it may make positive contributions, but are they the answer, or do we need something else to ensure human relationships control the quality of life and not robotic thinking and acting? Robots are not the answer. Helpful, sure, but they will never solve humanity's fundamental needs.

In His service,

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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Planning and Drilling the Blast Pattern

Adapted from Information by U.S. Department of the Interior's Office of Surface Mining



Good blasting practices start with the accurate layout and drilling of blastholes in their planned or sometimes unplanned locations. For a single blast, these locations rarely form a uniform, rectangular grid. Each blast layout will present new or challenging design elements depending on the performance of previous blasts nearby, geology, or production requirements.

Large mining operations may use high-capacity drill rigs with GPS technology and onboard computers to precisely position the rigs in each blasthole location. A planning engineer is often responsible for laying out and entering the locations for drill holes into a computer. This information is then transferred to the rig's computer, and the drill is guided by GPS to reach drill hole position.

Since the late 1980s, lasers and computer imaging software have been used as planning tools to advance safe drilling and blasting in an economical manner. 3-D laser profiling allows drilling and blasting professionals to visualize the rock face and determine the face profile on the computer, which assists them in planning blasthole patterns, optimum burden dimensions, and explosives loading.

Within the bounds of the planned blast, equipment is used to transmit a laser beam and receive accurate position information in x-y-z coordinates from beam reflections for millions of points on the highwall between the crest and toe of the bench. This data is collected in some form of logger, and downloaded to the computer.

In 2-D profiling, the proposed drill angle and hole offset from the crest are entered into the software, and profiles of the rock face and planned borehole are created graphically. 3-D profiling includes a survey of the actual drilled blastholes over the hole length from the hole collar, allowing for calculation of the effect of the hole deviations and computation of the explosive loading required from actual burden dimensions. Profiles of a bench may be interpreted by the software and printed out on a thermal printer in the field. The burdens over the length of each blasthole can be computed, allowing adjustments to be made in explosive quantities, location, or delay timing.

Using Subsurface DNA in the Oil Industry

Adapted from Information by Biota

Biota uses DNA sequencing and data science applications to explore the earth's subsurface, which provides insights to the oil industry for maximizing reservoir production and reducing environmental impact. With DNA data services, Biota can supply information for production profiling, sweet spot identification, well spacing, oil potential, and reservoir connectivity.

Subsurface DNA Diagnostics™ was recently used in the Wolfcamp Shale in Texas to estimate vertical drainage heights and landing zones for multiple laterals wells. The results provide groundbreaking reservoir insights, which will help optimize

well spacing and production monitoring. Subsurface DNA was also used to monitor well-to-well communication over time, confirming subsurface fracture propagation. These findings can potentially save millions of dollars for the oil industry through targeted completion designs, which will ultimately increase efficiency and asset value.

Subsurface DNA is obtained from reservoir fluids, well cuttings, and cores. Samples are collected in the field through noninvasive methods, which do not require pumping any chemicals into the reservoir. Biota works with mudloggers and pumpers to safely acquire samples during normal drilling and production processes, then samples are returned to the lab where DNA is extracted using techniques designed

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Subsurface DNA cont'd on page 52.

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Odd Facts

Without an atmosphere, the surface temperature on earth at the equator would be 176°F (80°C) by day, and fall to -200°F (-128°C) at night.

In *Toy Story's* most productive week during production, Pixar completed 3.5 minutes of animation.

The Un-Comfort Zone II

by Robert Evans Wilson, Jr.



A Survival Guide for the Era of Fake News Critical Thinking is Now More Important than Ever

Last year, I was invited to give a lecture on critical thinking to the U.S. Navy. I opened my presentation with a story I'd read in *Reader's Digest* magazine as a child. It's an old story you may have heard before, but it's a perfect introduction to the importance of critical thinking. Here's how it goes:

A newlywed husband observing his wife preparing a roast beef was shocked to see her slice an inch off the end of the meat and toss it in the trash. "Why did you do that?" he asked. She shrugged and replied, "I don't know; it's what my mother always did." Baffled anyone would waste good meat, and curious to learn the answer, he phoned his mother-in-law and put the question to her. Her response was the same as her daughter's, "It's the way my mother did it." Knowing his wife's grandmother was still alive, he phoned her next. Upon hearing the question, the older woman laughed, "Oh my, I don't do that anymore. When I was younger and poorer, I only had one pan and a roast wouldn't fit in it unless I cut the end off."

At some point in our lives, all of us have heard these words, "That's how we've always done it." These six words are a tip-off that it's time to reexamine a technique, method, or course of action, and the motivation behind it.

In many organizations, people fail to question everyday practices, processes, and procedures and just repeat them by rote, as a matter of routine or habit. There are traditions we accept which enslave us and hold us back. Much of our thinking is biased, partial, and uninformed. To be fair, it's because of what we are taught; and it doesn't occur to us to question it. On top of this, there are people and organizations with vested interests who will resist change so they don't lose money, power, influence, market share, seniority, and so forth. This resistance can take the form of denial, misdirection, obfuscation [purposeful confusion], or even punishment of those who push for change.

Today, we are inundated with lies, propaganda, and fake news by politicians, government, corporations, and the media. We need to protect ourselves by developing critical thinking skills.

