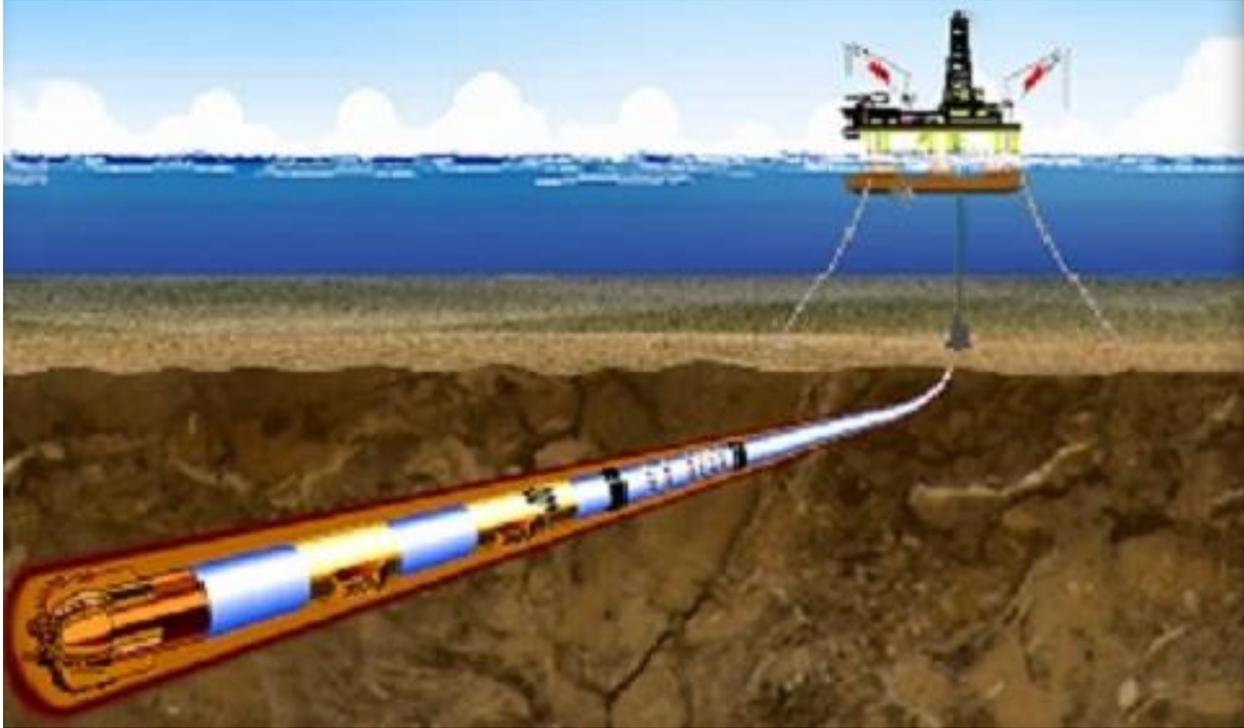


Driving Innovation: What Makes a Fluid “Better”?



The slowly recovering oil price environment is driving innovation for reducing non-productive time in drilling and completion operations. Opportunities for improving the fluids that companies use should not be overlooked.

Better fluids can help oil and gas companies in a wide range of operations. In the wellbore, improvements can be made to drilling fluids, drill-in fluids (used to minimize damage to the hydrocarbon bearing formation), and fluids used during mud displacement and wellbore cleanout. On the surface, there is a need for improved treatment (cleaning) fluids, and more efficient bioremediation.

The quality of the fluid is determined by the HSE (Health, Safety and Environment) benefits, performance and cost.

Workers come into contact with fluids on a regular basis, so the effects on human health are very important. Skin irritation should be low, inhalation hazards minimized, and the fluid needs to be non-carcinogenic. The safest ones have a low risk for fire hazard and minimize dangerous rig activities. To protect the environment, low acute and chronic toxicity are desired, as well as high biodegradation and low bioaccumulation.

Performance attributes vary depending on the activity. For drilling, we want fluids with good shale inhibition for constructing a gauge borehole. They should provide a high penetration rate, good lubricity, have a high stability, and be compatible with elastomers. For drill-in fluids, we also look for shale inhibition but design the fluids specifically to minimize formation damage from solids and emulsions. Drill-in fluids may also have a low density for underbalanced drilling when encountering depleted pressure reservoirs.

The desired properties are quite different for spacers and wellbore cleanout fluids. Powerful chemical interactions are needed for removing oil-based mud and filter cake from the tubing and open hole formation, converting surfaces from oil-wet to water-wet. At the surface, there is room for improving systems that are effective at quickly and efficiently cleaning oil from solids. Bioremediation systems should be designed to rapidly degrade the oil by sequestering it to prevent it from entering the environment, then allow microbes to break down the oil molecules into harmless by-products.

The unit cost of the fluid per pound or barrel should be minimized since very large volumes are consumed in drilling and completion operations. More importantly, since the rig day rates are so high, the fluid must contribute to lowering the well cost by decreasing non-productive time. For drilling and drill-in fluids, this can be accomplished by increasing the rate of penetration, keeping the hole open, reducing stuck pipe, minimizing lost circulation, and reducing formation damage. Wellbore cleanout fluids are needed that efficiently clean the wellbore surfaces saving rig time and preventing “gunk” from forming. At the surface, the fluid systems should minimize the need for waste treatment, disposal and storage.

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