Drilling Fluids I looks at high performance fluids

SOLIDS FREE FLUID

WELLS DRILLED ON a subsea development offshore Norway required the use of oil-base drilling fluid. Plugging of sand control screens due to barite sag in the oil-base mud has been experienced and thus the use of a solid-free heavy brine was required to reduce this possibility. Consequently, the wells required hole opening using water-base mud to remove the oil-base filter cake prior to displacement with the solid-free water-base completion fluid and the running of screens.

The use of a unique solid-free oil-base completion fluid has allowed the wells to be completed immediately after drilling with the oil-base drilling fluid without having to reopen the hole with a water-base mud. Not having to reopen the hole not only reduces rig time but also prevents the risk of problems related to emulsion blocking and incompatibilities with the oil-base drilling fluid.

The authors will describe the design and successful application of the unique high-density solid-free, oil-base completion fluid, which consists of a heavy brine in the internal phase.

The Completion of Subsea Production Wells Eased by the Use of a Unique High Density Solids Free Oil Based Completion Fluid (IADC/SPE 87126) **K Taugbol**, **T Jakobsen**, **M-I Drilling Fluids**; **L Lilledal**, **H Juel**, **K Svanes**, ***Statoil ASA.***

THROUGH TUBING DRILLING

Through-Tubing Rotary Drilling (TTRD) is a technique that was developed to extend the production life of older fields by substantially reducing drilling costs to render smaller reserves of oil economically recoverable. However, the small wellbore dimensions required to utilize drillpipe inside production tubing places some unusual demands on the drilling fluid. When these are compounded by the challenges of drilling into a reservoir containing both depleted sands and high pressure shales, a radical approach to drilling fluid design is required.

The authors will detail the design considerations of the fluid used to drill two TTRD side-track wells on Shell's North Cormorant field. Modeling of hydraulic parameters will be presented, together with field results from the first well and how these led to modifications of fluid design and engineering practice which were incorporated into the second well.

Novel Drilling Fluid for Through-Tubing Rotary Drilling (IADC/SPE 87127) **D S Marshall**, **Baker Hughes INTEQ Drilling Fluids**; **T Franks**, **Shell UK Exploration and Production**.

INVERT EMULSION FLUID

In mature fields the difference between the pore pressure and fracture pressure, expressed as the hydraulic window, is reduced. Underbalanced drilling and the use of low-viscosity drilling fluids in conventional operations are but a few of the many approaches that have addressed this challenge.

The authors will describe the development and application of novel technology that has resulted in a ten-fold reduction in the particle size of the weighting agent. With this development, invert emulsion drilling fluids can be designed with low viscosity with minimal settling potential of the weight material. The authors will also explain in detail the first field applications of this polymer-coated, micron-sized weighting agent in an oil-base drilling fluid.

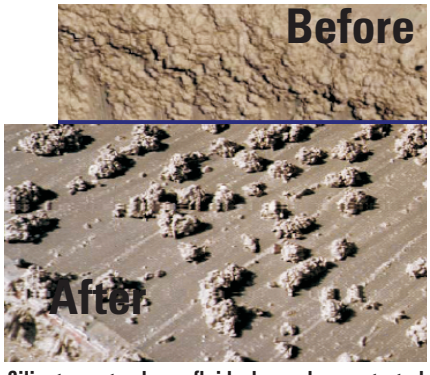
Advanced Invert Emulstion Fluids for Drilling Through Narrow Hydraulic Windows (IADC/SPE 87128) **G Fimreite**, **S E Vik**, **J Massam**, **K Taugbol**, **M-I Drilling Fluids LLC**; **T H Omland**, **K Svanes**, **W Kroken**, **A Saasen**, **Statoil ASA**.

OIL MUD CHEMICAL ANALYSIS

Oil-base and synthetic-base drilling fluids are important to the industry because they provide excellent performance under the most difficult drilling conditions. They are the fluid of choice for deepwater, high angle, and extended reach drilling, as well as most high temperature environments. To maintain the integrity of these systems, engineers depend upon data generated by a standard set of field test procedures contained within API RP 13B-2 (ISO/FDIS 10414-2).