Critical thinking is about forming a judgment. It is about examining and evaluating information we have received. Testing it, applying scientific methods, and interpreting it. However, we must be aware it will be influenced by our personal motivations, such as beliefs, assumptions, and experiences. To be a critical thinker, we must become aware of our biases. We must ask ourselves, "Do I have the integrity and humility to question my own prejudices?" If so, we can be much more objective in our assessments.

To be a critical thinker, we also must ask the right questions. Some examples include: "Will you be more specific?" "Can you give me more details?" "Can you show me an example or give me a demonstration?" "How can I verify that?" "Why is this a problem?" "How can we look at this from a different perspective?" "What is your proof?" "Is your proof based on scientific method or is it anecdotal?" "Can this situation/condition be duplicated or is it coincidental?"

Critical thinkers ask, "What is the evidence?" Evidence must be comprehensive, sufficient, and honest. It should be compared to known theories, laws, axioms, principles, definitions, and models. The critical thinker should test it against his or her own information, data, facts, observations, and experiences, along with those of people they trust. Critical thinking can also rely on common sense, which is the experiential knowledge shared by most people.

Critical thinkers use logic. They ask, "Are all the premises true?" A premise is a proposition upon which an argument is based. They are the reasons from which a conclusion is drawn. When someone presents you with an argument, make sure they aren't baffling you with logical fallacies (look up the most common logical fallacies to arm yourself against their use - you'll be surprised by how often they come up).

To be a critical thinker, you must question the purpose, goals, and objectives of the source of the information. For example, you might ask, "Who funded the research or study?" or "Who stands to gain from this?"

Thinking critically is about deciding what to believe. Critical thinkers do more than question authority, they question everything. Making inquiries is also the beginning of creative thinking. Challenging the status quo is how innovative ideas are born. Best of all, when you stop accepting unevaluated information as truth, you'll be amazed how liberating it is.

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.jumpstartyourmeeting.com or contact him via e-mail to michele@worldwidedrillingresource.com

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Removable Gooseneck's 70-Year Anniversary

Adapted from a Press Release by Talbert Manufacturing



Talbert Manufacturing was originally established as Talbert Construction Equipment Co. in 1938, in Lyons, Illinois. It served the Chicago market with crane and construction equipment rentals, as well as heavy-haul transport services. While Talbert was quickly regarded as a trusted name and a company which consistently delivered results, it did not have its claim to fame until the advent of the first mechanical, detachable gooseneck trailers in 1946. The product was patented in 1947, and entered the Canadian market in the 1950s.

The mechanical gooseneck revolutionized equipment loading by eliminating the need to drive equipment up and over the trailer tires. The design not only enhanced operators' safety, but also saved contractors time and hassle. Austin Talbert continued this trend when he designed and patented the industry's first hydraulic removable gooseneck 15 years later. The hydraulic gooseneck offered the same safety benefits as the mechanical unit, but could be removed in as little as two minutes, much faster than the mechanical model.

"The mechanical gooseneck is still a popular choice for owners who do little equipment loading and offloading, and need to minimize weight," said Troy Geisler, Talbert Manufacturing vice president of marketing and sales. "But when it comes to multiple offloads, as often as two or more times per day, the time savings of a hydraulic gooseneck really adds up."

In addition, the hydraulic gooseneck has virtually eliminated injuries associated with railroad track hang-ups due to the trailers' low clearance. Drivers can adjust the ride height to a variety of positions, enabling them to negotiate tracks as well as other obstacles, such as bridges. Talbert also patented several other heavy-haul trailer technologies which improved safety and efficiency.

All these years later, the company continues Austin Talbert's legacy and the hallmark of Talbert Trailers - safety. Talbert builds its trailers to the highest safety standards, which includes rating all of its load capacities at half the deck length to ensure the integrity of the trailer at maximum load capacity.



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New Laboratory Brings the Bakken to Engineering Students

Adapted from Information from the University of North Dakota

Students at the University of North Dakota's (UND's) Department of Petroleum Engineering and Institute for Energy Studies have a new hands-on educational tool which brings virtual oil fields into the classroom.

The Hess/Drilling Systems Drilling Simulator Lab features a control panel and levers which replicate a real drill floor environment in great detail, along with screens mirroring actual drilling fields from the state's Bakken Formation. This gives students a unique experience as instructors are able to set up any drilling/well control scenario based on actual events experienced in the field. This real-world environment gives students a feel for what is involved in day-to-day drilling operations and how to react and control stressful, potentially hazardous situations in a safe manner. The Hess Innovation Lab allows students to study shale drilling, while the Hess Teaching Labs give students the ability to learn petroleum engineering basics and conduct experiments to develop new drilling technologies.

"Our goal is to be the chief opportunity engine in North Dakota," said UND President Mark Kennedy. "These labs allow students to help advance energy further. Research and experiential learning are core to our strategic plan. Labs like this keep us innovative."

During the grand opening of the four labs, oil executives, state legislators, and other dignitaries, many of which are members of the university's Petroleum Engineering Industry Advisory Council (IAC), were allowed to experience the labs themselves.

The IAC, a group of oil executives who support the UND's petroleum engineering department, is tasked with helping to increase retention and graduation rates, while also increasing research. The overall goal of the IAC is to enlist the petroleum industry in the process of developing and educating the next generation of petroleum engineers.

Realizing the value of educating engineers in their home state, Hess Corporation has been in North Dakota since 1951, and values its relationship with UND. "It's been about seven or eight years since we first started the IAC," said Will Lehman, director of geological science and engineering development for Hess Corporation in Houston. "We laid out a plan, and formed a partnership with common objectives, and we hope to continue."

