GEO
Drilling Fluids, Inc.

TECHNICAL SERVICES NEWSLETTER

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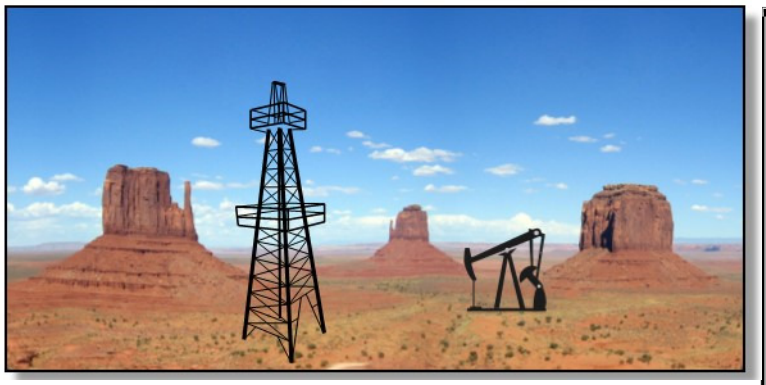

NEW TECHNOLOGY

Drilling an exploratory well usually takes a lot longer than drilling follow-up wells. The more we know about the rock and the pressures the better prepared we are. Time is saved by having the right mud weight and viscosity. Additional time is saved in many other areas by doing such things as changing the casing program.

We are now in the midst of a drilling boom as horizontal wells are drilled in shale all over the country. Most of these fields are more or less consistent from well to well allowing an even greater degree of predictability. New technologies are coming on line now that allow thee wells to be drilled faster and cheaper than ever.

New rig design has a lot to do with the faster drilling speeds. Nabors has a new rig design called the PACE® -X. Among other time saving

New Technology
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"It don't cost nuthin' to be nice."

Paul "Bear" Bryant (9/11/1913 – 1/26/1983) University of Alabama Head Football Coach for 25 years.

Or: "As you sow so shall you reap."

Or: "What goes around comes around."

WHAT DO *YOU* WANT IT TO BE?

1. CalCarb would be a better weight material if it was: a) finer, b) coarser, c) less dense, d) denser.
2. The Model 35A is a: a) Baroid mud balance, b) FANN 6 speed VG Meter, c) Halliburton pressurized mud balance, d) OFITE 10 ml retort.
3. Lost circulation is easier to control when the well has: a) deviations, b) high permeability, c) a mud system with a high low coefficient of friction, d) a high frack gradient .

ANSWERS ON PAGE 4

INTRODUCING RYAN PRITCHARD

We would like to introduce you to Ryan Pritchard who is the new California Sales Representative for GEO Drilling Fluids, Inc. We are proud to have Ryan joining our management team.

Ryan is a Bakersfield native who grew up surrounded by the oil and agriculture industries. After graduating from Centennial High School, Ryan chose to pursue his education at California Polytechnic State University of San Luis Obispo (Cal Poly) where he majored in Agriculture Systems Management with specialized studies in State Water Conveyance. During his enrollment at Cal Poly Ryan worked with the Kern County Water Agency as an engineering and operations in-

Ryan Pritchard
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New Technology

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features is a tall sub-base with a derrick that collapses straight down by telescoping into the sub-base. This has allowed the rig to be moved without laying down the derrick. Not only does it speed the move but it means wells can be spaced more closely on a single pad.

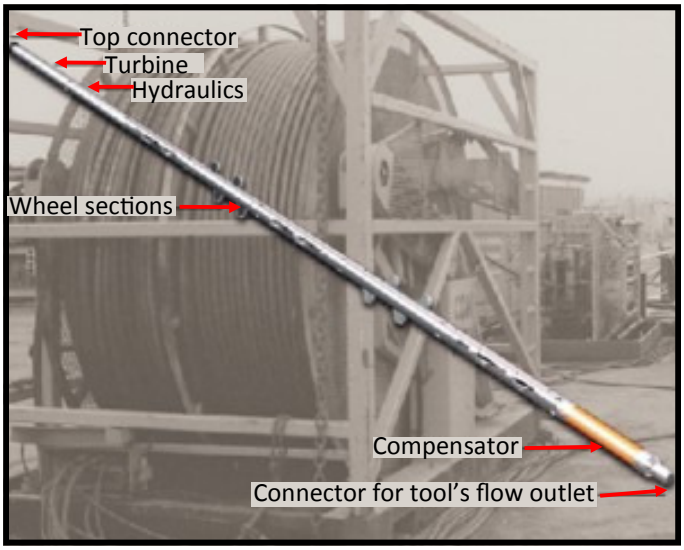
Automated pick up and laydown catwalk/V-door equipment has been around for several ears. These new rigs incorporate this with the latest changes to make them faster and easier to use.

