



Drilling Fluids, Inc.



TECHNICAL SERVICES NEWSLETTER

Volume XIII, Number 7

December 1, 2009



PLACEMENT OF JARS

Jars are a mechanical device used downhole to deliver an impact load to another downhole component, especially when that component is stuck. There are two primary types of jars, hydraulic and mechanical. While their respective designs are quite different, their operation is similar. Energy is stored in the drill string and suddenly released by the jar when it fires (or trips). Jars can be designed to strike up, down, or both. In the case of jarring up above a stuck bottom hole assembly, the driller slowly pulls up on the drill string but the BHA does not move. Since the top of the drill string is moving up, this means that the drill string itself is stretching and storing energy. When the jars reach their firing point, they suddenly allow one section of the jar to move axially relative to a second, being pulled up rapidly in much the same way that one end of a

Placement of Jars
(Continued on page 2)

"No matter how insignificant what you do may seem, it is important that you do it."

Mahatma Gandhi
(Favorite quote of Matt Damon)



WHAT DO YOU WANT IT TO BE?

1. The GEO philosophy "Don't be a hero." includes: a) don't stick your neck out, b) don't take unnecessary risks, c) call the office, d) consult with the Company Man before changing the mud.
2. Torque and drag can be reduced by making a: a) short trip, b) wiper trip, c) drag trip, d) widget.
3. As water content increases in PetroDrill viscosity: a) increases, b) decreases, c) is unaffected, d) effect cannot be predicted.

ANSWERS ON PAGE 4



H₂S
POISONOUS GAS

Hydrogen sulfide (H₂S) is colorless, transparent, flammable, smells like "rotten eggs" at very low concentrations, and is denser than air and thus may accumulate in low places.

The slightest presence of H₂S in the air is normally detectable by its characteristic "rotten-egg" odor; however, it is dangerous to rely on odor as a

H₂S
(Continued on page 6)

Safety ALERT
RESPONSE REQUIRED

Placement of Jars

(Continued from page 1)

stretched spring moves when released. After a few inches of movement, this moving section slams into a steel shoulder, imparting an impact load. (Schlumberger Oilfield Glossary)

The computer programs of major jar vendors predict where jars should be placed for optimum

point. This has the perverse effect of causing you to think you are helping your situation, while you are probably making it worse by sitting in the hole. This is true whether the problem is differential or mechanical sticking.

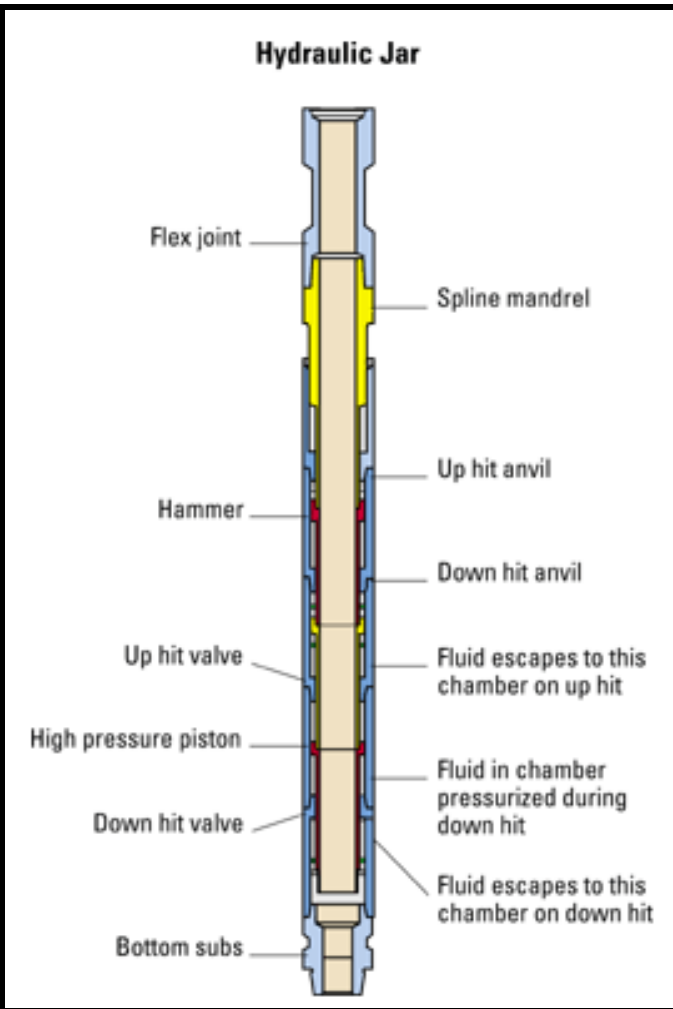
Even if the stuck point is below the jars they can still provide no benefit if you are stuck at a different point than you assumed in the BHA design.