Matt Jurgens, VP of operations for Zarvona Energy and current chair of the IAC, who happens to be a 2005 graduate of the program said, "There is a lot of industry support for this department. You have a world-class resource here and a great opportunity for students to learn. We want to provide the best resources and attract top students. These labs bring the oil field to the students."

Department Chair and distinguished Professor at the Department of Petroleum Engineering, Vamegh Rasouli is proud of the program. "We don't compete with other petroleum engineering programs," he stated. "We are different. Shale drilling is number one for us, and our facilities are unique, thanks to our partners."



Derek Vioen with Drilling Systems of Katy, Texas, one of the donors of the Hess/Drilling Systems Drilling Simulator Lab, demonstrates the drilling capabilities to Andrew Eis from Halliburton.

Photo by Tyler Ingham.

A Geothermal Well Goes Subhorizontal

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

In 2017, the first subhorizontal geothermal well, designed and supervised by GPC IP, was completed on the Paris, France, suburban Cachan site for its customer Dalkia. The well architecture was a milestone in geothermal engineering since it achieved a 3280-foot-long, 87 degree slanted, 8½-inch openhole drain at a true vertical depth of over 5000 feet. Usually, the angle is 40 degrees during traditional drilling, and this is the first time the horizontal drilling technique has been used in this particular way, as it's typically reserved for oil drilling.



Photo courtesy of GPC IP.

The well concept will be replicated with an injection well of similar architecture. The new doublet, managed by a Dalkia/City of Cachan JV will replace two, 34-year-old existing geothermal district heating doublets. It will cover the heating and hot water needs of more than 7000 housing equivalents.

"This is a world first," said Jean-Philippe Buisson, regional director of Dalkia. "We have just completed a phase of horizontal drilling over [3280 feet] in the Dogger water table (an aquifer below the Paris Basin) at [5250 feet] depth."

The design allows for more hot water to drain over a long length, meaning the flow will be doubled and the production of heat increased. Subhorizontal drilling also significantly reduces the duration of the work, taking only four months instead of eight to drill two doublets.

The City of Cachan has been involved in the deployment of geothermal energy since the early 1980s. As of 2013, the city's network was positioned among the best French networks in terms of carbon dioxide emissions, with three times less than with gas production, four times less than with an oil boiler, and five times less than coal production. The geothermal network supplies 60% of the territory of the Cachanais.



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Grout Pump

The "Idiots" Corner

by "Billy Bob Smith"



"Most modern calendars mar the sweet simplicity of our lives by reminding us that each day that passes is the anniversary of some perfectly uninteresting event." ~Oscar Wilde

Stupid Holidays - I know I mentioned this before [December 2015 *WWR*], but you are not going to believe some of the following - and this is just for January! When I started doing the research on some of these holidays and their origins, rationale, and purpose, I got no further than number five on the list. I mean, come on Play God Day, Make Your Dream Come True Day, and Squirrel Appreciation Day? Geez Louise!?!&\$^*P))P((!&^^%\$#!

Fruitcake Toss Day
 Humiliation Day
 Trivia Day
 Bean Day
 Old Rock Day
 Male Watcher's Day
 Opposite Day
 Australia Day
 National Tin Can Day
 National Cheese Lover Day
 National Hugging Day
 National Pie Day
 National Handwriting Day
 Compliment Day
 National Corn Chip Day
 Fun at Work Day
 Backward Day

Festival of Sleep Day
 Spouse's Day
 National Spaghetti Day
 National Bird Day
 Cuddle Up Day
 Bubble Bath Day
 Play God Day
 Thesaurus Day
 National Popcorn Day
 National Buttercrunch Day
 Penguin Awareness Day
 Squirrel Appreciation Day
 National Blonde Brownie Day
 Beer Can Appreciation Day
 National Puzzle Day
 Data Privacy Day
 Chocolate Cake Day
 Inspire Your Heart with Art Day

Run up the Flagpole and See if Anyone Salutes Day
 Houseplant Appreciation Day
 Peculiar People Day
 Step in a Puddle and Splash Your Friend's Day
 Feast of Fabulous Wild Men Day
 National Pharmacist Day
 International Skeptics Day
 Make Your Dream Come True Day
 Dress Up Your Pet Day
 National Hat Day
 Appreciate a Dragon Day
 Measure Your Feet Day - we only ask . . ."Why!?!"
 Bittersweet Chocolate Day
 Ditch New Years Resolutions Day
 Punch the Clock Day
 National Inane Answering Message Day
 National Kazoo Day
 Bubble Wrap Appreciation Day

There's actually more than those listed here, so why not create your own special holiday - I just did. January first is no longer New Year's Day, but Billy Bob Stupid Day!

Billy Bob

Contact him via e-mail to michele@worldwidedrillingresource.com

Customer Appreciation Days Are Special in Pennsylvania

by Ed Moranski, Chief Marketing Officer
WorldWide Drilling Resource, Inc.

"On the Road" . . .

Having the ability to reach out to manufacturers on their own turf is truly an exciting thing. But more so, as I arrived at East West Machinery & Drilling in Mifflinburg, Pennsylvania, was the excitement I felt at the enormous facility I saw before me, something I feel quite certain like me, many don't realize.

What may also not be realized is the "reach" across the globe this company has.

Their remanufactured drill rigs are top-notch and in demand.