The authors hope to heighten the industry's awareness of improvements to oil mud field test standards in order to facilitate their distribution and use. They will describe the learnings and improvements made to the existing oil mud chemical analysis field procedures.

Advances in API/ISO Oil Mud Chemical Analysis Field Procedures (IADC/SPE 87129) **M V Smith**, **ExxonMobil Development Company**; **K Morton**, **ChevronTexaco**; **M Pless**, **Baker Hughes INTEQ**; **R Ray**, **M-I LLC**; **T G Shumate**, **Halliburton Energy Services/Baroid**; **J A Toups**, **Westport Technology Center International**.



Silicate water-base fluids have demonstrated optimum inhibition, high penetration rates, reduced trouble time, superior wellbore integrity, optimum solids removal performance and minimal environmental impact. IADC/SPE 87133

WELLBORE STRENGTHENING

A major benefit would occur if the fracture gradient of rocks could be increased while drilling, resulting in drilling with higher mud weights without losing fluid and without interruption of the drilling process. Particular applications are to access difficult reserves in depleted reservoirs, or to drill without mud losses in deepwater environments where the mud weight window is often narrow.

The authors will review the theories of fracture gradient enhancement and describe the approach taken by BP in designing a drilling fluid that raises the fracture gradient during drill, and that can be applied in both shales and sand-

stones. The concept uses fracture-bridging particles, coupled with an ultra-low fluid loss mud system. Laboratory data show how the fluid system was developed and the bridging particle blends were selected. Field data are presented that verify the theory and quantify the increase in fracture gradient. The system is generic and does not use proprietary chemicals, so it can be applied widely. Logistics and solids control considerations will also be discussed.

Drilling Fluids for Wellbore Strengthening (IADC/SPE 87130) **M Aston**, **M Alberty**, **K Armagost**, **M Mclean**, **BP**.

DEEPWATER RECORDS

Two record wells were recently drilled in the ultra-deepwater Eastern Gulf of Mexico. The wells were the fastest two wells drilled in water depths greater than 7,000 ft. A high-performance water-base mud (WBM) was used to drill the intermediate sections. The fluid had comparable performance to a synthetic-base mud (SBM), with the advantage of cuttings disposal permission in the environmentally sensitive offshore area. Significant savings were realized by not carrying the cuttings to shore for disposal. Other advantages included no losses while running and cementing casing and easier displacements. The fluid was re-used on two consecutive wells and then stored for further applications.

The authors will present a comprehensive analysis and comparison of the drilling and economic performance of the new water-base mud and the synthetic-base mud. Also presented are innovative solutions introduced to optimize hole cleaning and shale inhibition.

Eastern Gulf of Mexico: Ultra-Deepwater Records with Inhibitive Water-Base Mud (IADC/SPE 87131) **P Watson**, **Anadarko Petroleum Services**; **C Aldea**, **B Blackwell**, **M-I Drilling Fluids LLC**.

SILICATE-BASE FLUID

More than 300 wells have been drilled around the world since the reintroduction of silicate fluids in the North Sea. Silicate water-base fluids have demonstrated superior performance characteristics, including optimum inhibition, high penetration rates, reduced trouble time, superior wellbore integrity, optimum solids removal performance and minimal environmental impact.

The authors will detail the design and performance of a silicate-base drilling fluid formulated with a soluble silicate for maximum shale inhibition. They will discuss the design and the application of fluid, which was selected to drill a formation containing anhydrite, claystone, dolomite and salt. The authors will also present its effectiveness, formulation, properties, maintenance and lessons learned.

Silicate-Base Drilling Fluids Deliver Optimium Shale Inhibition and Wellbore Stability (IADC/SPE 87133 – Alternate) **T Soric**, **INA Naftaplin**; **P Marinescu**, **R Huelke**, **M-I Drilling Fluids**.