Moving the accumulator and kill manifold has always been a time consuming part of a rig move. The PACE®-X has eliminated this chore by putting the manifold on the rig floor. One can only assume that they have dealt with the safety issues inherent in having this vital piece of equipment located so close to the well bore where a blowout could quickly destroy it.

The rig has a mechanical derrick had as well. This hydraulic arm pulls pipe back and racks it on either side of the board. Running in the hole the pipe is brought back out and loaded in the elevators. The runaround remains basically the same so that a derrick hand can take over if the machine breaks down.

One of the challenges in long horizontal wells is

getting logs to bottom. Drillpipe conveyed logs are very time consuming and often troublesome. A technology that is several years old is called "coiled tubing tractor" which literally pulls the tools out to the end of the well.



Coiled Tubing Tractor for pulling logging, completion and work over tools.

Top drives have been improved with both hydraulic and electric power. For the same lifting capacity the size has been reduced to make them easier to handle. A new model from Tesco Corp. has a weight rating of just 150 tons and is designed for older, smaller rigs that currently use a Kelly.

PROGRESSING CAVITY PUMPS & MUD MOTORS

In 1930 the progressing cavity pump was invented by a French compressor designer. The pump uses a helical metal rod rotating inside an elastomer sleeve. The rod forms closed spaces which move along the pump's length as it rotates. The pumps have almost no slippage when new making them ideal for very viscous fluids. Their primary use is in the food and manufacturing industries to pump things like peanut butter.

Oil field applications of this pump type include centrifuge feed pump, downhole oil pump and the power of a mud motor. California was the site of the first use of PC pumps to replace the traditional "horse head" reciprocating pumps that dominate the landscape in many oil fields. Their use spread to Canada where pumping heavy crude mixed with sand was tearing up the traditional rod pumps.

Heat, oil and gas all can rapidly destroy the traditional stator elastomers. Few customers of PC pumps have these problems so the manufacturers have been slow to meet the need for a high temperature stator that can pump light oil.

OILFIELD WATER TREATMENT

In 2013 worldwide oil production is approximately 25 million barrels per day. This volume of liquid is mind boggling to most of us. Over one billion gallons. Enough oil to fill 50,000 frack tanks of 500 barrels each. Every single day! That's a lot of oil. But there is **three times** that much water produced from those same wells every day.

A portion of the water that is produced is naturally associated with the oil. Ideally a well only produces oil but in most cases there is some water also produced along with the oil. The ratio of water to oil is call WOR or water oil ratio.

In order to get oil out of the ground after the natural pressure has dropped, or if there is insufficient pressure to bring the oil to the surface requires a pump (secondary production). As the pressure continues to drop it becomes necessary to push the oil toward the pump (tertiary production).

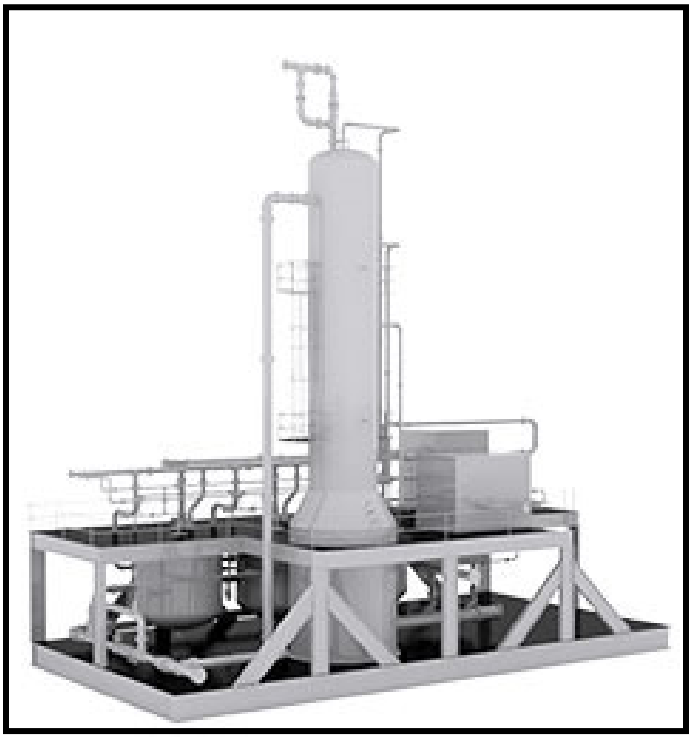
Tertiary production can use a gas but in most cases it is water or steam that is injected. As more water is pumped into the reservoir more water is produced with the oil. It is predicted that the water associated with oil production will reach an EOR of 12:1 for onshore production from the current 3:1 WOR.