It was raining as I arrived, which appears to be what is becoming the norm for me. It certainly did not dampen the attendees' spirits on the inside! Customers had the opportunity to visit with multiple drilling-related product representatives along with East West's own professional technicians. Several vendors gave presentations as well as product demonstrations, which were not only educational, but enjoyable.

As lunch approached, everyone gathered around for a delicious feast, and to their additional delight was the door prizes which they could actually use in their businesses.

East West not only stocks a full supply of drilling products and equipment, but also has the ability and qualified staff to machine parts and manufacture custom items as needed. On display that day was an Atlas Copco T4W drill rig they recently rebuilt. They do it all - from dismantling the drill, to painting, repairing and rebuilding the drill to ensure it is ready to hit the ground in full force to make a profit for its new owners. Nothing is left undone as these rigs leave the yard. This unit showed excellent craftsmanship and made everyone take a second look.

East West has an uncanny ability to perform these tasks to completion in a relatively short time as they roll up their sleeves and just get to work; while others may just pull their sleeves down and walk away from it, leaving a used unit which has the potential of bringing in thousands upon thousands of dollars for a drilling company.

To think, this was only East West Machinery & Drilling's SECOND ANNUAL Customer Appreciation Days event, is another thing that struck me. The ease in which they handled everything made those in attendance feel comfortable and at home. They invite everyone interested in attending next year, to give them a heads up. You can be sure, their welcome mat will be out for you too!

To see all the photos from this event, go to www.worldwidedrillingresource.com or click [here](#).



Product Spotlight

Team Geoprobe® Engineers Release Patented Split Spoon Sampler



Geoprobe®'s patented interlocking split spoon soil sampler is two times stronger, lasts longer, and saves both money and field time. The new design specifically benefits geotechnical drilling operations. It's the latest innovation from the engineering team which created Genuine Geoprobe® products, such as the MC5 Macro-Core® and DT22 Dual Tube soil sampling systems.



The patented design of the split spoon soil sampler meets ASTM Standard D1586 and self-aligns during assembly to save field time. Its interlocking feature eliminates bulging and bowing by strengthening the entire sheath and enabling it to stay aligned during impact. Multilead threads at the drive head and cutting shoe allow the drill operator to make fewer turns throughout the day during assembly and disassembly.

Enhanced material properties deliver cost savings in the form of greater longevity with double the strength and durability when compared to traditional split spoon samplers.

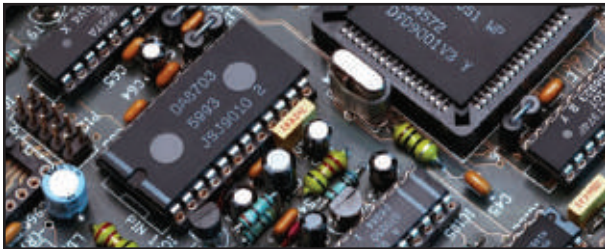
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Exascale Computing in the Energy Sector

Adapted from Information by HPC4E

Exascale computing refers to computing systems capable of a billion billion calculations per second. The HPC4E project aims to apply exascale high-performance computing techniques to energy industry simulations. The project customizes and innovates the techniques in the required exascale simulations with wind energy production and design, efficient combustion systems for biomass-derived fuels (biogas), and exploration geophysics for hydrocarbon reservoirs.

For the wind industry, high-performance computing is a must. The competitiveness of wind farms can only be guaranteed with an accurate wind resource assessment, farm design, and short-term wind simulations to forecast the daily power production. Models capturing turbine wakes, and array effects used to analyze atmospheric flow also require exascale systems.



Biogas is attractive because of its wide availability, renewability, and reduction of carbon dioxide emissions. However, its use in practical systems is limited because the complex fuel composition might lead to unpredictable combustion performance and instabilities in industrial combustors. The next generation of exascale systems will run combustion simulations in parameter regimes relevant to industrial applications using alternative fuels, which is required to design efficient furnaces, engines, and power plants.

One of the main high-performance computing consumers is the gas and oil industry. The computational requirements arising from full wave-form modelling, as well as seismic and electromagnetic data is causing the industry to adopt exascale computing technologies. By taking into account the complete physics of waves in the subsurface, imaging tools are able to reveal information about the earth's interior with great quality.

Geophysical exploration for finding and monitoring hydrocarbon reservoirs relies heavily on processing large amounts of data. The computational intensity associated with current data processing tools makes geophysical imaging a challenge. The huge cost related to data acquisition and drilling in challenging locations is being counterbalanced by using cheaper computing infrastructures. This is expected to cause companies to buy their own computing systems for geophysical imaging and reservoir modelling. Accurate imaging of the subsurface helps reduce geological uncertainty, which reduces drilling failure rates, making the cost of a drilling project a far less risky investment. Furthermore, the environmental consequences of drilling are reduced since each bore is more likely to hit the reservoir.

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In Memoriam

Clifford J. McAlpine

With heartfelt sadness, the Minnesota Water Well Association shared the passing of Clifford J. McAlpine on February 19, 2018. He was co-owner of McAlpine's Well Drilling in Dayton, Minnesota.

After retiring, Clifford was the caretaker of St. John the Baptist Catholic Cemetery for 18 years, in addition to being an active member of the parish and a member of the Knights of Columbus. He was one of the organizers of the Dayton Softball League, playing up to the age of 55.

