S.O. INTERNATIONAL, INC.

S.O. LUBE I000™ SOLUBLE OIL DRILLING LUBRICANT

S.O. Lube 1000™ is a 100% petroleum based, extreme pressure, biodegradable, pollution free drilling lubricant designed to be a one-step lubricant for use in all troublesome wells. S.O. Lube 1000™ is formulated to provide the following benefit:

- Increases ROP. with 3% - 6% concentration
- Minimizes torque and drag
- Minimizes Differential sticking
- Stabilizes the well bore and therefore preventing sloughing shales by lowing the high temperature, high pressure water loss and forming a durable filter cake
- Eliminates bit balling and thereby improves the penetration rate by allowing more weight on the bit and increased rotary table RPM
- Reduces wear on all down hole tools and casing in directional wells to reduce the likelihood of a twist off and/or fishing job
- Assists in reducing drag when logging tools are being run. Compatibility with all types of mud systems
- It helps prevent washout when drilling through a salt zone because S.O. Lube 1000™ will not dissolve salt
- Minimizes premature bit bearing failure, thereby helping to reduce the number of bit changes
- Does not affect the rheological properties of any mud system
- Will not be affected by temperatures up to 500°F
- Can be checked on a retort. Will show as oil and will separate from diesel oil on retort. Example: If there is 3% diesel in a system and 2% S.O. Lube 1000™, a 5% oil content will show in the mud. S.O. Lube 1000™ will be on top of the diesel and a shade darker color
- S.O. Lube 1000™ passes the Static Sheen Test performed on the rigs

R.O. P. ENHANCEMENT

S.O. Lube 1000™ has proven many times in different mud systems to increase rate of penetration when 3% - 6% is added to mud system, no matter the type of bit that is in the hole.

A few of the mud systems that have been successful are:

- Fresh water lignosulfonates up to 17.3 #/BBL. Callon Petroleum, State lease 15543 #1, Mallard Rig #57, Venice, LA. Up to 44 feet per hour with motor bit.
- Baker Inteq's Aqua-Drill Plus — Stone Energy Corp., OCSCI 1238 #2, Block 23, South Pelto Field, Noble Drilling Co. Rig "Max Smith". Running a 9.875 PDC bit from Diamond Products, Inc. From 4 feet per hour to 15 feet per hour.
- Seawater lignosulfonate, MI. Drilling Fluids — Marathon Oil Co., OCSO 14621, block 829 #1, 511 Ewing Banks, Diamond "M" Drilling Co. "Ocean Lexington" Rig. Running a 12.250 blo-center #SR244 POC bit. From 8.8 feet per how to 12.10 feet per hour.
- Baroid's Glycol Enhanced Muds (GEM) Santa Clara Field, CA, Platform Gilda, S-28 RI), Torch Energy.
- Fresh water Lig/CLS, SBM Drilling Fluids — Aviara Energy Corp. R.L. Smith #2RE, Greywolf Rig #83, North Ridge Field. From 8-12 feet per hour to 30-50 feet per hour.

TORQUE AND DRAG

Because no hole is truly vertical and because the drill string is flexible, the rotating drill pipe tears against the side of the hole at numerous points. The frictional resistance thus generated may require considerable extra torque than otherwise would be required to wm the drill bit. Similarly, considerable frictional resistance to raising and lowering the pipe may also occur and be referred to as drag.

Under certain conditions, such as highly deviated holes, holes with frequent changes in direction (dog legs), undergauged boles, or poor drill string dynamics, torque and drag may be significant enough to cause an unacceptable loss of power. The addition of a good E.P. (extreme pressure) petroleum bases drilling lubricant to the mud can alleviate torque and drag.

DIFFERENTIAL STICKING

Differential sticking occurs when part of the drill string bears against the side of the hole when drilling and erodes a portion of the filter cake. When rotation of the pipe is stopped, the section of the pipe in contact with the cake is isolated from the pressure of the mud column and subject only to the pore pressure of the filter cake. The differential pressure thus created can be great enough to prevent the pipe from being moved, If the pipe cannot be freed by spotting oil around the stuck section, an expensive fishing or side tracking job is required.

The risk of differential sticking can be reduced by using a mud which lays down a thin, tough filter cake, by maintaining the lowest possible mud density in order to lower the differential pressure, and by adding a lubricant to the mud adhesion between pipe and the filter cake.

Good filtration properties are also necessary when drilling in unconsolidated sands, which will slough into the hole unless protected by the rapid formation of a filter cake.

HEAVING SHALE

Any shale that sloughs into the hole in excessive quantities and interferes with the drilling process is referred to as heaving shale. Some forms of shale swell on contact with water while other types of shale break up into fragments with very little indication of swelling.

Due to the difficulties entailed in obtaining reliable samples of all trouble causing shale formation, S.O. International has focused its investigative work on bentonite. S.O. Lube 1000™ will not dissolve bentonite, The polymers in S.O. Lube 1000™ help prevent water loss and for a very thin, strong, durable filter cake. By helping prevent the bore hole from becoming washed out and overgauged, S.O. Lube 1000™ helps avoid costly cementing.

BIT BALLING & BOTTOM HOLE BALLING

Bit balling occurs at high bit weights. In hard formations, the bit teeth become partially clogged with cuttings. A much worse type of bit balling occurs in soft shales, particularly gumbo shales and swelling shales that absorb water from the mud. In this case, a ball of compacted shale may build up and even cover the whole bit, preventing further drilling progress. The driller must then either try to spud the ball off (risking damage to the good bit) or pulling a green bit. Both options are expensive.

Bottom hole balling occurs if the drill cuttings are not removed from beneath the bit as fast as they are generated. In this situation, a layer of broken rock will build up between the bit and the true hole bottom, creating excessive drill wear and reducing penetration rate.

Use of S.O. Lube 1000™ can prevent bit balling and bottom hole balling before they occur, allowing faster drilling and reducing drilling costs.

S.0. Lube 1000™ Lubricant

Step1: Determine the capacity of the mud system in barrels. _____ Barrels
(barrel = 42 gallons)

Step 2: Multiply system capacity by 42 gallons to determine _____ Gallons
system capacity in gallons

Step 3: Divide system capacity in gallons by 55 to determine _____ Drums
system capacity in drums

Step 4: Multiply system capacity in drums by 2.5% to determine _____ Drums
the number of drums of S.O. Lube 1000™ required for
initial treatment

EXAMPLE

Step 1: For system capacity of 1,200 barrels	1,200	Barrels
Step 2: Multiply system capacity by 42 gallons	54,000	Gallons
Step 3: Divide system capacity in gallons by 55	916	Drums
Step 4: Multiply system capacity in drums by 2.5%	23	Drums

Since ½% will be lost to initial coating in the system, the initial treatment of a 1,200 barrel system would require 23 drums of S.O. Lube 1000™ Drilling Lubricant.

Adding To The Mud System

I. Put directly into suction pit over at least two complete mud circulations.

2. Try not to mix caustic at same time as adding S.O. Lube 1000™

3, If mud properties rise, they will fall back in line after circulation goes around 2 to 3 times.