One of the methods of water reclamation that has been considered for many years is called electrocoagulation. This process uses an electric current to coagulate solids into large enough clumps to be removed by settling. The method is plagued by anode and cathode fouling by trace amounts of oil, difficulty sizing it up to handle large volumes as well as high cost of operation. Yet with all these problems the method is being seriously considered by oil companies who are searching for ways to dispose of vast volume of produced water, both on shore and offshore.

A key to many water cleaning processes is monitoring of the input to adjust treatment and the output to assure regulatory compliance. Lab results that are two days to two weeks away just won't cut it for a facility that needs to operate 24/7. Technology already exists to monitor relatively fresh waters with sensors installed and connected online to get real time results. Produced waters however are considered too dirty for this equipment to function long -term. Efforts are underway to make these sensors more robust, but the solution is not yet is sight.

One of the technological hurdles that the oil and gas industry has faced is called deoxygenation. In order to use sea water for water flood the free oxygen has to be removed. A method exists but it involves vacuum and deareation towers. They have a very big footprint making them very costly for offshore applications. An alternative has been explored using membrane separation. For more than 20 years a solution has been sought with a couple of ideas that seemed to work until they were actually installed in an oil field application. Their failure in the real world was very costly as projects had to be delayed while conventional technology was deployed.

The obstacles to be overcome in oilfield water treatment are seemingly impenetrable but the rewards for overcoming these obstacles are monumental. Fortunes are there to be made for the inventors of solutions because failure to improve water recycling will slow oil production, at least in this country.



NOV Mission Production Technologies seawater treatment compact system for injection to maintain reservoir pressure. The package includes media filtration and vacuum strip deoxygenation tower.

FIBERGLASS TUBING FOR SETTING CEMENT

Fiberglass liners were considered many years ago for the Brawley geothermal field. The resistance to corrosion made it a perfect option. The liners they run now have to be either 1/2" thick steel 7" casing or high dollar titanium. In either case the life span is too short because of the various chemicals in the water combined with the heat of as much as 800 degrees F. Fiberglass was rejected because the temperatures were too high.

A recent discussion on an SPE chat room involved the use of fiberglass to set cement plugs.

Fiberglass tubing is one of my favorite field methods for dealing with cement plugs. It presents an excellent opportunity to place the cement plug in the proper position and under the best conditions without the fear of leaving an undrillable material inside the plug. When using steel tubing there is always the need to get above the cement top and reverse circulate to clear the pipe [and annulus] of cement. Here, the fiberglass tubing can be used to set the plug, squeeze and confirm its placement without concern about leaving steel tubing stuck in the hole. If the fiberglass tubing gets stuck it's a simple matter of running a temperature log to find the top of cement, use a backoff charge and blow the fiberglass tubing apart above the cement top. Mill tooth bit can drill out the cement and any fiberglass pipe inside the plug. This procedure eliminates the over-caution that often accompanies cement placement through steel pipe.

Les Skinner
Drilling Consultant
HoustonTX

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Fiber glass tubing has been used for the last 40 years around the world to perform successful plug back jobs. The only disadvantage of fiberglass tubing is that it easy to break, especially when running in the hole where condition may be very rough. It doesn't take much to break and if the tail is lost on the way in the plug setting depth will be wrong.

Tahir Bhatti
Directional Drilling Supervisor
Sperry-Sun Drilling Services
Murphy, TX

In wells where the fiberglass might not survive the trip -in, aluminum is a good alternative.

David Kulakofsky
Executive Account Manager
Impact Fluid Solutions, LLC
HoustonTX

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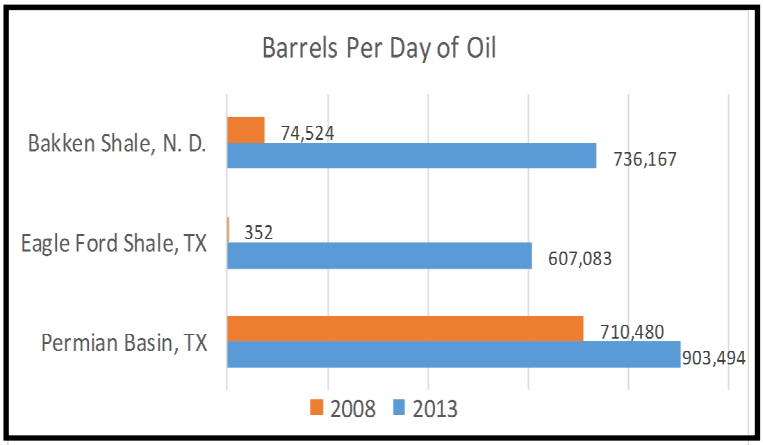
Aluminum works too but aluminum-to-steel connections deform with repeated motion and eventually shear. Fiberglass is flexible and the forces tend to be absorbed in the body of the pipe instead of damaging the thread. Fiberglass pipe can be strengthened using Kevlar.