Better results were obtained with jars that were run in a fishing string, compared to those run in the drilling BHA. This is because the free point had been established before we backed off and the placement of the jars was calculated based on the free point that actually existed.

This doesn't mean that jars should not be run in a drilling string, but jarring for a very limited, several good hits, before giving up is probably a better plan. Given the cost of the modern BHA components (MWD, LWD etc.), and the associated lost time associated with stuck pipe, any improvement in recovery would be helpful. Jarring on sensitive electronics for several hours usually decreases the value of the tool, so jarring for long periods of time should be avoided.

Three things to consider. First and foremost the jars must be above the stuck point. Second, will you be jarring up or down? You can jar up much harder than you can jar down. Jarring down is required roughly 75% of the time. Finally, try to be as close to the stuck point as possible without being in the neutral point.

There are two components to the blow imparted by the jars, impact and impulse. Impact is kinetic energy that breaks rock but dissipates in a very short distance. Impulse is momentum that moves the BHA, and can move through the entire string. Imagine a stand of collars hanging freely above the rotary table. If you hit it with a ball peen hammer you dent the steel, (impact). If you hit it with a large sledge hammer you can move the collar, (high impulse), but you don't leave a mark on it, (low kinetic energy). You need both components to get free. Sometimes it takes the impulse of one jar high in the string in order to fire a second jar close to the stuck point in high angle wells.



performance. The problem with these calculations is that they require input of the stuck point. This cannot be known for certain without running a free-point **after** getting stuck. Since the placement of the jars must be made before getting stuck, some far sighted thinking is required to anticipate the stuck point.

If the stuck point is different than what was assumed in the BHA design, it is possible to jar all day and apply essentially no force at the stuck

THE MUD MAN'S CORNER

Paperwork

Paper work for all wells completed before the 1st of the month is due in Bakersfield by the 10th. This includes delivery tickets, inventory report, recap, and digital copy of the well. On lengthy wells where monthly billing is applicable the delivery tickets for each month are due by the 10th of the following month. If you have a logistical problem meeting these dates you must call Shelle to let her know.

Our customers have an expectation of prompt billing and we have an obligation to provide a prompt accounting to them. Please be a part of the solution, not a part of the problem.



Mud Report 7.5.2

Mud Report v.7.5.2 is now being beta tested. We have added some built in flexibility for reporting liquid storage and oil base mud losses as an alternative to torque drag and lithology. The most significant change is in the inventory. 20 new product spaces have been added. If you anticipate a long well with multiple mud types it should be good to start with the new format. Anyone who is interested in having a copy of this new format please let Andy know.

WHAT DO YOU WANT IT TO BE?

This little story was in the Technical Services Newsletter about 6 1/2 years ago. It explains the title of the question box on the front page.

WHAT'S THE ANSWER?

A farmer came onto a location one day seeking information from the "experts" who were drilling an oil well on his land. His question was simple but the answers amazed him. He found the geologist standing in the middle of the location with a handful of gravel, staring at the rocks in his hand. The farmer asked the geologist, *"What's the mud weigh now?"* The geologist replied, *"I thought I knew that but the deeper we get and the more I find out the less sure I am. I'll have to wait for the logs and then I can tell you for sure."*

The farmer shook his head and looked around, spotting the Company Man peering into the distance trying to see the logging trucks that were two hours late. *"What does the mud weigh now?"* he asked. The Company Man replied, *"Look, I'm busy here, come back later, or better still, ask the Tool Pusher or the Mud Man. They're supposed to keep track of that!"*