Clifford was preceded in death by his wife Betty and is survived by his children Michael (Cheryl), Linda (Gregg), Tim (Lucy), Terry (Linda), Mary (Robert), LuAnne (Gary), Bill (Debbie), and Kim (Mike); 28 grandchildren; and 44 great-grandchildren. He had a very long, fulfilling life.



Stephen Douglas "Steve" McNeill (1952~2018)

The *WDR* Team was saddened to learn of the passing of Stephen Douglas "Steve" McNeill on March 1, 2018.

Born in 1952 in Connersville, Indiana, Steve attended Eau Claire High School in Columbia, South Carolina, then went on to J. Sargeant Reynolds College in Richmond, Virginia.

He began his career with Heater Well Company in 1968, then opened his own business, McNeill Well Drilling, Inc. in 1982, in Blythewood, South Carolina. He was a past president of the South Carolina Ground Water Association and was on the Board of Directors of the South Atlantic JUBILEE. He was a loving son, husband, father, and most importantly, Papa.

Steve is survived by his father Percy (Jo); wife of 35 years Melissa; children Melody (Tommy), Reverend Stephen (Morgan), and April; six grandchildren, and four great-grandchildren.



Lest we forget...

Van Norman Well Development

Information Provided by WellJet®

The Van Norman Complex of the Los Angeles Department of Water & Power (LADWP) is the nerve center of the region's vital infrastructure. Located in the foothills of the San Gabriel Mountains in California, it is the site where the Los Angeles Aqueduct completes its 400-mile journey from the Owens Valley high in the Sierras. Up to 600 million gallons of water per day are treated in the Los Angeles Aqueduct Water Filtration Plant before flowing through faucets and spigots from Boyle Heights to Beverly Hills.

In 2015, LADWP drilled a pair of exploratory deep artesian wells - Van Norman #1 (VN #1) and Van Norman #2 (VN #2). The wells are approximately 1400 feet deep, with 10-inch diameters. They were drilled in response to the Los Angeles Mayor's Executive Directive No. 5, mandating the development of local supplies. LADWP is trying to find more sources of clean drinking water. The Van Norman wells are located within the San Fernando basin and not contaminated, which means they do not require additional treatment.

In 2017, after the wells had sat idle for more than a year, LADWP engineers designed the development protocol for both wells. The engineering consultant firm Kleinfelder was hired to oversee and analyze the development efforts, which would be executed by the drilling and rehabilitation team at Layne Christensen.

Down hole video revealed areas of residual drilling mud plugging perforations in both wells. WellJet® was brought in to use its patented high-pressure water-jetting technique to remove hardened mudcake from inside the well screens, and deliver energy out through the gravel pack to the near-wellbore formation. This helped break up all the harmful deposits which had accumulated during the lengthy idle period.



VN #1	Output	Drawdown	Specific Capacity
BEFORE	900 gpm	207'	4.3
AFTER	1,200 gpm	120'	10.0
CHANGE	+33%	-60%	+233%
VN #2	Output	Drawdown	Specific Capacity
BEFORE	529 gpm	66'	8.0
AFTER	1,200 gpm	71'	17.6
CHANGE	+127%	+7.6%	+220%

One particular challenge for this project was maintaining control over discharge water during the rehabilitation process, which is always an issue with artesian wells. This was solved by installing a suction hose at the well access ports, and pumping off the overflow into a series of Baker settling tanks.

WellJet began its work with VN #1. Jetting the entire perforated area of each well required three days. Following jetting, Layne continued the development process with several days of swabbing, airlifting, surging, and test pumping.

Advanced Drilling Performance Tools

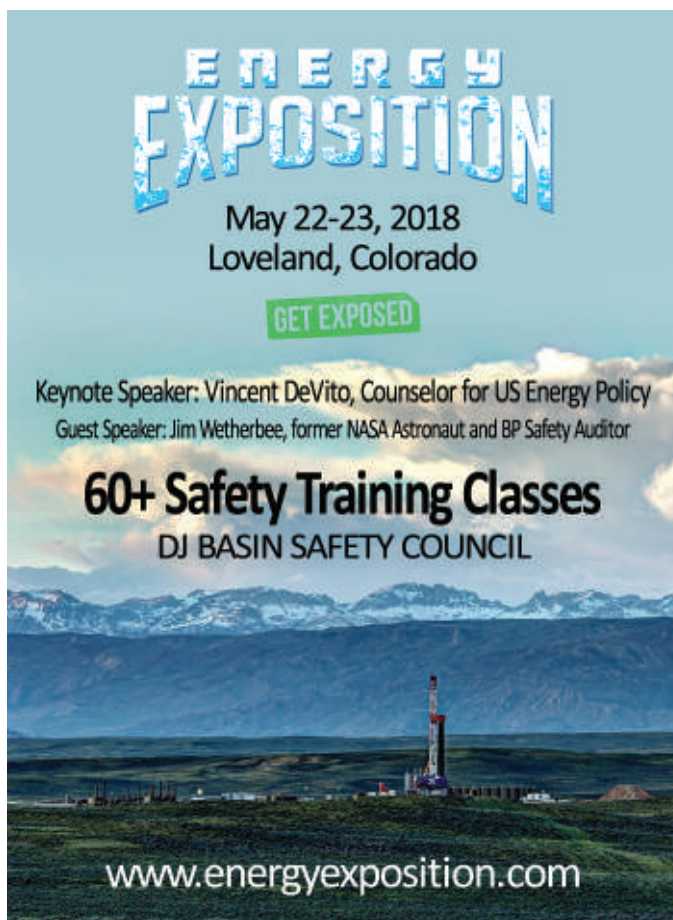
Adapted from Information by
Canrig Drilling Technology Ltd.