Last point - aluminum is not inert. It can degrade with time and fluid exposure. Fiberglass only degrades in high temperature applications and even that can be controlled by using resins that are temperature resistant.

Les Skinner
Drilling Consultant
HoustonTX

This last comment about temperature stability of fiberglass caught my eye. Perhaps it should be investigated again as a geothermal alternative. Certainly there are occasions when pulling up to clear the pipe may compromise the plug and this could be an attractive alternative.



ANSWERS TO **WHAT DO *YOU* WANT IT TO BE?**

1. b) coarser, and d) denser.
2. b) FANN 6 speed
3. d) a high frack gradient

Ryan Pritchard

(Continued from page 1)

tern where he helped provide stream flow calculations for Groundwater Recharge Committees, mapped groundwater elevations for Kern County groundwater basins, and performed economic analysis for various water well expansion projects. His passion for state water volatility drove him in this direction as he saw the impending future of such a hot topic. Ryan also regularly participated and was a member of the Society of Agricultural Engineers.

After graduating from Cal Poly, Ryan immediately changed directions in professional focus. With the encouragement of his stepfather Daryl Thomas who is a seasoned veteran in the drilling fluids industry, Ryan went to work for Halliburton -Baroid as a mud engineer. Once out of mud school, even though he had never even set foot on a drilling rig, Ryan knew that this was going to be his career. After the recession of 2008, Ryan made the transition to GEO Drilling Fluids.

GEO provided Ryan with the working platform that he had been looking for since graduating from college. A company that cares just as much about its people as it does about the work they are doing. While at GEO Ryan has worked with many different operators allowing him to diversify his experience in the state of California. In 2013, with the retirement of long time Sales Manager Bob French, Ryan was given the opportunity to advance his role within the company when he was offered a position as California Sales Representative.

Ryan currently approaches these new challenges and roles with the same attitude and ambition as he did while working on the rigs. "Keep your head down, work hard, and stay humble!"

INTRODUCING TRACE MORENO

Trace was hired recently to take on Regional Sales efforts for the California region, working with Travis to expand GEO's presence in this market.

Trace was born and raised in Bakersfield, California and like many natives his family has been involved in the oil and gas industry for several generations. After graduating from Centennial High School, he attended Bakersfield College to pursue his education and love of baseball. His time at Bakersfield College forever changed his understanding of education and the value of hard work.

Trace was awarded a baseball scholarship to Avila University in Kansas City, Missouri where he spent the next two years pursing a degree in Business Administration. Upon the completion of his athletic eligibility, Trace decided to transfer back home to California State University Bakersfield to complete his education in Business Administration with an emphasis in marketing. He planned to use his education to pursue a career in the construction industry.

While finishing his degree, Trace worked for a landscape construction company as an estimator. He was promoted to project manager over several large commercial landscape projects scattered around the Kern County area. Looking for a larger opportunity Trace accepted a job with Gothic Landscape as a project manager over their San Diego projects. After a few years as a project manager, Trace was promoted to Account Executive for Business Development for Southern California, where he was successful in expanding business opportunities during the worst housing decline in 20 years.

With no sign of the construction industry turning around, Trace decided to follow the family tradition and came home to Kern County to work in the oil and gas industry. He accepted a job at San Joaquin Bit Service as their Southern California Sales Representative. Within a few months of being back in Bakersfield, Trace was introduced to his wife-to-be Jackie. After several years of peddling bits throughout California, Trace was approached by techSTAR Fluid Systems to help expand their business into the US markets. In working with techSTAR, Trace became all too familiar with the competition from GEO Drillings Fluids acquiring great admiration and respect for their operation. When techSTAR moved out of the US market, it brought an opportunity for Trace to join GEO Drilling Fluids!

Trace and his wife Jackie are the proud parents of a baby boy named Jacob David Moreno. These two new beginnings, a growing family and an exciting new job, have opened new horizons with all the challenges and rewards they bring.