So the farmer took off to find the Tool Pusher. He found him standing on the rig floor staring at the driller, pondering the amount of time it was taking to get the floor ready for a trip. The farmer asked, *"What does the mud weigh now?"* "Well, lets see," he replied stepping into the driller's shack, *"Well, they were supposed to raise it ten percent. I'll have to get out my calculator, its here some place. Maybe under this pump liner. Well anyway, its about 12.5, but it may be a little more or less. Doesn't really need to be that accurate does it?"*

Finally he went to the Mud Engineer who was standing on the pit, watching the mud swirl. *"What is two times two?"* he asked. The Mud Engineer, who had been working with the derrick hand to get the mud weight even all the way around said without even looking to see who had walked up behind him, *"What do you want it to be?"*



ORGANOPHILIC CLAY VISCOSITY

PetroDrill, GEO Drilling Fluids’ oil base mud, uses Mul Thik, an organophillic clay, as the primary viscosifier. Mul Thik is made by reacting quaternary amines with Bentonite. The Bentonite used in the process of making Mul Thik is the same “Gel” we use in water base mud. The process involves shear blending without water. The resulting product will not hydrate in water but slowly, over a period of days, reaches full yield by absorbing the base oil.

PetroDrill consists of an emulsion of water in oil. The base oil is either LVT-200 (a low viscosity, low toxicity refined hydrocarbon) or diesel, depending on regional factors. The water is either Calcium Chloride (CaCl₂) or Sodium Chloride (NaCl). When fully emulsified and sheared the water droplets are reduced to sub-micron size.

TESTING

In research done by Amoco, published in 1987 as SPE 16683, “Interaction of Water With Organophillic Clay in Base Oils To Build Viscosity”, the entire process of oil base mud mixing was carefully examined. The work was broad based to isolate the effects of particular products from the general truths about oil base mud. Four different base oils were used, two different organophillic clays, two types of water, and three different types of emulsifiers were used in various combinations.

The first set of tests was done without emulsifiers or water to isolate the effects of the clay in oil. The results were not statistically significant but they did indicate that the higher the aromatic content of the oil the faster the clay yielded. In some

cases the high aromatics produced higher ultimate viscosity.

Further testing was done with oil, water, and clay. In this case they varied the water, using de-ionized water as one variable and 5% by volume 30% CaCl₂ solution (10.7 ppg), as the other. Two clays and three oils were used including diesel fuel with and without additives. The additives included corrosion inhibitor, icing inhibitor, antioxidants, metal deactivator, and electrical conductivity. Yield varied greatly with the additives in diesel being the biggest contributor to the variation.

The final step added one of three emulsifiers to a clay/water/oil system. They measured rheology initially and after sitting for one day. The results showed that emulsifiers acted as a thinner in every case. If we were choosing a base oil or salinity based solely on the resulting viscosity these data would be helpful. However, there are always many other factors that go into this decision.

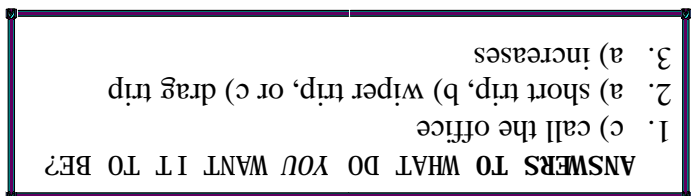
RHEOLOGY

The rheology of PetroDrill is derived in part from the size, shape and quantity of solids as well as the viscosity of the continuous phase (base oil). This type of viscosity is reported as Plastic Viscosity (PV). This is an identical process as found in water-base fluids.

Yield Point (YP) in water-base fluids depends on the electrical interaction of the solids with each other and with the electrolyte (continuous phase). Oil, being an insulator, cannot conduct these electrical forces and thus the YP must derive from some other process.

The testing described above was able to determine which materials developed the most YP but gave no clue to why this was happening. It wasn’t until they performed microscopic evaluations that the answer was derived (see Yield Point in PetroDrill below).