When it comes to drilling, efficiency is important. Canrig Drilling Technology Ltd. offers a line of advanced tools to enhance drilling performance. The tools save drilling time and reduce cost by using state-of-the-art technology.

ROCKit® system is a patented directional steering control system. It oscillates drill pipe to reduce friction and increase penetration rate. This reduces drilling time, resulting in huge savings in rig time costs. The ROCKit® system significantly increases rate of penetration by rocking pipe and delivering ideal weight to the bit. It promotes improved tool face control by allowing fine adjustments while still drilling ahead, reducing the need for lubricants and other friction-reducing additives. Drilling professionals save time by quickly setting tool face orientation.

Another drilling performance tool is top drive equipment conditioning monitoring (ECM). Sensors are placed on rig machinery to gather information which determines how well the equipment is performing and when it might be due for maintenance. This information is stored and displayed at the rig site using the company's RigWatch® platform, which can be transmitted and accessed remotely any time via myWells.com® or the RigWatch Pulse® application for smartphones.

Diesel engine ECM and FuelTool™ is a system comprised of sophisticated hardware, purpose-built software, and web-based data collection. It allows rig site personnel to proactively



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monitor and efficiently manage engines and fuel consumption. Standard engine management practice requires all engines to operate simultaneously to minimize risk. This practice causes engines to operate at 15-40% load, increasing fuel usage, maintenance costs, wear at lower loads, downtime risk with extra hours, and overall emissions. By monitoring rig site data, personnel know exactly how many engines are required during rig-up, drilling, logging, cementing, and other phases of well operation.

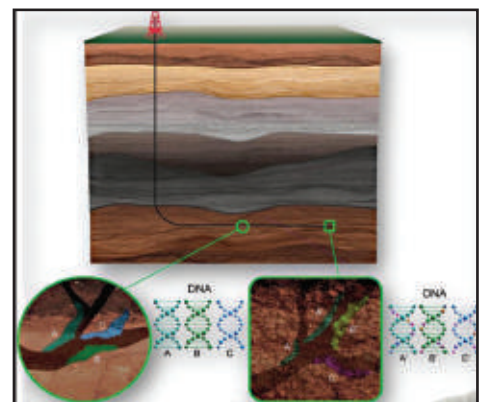
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Subsurface DNA cont'd from page 42.

specifically for oilfield samples. The samples are kept cold during handling and shipping to minimize changes to the DNA. To ensure sample integrity, Biota provides the required materials and training. In addition to field samples, control factors such as drilling muds, fracturing fluids, and other inputs to the system are collected for quality control.

Next, the samples are sequenced using next-generation DNA sequencing technology capable of returning over 10,000 reads per sample, providing highly specific information to identify the subtle subsurface changes which impact business decisions. After sequencing, the data is thoroughly checked to remove any sequences introduced to the sample by human and environmental contamination, ensuring the highest Subsurface DNA signal accuracy.

Most Subsurface DNA is obtained from microbes living in fractures, faults, and large interparticle pores. Microbes are very small and can live in the pores of minerals and organic matter; however, the majority of microbial communities are thought to be living in fracture pores, which are pore spaces formed through faults, fractures, and joints, providing sufficient space for microbial communities to survive.



Overseas Travel Management

by **Ashish Rathi**
National Sales Manager, **Shakti Pumps USA LLC**



Driving and Taxi Drivers

- Carry an up-to-date driver license and insurance documentation.
- Understand local driving practices and ask about bad driving habits, such as for giving way and overtaking (passing). Check on local police methods and carry money for fines.
- Carry a local map, be aware of “no go” areas, and plan the route thoroughly.
- Learn some useful local phrases in case you break down or have an accident.
- Ask to inspect and try out a hired vehicle before accepting it - ask for a demonstration. Remember to check tires, brakes, oil, and water levels.
- Make sure there is enough fuel for your journey and check ahead for petrol/gas stations on long journeys.
- Drive unobtrusively and be observant, particularly of following vehicles. Note familiar landmarks.
- Lock the vehicle even if you’re leaving it for only a few minutes, such as when refueling. Keep the passenger doors locked while driving. Leave nothing valuable inside.
- Carry emergency equipment (e.g. fire extinguisher, first aid kit, tool kit, spare bulbs, and warning triangle) in the vehicle. In many countries, this is a legal requirement.
- Don’t get out of the vehicle if you’re unsure of your surroundings, or if you’re involved in an accident which appears in any way contrived.
- Be wary of locals pointing out “problems” with the car. Go on to the next busy public place to inspect the vehicle.
- The police in some countries aren’t always sympathetic to travelers. If possible, tell your office you’re going to the police station before you go. Don’t give the police your passport unless you have to - try to use some other form of identification such as an ID card or driver license.
- Always leave enough room between you and the car in front to drive out if you’re approached by potential hijackers.
- Don’t wind your car window down fully when speaking to strangers.
- If you’re not confident about driving or there’s a high risk of carjacking or kidnap, hire a reliable driver.
- If possible, book taxis through your hotel or a reliable local contact.
- Make a note of the taxi company and the driver’s name, car registration, make and color, and the approximate fare when you book, and check them again before you get into the taxi.
- Travel in a licensed taxi with a meter, and make sure the driver uses it.
- Don’t get into a cab if there’s another passenger already there.
- Taxi drivers could take criminal advantage if they see a passenger as a newcomer, so act naturally and don’t ask too many questions.
- Always ask drivers who are to meet you at the airport to use your organization’s logo on the meeting card. (This makes it harder for other people to copy your name and try and get your attention before your official driver does.) Before getting into the car, make sure they know your name and either put your luggage in the boot/trunk yourself, or watch as the driver does it.