*Organophillic Clay
(Continued on page 5)*



Organophillic Clay
(Continued from page 4)

ORDER OF ADDITION

For maximum viscosity, it is important to use a certain order of addition when building PetroDrill and other oil base muds. The experimenters found that adding emulsifiers and lime to the oil as a first step worked well. The best yield was obtained when the organophillic clay was added along with fresh water, raising the salinity of the water phase after yield using dry CaCl₂. At low ultimate CaCl₂ concentrations this could be attained by adding a portion of the water as fresh water along with the Mul Thik then following with enough saturated CaCl₂ to bring the salinity to the desired point. Extremely high salt concentrations might require the addition of powdered salt.

LAB TESTING ACCURACY

It was found that lab results obtained by the most careful methods used to simulate the conditions in the field often fail to accurately create a fluid with the same proprieties. Shear under pressure and temperature, the grinding effect of the bit, evaporation, filtrate loss, and other factors difficult to quantify and replicate in a lab contribute to the differences in properties from the lab prepared samples.

The experimenters used three different devices for shear. In most cases a Model 9B Multimixer was used. This is considered to be a low energy shearing devise relative to the Hamilton Beach H S m i x e r (intermediate energy) and the Gifford-Wood Model 1L homogenizer (high shear energy). The other two were also used in some of the tests. In our lab we use the Hamilton Beach mixers for most of our work. We have found that shearing at high rates for 30 minutes to an hour imparts significant shear to PetroDrill as measured by electrical stability. By using a variable voltage transformer we are able to

conduct experiments at shear rates from intermediate to very low energy shear rates. When high shear energy is required we use a Hamilton Beach Commercial Blender. This machine is capable of imparting extremely high shear rates to a drilling fluid.



Hamilton Beach Blender

YIELD POINT IN PetroDrill

A camera was coupled to a 1000 power microscope in an effort to visually determine the process in effect when organophillic clay is added to a water-in-oil emulsion. Organophillic clay particles in a well sheared system are sub-micron in size. This is below the resolution of a 1000x microscope. Water droplets in the well sheared mud were also in the sub-micron size range and were not visible as independent structures. However, the Young-Dupre equation from A. W. Adams' 1976 book "Physical Chemistry of Surfaces" tells us that the same surface interaction that takes place at a microscopically visible size range will take place in the microscopically invisible sub-micron range as well. Observing larger water droplets and freshly added clay particles the nature of their interaction could be determined.

The observed behavior of the clay particles and the water droplets showed an attraction for each other capable of causing the observed YP in PetroDrill. High levels of CaCl₂ inhibit the reaction between the droplets and the clays as compared to fresh water droplets. The addition of polar liquids such as water, xylene, and the aromatics of diesel, increase the YP by enhancing the attraction of the clays for the water droplets. While low aromatic mineral oils like LVT-200 are more difficult to viscosify, extended shear and/or temperature help them develop their full potential. YP increases lineally with the addition of water. The addition of organophillic clay increases the YP exponentially. A 10% increase in water content would yield a 10% increase in YP while a 10% increase in the amount of Mul Thik in the system would result in a 100% increase in YP.



Hamilton Beach Multimixer

H₂S

(Continued from page 1)

means of detecting life-threatening amounts because the sense of smell is lost rapidly, allowing lethal concentrations to accumulate without warning.

Under normal operating conditions, GEO employees are not trained to work in any environment



where there is an H₂S alert. Employees should follow the directions of the operator's representative or contractor's representative. Lacking direction, evacuate upwind or across the wind, away from the source of gas.

H₂S is detectable with a meter. Stationary meters are posted on the drilling rig where there is a risk of exposure. Personal detectors are provided by the operator and/or contractor for rig personnel when appropriate. In some cases the operator requires GEO employees to wear a personal detector provided by the operator.

Again, if an alarm sounds, evacuate. Do not stay to help solve the problem or to determine if it is a false alarm.

The "rotten egg" smell is found in many of the areas where we work. This results in large part from steaming operations for tertiary oil recovery.

CONCENTRATION OF H₂S

There is a minimal perceptible odor 0.13 parts per million (ppm). At 4.60 ppm there is an easily detectable moderate odor. Eye irritation begins at 10 ppm. At 27 ppm there is a strong, unpleasant odor. At 100 ppm there is coughing, eye irritation and a loss of smell after 2 to 15 minutes. There is marked eye inflammation and respiratory tract irritation after 1 hour of exposure to 200 to 300 ppm. At 500-700 ppm there will be rapid unconsciousness, cessation of breathing and death. 1000 ppm and above will cause the victim to fall unconscious immediately with death in a matter of a few minutes.