Look for the final list of tips next month.

Ashish

Ashish Rathi may be contacted
via e-mail to michele@worldwidedrillingresource.com

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FRASTE Celebrates Success in Turkey!

Adapted from a Press release by FRASTE S.p.A

FRASTE S.p.A. is celebrating its recent success in Turkey. Over the past three years, 13 drilling rigs have been delivered to Turkish Ministries.

One important contract between FRASTE and the Turkish Government Department for Electricity Production was for two rigs mounted on a 6x6 Iveco truck carrier, to be used for large-diameter reverse circulation drilling operations in open air coal strip mines.

The second contract was signed at the end of the 2015, with the Turkish "General Directorate of State Hydraulic Works (DSI)", for 11 water well drilling rigs classified in two groups. The first group included ten FS 400 water well drilling rigs while the second group included a FS 500 water well rig.

One of the most interesting innovations with these machines is their remote surveillance capability. This cutting-edge system is equipped with digital devices mounted on the drilling rigs. It sends real-time data to the Ministry Headquarter Department through a GPS system. This allows them to constantly check all drilling functions and monitor the geological conditions of the site.

In addition to providing the 13 rigs, FRASTE provided on-site training for the local drilling team covering all technical, theoretical, operational, and practical aspects with knowledgeable and experienced technicians and even supervised the starting operations on the jobsite.



Turkish Dealer, Dizel Turbo Ltd., played an important role in this agreement between FRASTE and the Turkish Ministries and followed all the delivery, commissioning, and training stages. The company's skilled staff also provided commercial and technical assistance to the customers.

The outcome of the successful collaboration of FRASTE and Dizel Turbo led to DSI Turkish Ministry requesting two additional rigs later this year.



Environmental Monitoring

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

Cores ~ Valuable Information for Understanding Subsurface Geology and Hydrogeology

The two most common methods of drilling water wells are the cable tool and mud rotary methods. Both of these "destroy" the physical characteristics of the formations encountered. Unfortunately, the geologic structure (bedding, porosity, etc.) is often crushed and appears as ground-up grains and mud. Fortunately, some worthwhile information relating to the water level and water-producing characteristics of the formations are revealed by changes in the drilling fluid levels while penetrating these formations.

A formation that drinks water quickly will usually produce a lot of water if it is not a dry zone which is encountered. Other characteristics that are difficult to determine while drilling include the "connectivity between voids", or the size of voids. Some formations can have 20%, 30%, or more porosity, but the permeability (ability of the well to produce water) depends on the connectivity, or flow, between the pores. Permeability is often influenced by the layering of clays between the water-bearing zones. Even thin horizontal clay layers will "prevent" the movement vertically to the zones contributing water to the well. If the borehole is composed of cemented sandstones, limestones, fractured shales, or dolomites, and will remain open, the drill crew may be able to insert a pump, and measure the water pumped over time to determine if the well will sustain a yield sufficient for the intended use.

The drill operator can also obtain coring equipment for rotary rigs to recover rock and sediment cores. These cores, often in the two- to four-inch-diameter range, are very helpful in assessing the permeability of a formation. Core barrels can often yield cores of two- to ten-foot lengths, which can be preserved for future references or testing.

Coring equipment and operation of this equipment is probably more trouble and expense than the average drilling contractor cares to undertake. Cores for your area may be available for viewing from your state government, or the U.S. Geological Survey. A call to view these cores may be well worthwhile.



Tom

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

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Using Gas and Oil Technology for Offshore Wind Farms

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

Although the U.S. currently only has one commercial offshore wind farm in operation, several more are on the horizon. One of the challenges facing the industry is designing systems for hurricane-prone areas. The U.S. Department of Energy (DOE) is developing tools to help designers lower the risk for offshore wind turbine systems.

Since additional technology in floating foundations is necessary to make offshore wind development feasible in the deep waters of the Pacific, most of the offshore wind turbine development is currently planned for the East Coast and the Gulf of Mexico - areas which see regular hurricane activity, as well as other extreme weather conditions.

Both land- and offshore-based wind turbines are designed with built-in mechanisms which lock and feather the blades (reducing the surface area that's pointing into the wind) when wind speeds exceed 55 miles per hour. Essentially, the turbine goes into survival mode until the storm subsides, so it can safely go back to producing energy.

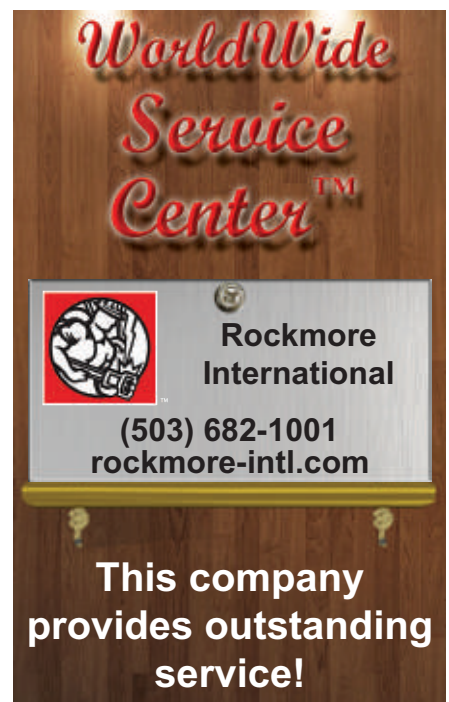
In addition to offshore storms being stronger, the turbine's foundation also has to deal with large, powerful waves. Engineers who design wind turbine systems use models to understand how different loads, like winds and waves, will impact a turbine and its foundation.

Previously, the DOE has funded work through the National Renewable Energy Laboratory (NREL) to figure out how to predict turbine loading in extreme conditions. Working with the University of Miami, NREL linked its preexisting wind turbine simulation software (called FAST) with the atmosphere-wave-ocean forecast model used for hurricane research and prediction to create a new Coupled Hydro-Aerodynamic Interface for Storm Environments. This tool helps wind system designers lower the risk for offshore wind turbine systems located in extreme weather areas.


Research priorities of a new offshore wind R&D (research and development) consortium, funded by the DOE, may include a focus on improving the understanding of extreme conditions like those experienced during hurricanes, to better predict potential failure modes of turbines operating in these areas, leading to the adoption of more robust engineering designs.

The DOE has been studying the twisted jacket foundation. Used in the gas and oil industry, this design withstood a direct hit from Hurricane Katrina, a category 5 hurricane in 2005, without any damage to the foundation. NREL designed and analyzed a hypothetical 500-megawatt offshore wind plant to be deployed in roughly 80-foot waters in the Gulf of Mexico. Some of the features included a twisted jacket foundation from Keystone Engineering and a customized lightweight direct drive generator from Siemens.

Perhaps the most surprising component of this system is the rotor designed by Wetzel Engineering. To optimize the project for hurricane resiliency and structural efficiency, the wind turbines use a downwind orientation - opposite from the upwind design used in virtually all utility-scale wind turbines today.



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Although hurricanes and the damage they can cause remain difficult to predict, with current R&D, the DOE is taking steps to alleviate potential risks to offshore wind systems.



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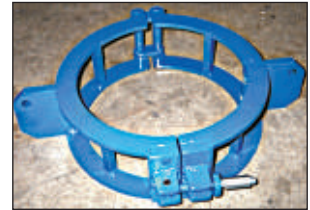
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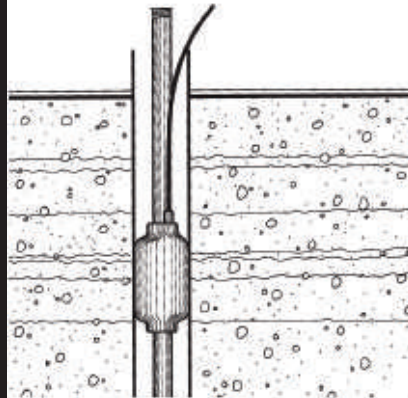
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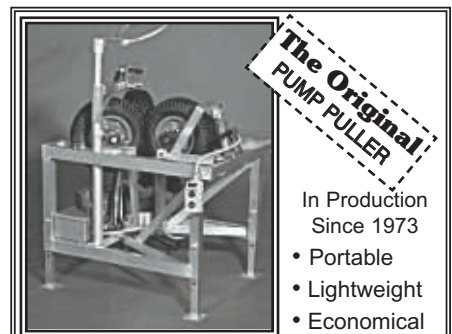
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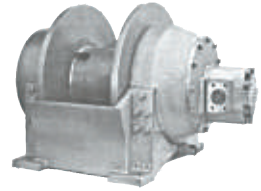
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MACC (Miami Airport Convention Center)
Miami, FL (USA)
Phone: 305-412-3976
<http://www.thewaterexpo.com/>

National Drilling Association (NDA) Convention

September 20-21 (Thurs.-Fri.)
The Bertram Inn & Conference Center
Aurora, OH (USA)
<https://nda4u.com/>

Atlantic Water Well Association (AWWA) Trade Show & Convention

September 27-29 (Thurs.-Sat.)
Truro, NS (CANADA)
E-mail: atlanticwaterwell@gmail.com

GEOFLUID

October 3-6 (Wed.-Sat.)
Piacenza (ITALY)
Phone: +39 0523-602711
<http://www.geofluid.it/>

Permian Basin International Oil Show (PBIOS)

October 16-18 (Tues.-Thurs.)
Ector County Coliseum
Odessa, TX (USA)
<http://www.pboilshow.org/>

2018 California Groundwater Association (CGA) Annual Convention & Trade Show

October 24-27 (Wed.-Sat.)
Grand Sierra Resort and Casino
Reno, NV (USA)
<http://www.groundh2o.org>

Groundwater Week 2018

December 3-6 (Mon.-Thurs.)
Las Vegas Convention Center
Las Vegas, NV (USA)
<https://groundwaterweek.com/>

Kentucky Blasting Conference (KBC)

December 6-7 (Thurs.-Fri.)
Heritage Hall & Hyatt Regency Hotel
Lexington, KY (USA)
<http://www.kyblastingconference.com>

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