EXPOSURE LIMITS

TLV (Threshold Limit Value) of H₂S is 10 ppm.
 STEL (Short Term Exposure Limit) is 15 ppm.
 Immediate Danger to Life and Health (IDLH) of H₂S is 100 ppm.
 Permissible Exposure Limit (PEL) is 10 ppm.

RESPIRATORY PROTECTION

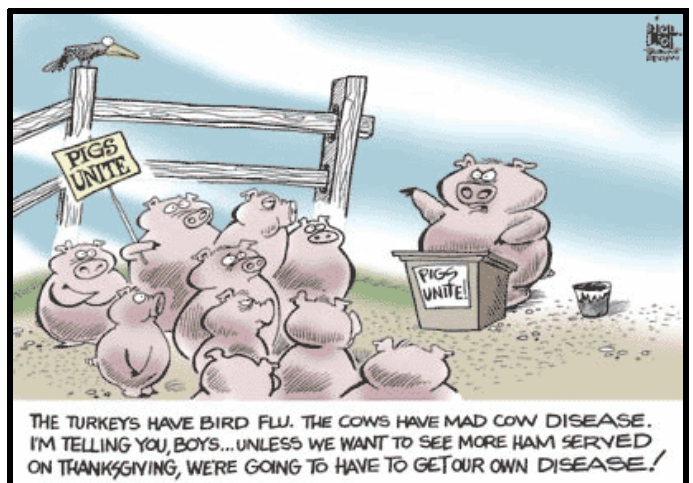
Anyone assigned to work in an area that has a concentration of more than 10 parts per million of H₂S must wear protective breathing equipment. The most common of these is the self-contained breathing apparatus or SCBA. Use of SCBA equipment is restricted to those who have been trained.

H1N1—SWINE FLU

You can still shake hands but don't touch your

H1N1

(Continued on page 7)



H1N1

(Continued from page 6)

face, mouth, nose, or eyes until you have washed your hands.

Always wash after using the bathroom.

Prevent the spread of all forms of Flu by using a handkerchief or the “sneeze into your armpit” (the crook of your elbow) method.

The most important thing is to wash your hands often and thoroughly with soap and water for 15 to 20 seconds or use an alcohol-based hand sanitizer frequently.

Try to avoid touching surfaces



that may be contaminated with the flu virus. Avoid close contact with people who are sick. Get plenty of sleep, be physically active, manage your stress, drink plenty of fluids, and eat nutritious food.

If you exhibit influenza symptoms such as fever, body aches, runny nose, sore throat, nausea, vomiting, or diarrhea, contact your health care provider who will determine if testing or treatment is advised. If it is determined that you do have influenza stay home and avoid contact with other people.

CUT HERE - Return Lower Portion

GEO Drilling Fluids, Inc. ! P.O. Box 1478 ! Bakersfield, CA 93302
Telephone (661) 325-5919 ! FAX (661) 325-5648 ! 1-800-GETSGEO ! geodf@geodf.com

SAFETY COMMUNICATION

I have read the safety bulletin covering H₂S Awareness and Swine Flu in the GEO Technical Newsletter of **December 1, 2009.** **VOLUME XIII NUMBER 7**

Print your name: _____

Signed: _____

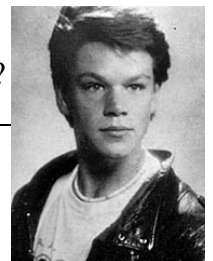
Date: _____

Comments: _____

1. The “rotten egg smell” is a sure sign of hazardous levels of H₂S. True or False _____
2. STEL (_____) for H₂S is 15 ppm.
3. The two most important things to do to prevent the spread of swine flu are: _____ or _____.



Bonus Question:
Who are these guys?



All GEO Drilling Fluids employees please answer the above questions, sign, date, and return to Andy Philips, Safety Coordinator / Technical Services Manager within one month of publication date. Any comments would be appreciated. E-mail response accepted.

Thank You.