Non-Damaging Thin Polymer Drilling Fluid Improves O&G Wells’ Productivity at Lower Drilling Operational Cost

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SUMMARY

Drilling fluid is a relatively minor direct expense (< 7% of the total drilling costs), but it can significantly affect principal item in drilling expense (which is time ~ 37%) and other items of expense, such as drill pipe, casing, bits, formation logging/testing, cementing, etc. (probably ~ 26%).

Any formation damage due to using improper drilling fluid could affect the productivity of the pay zone and increase post treatment costs. In case of permanent formation damage, loss cannot be described by certain amount of money. Therefore, performance of the drilling fluid is more important than its cost, i.e., an optimal drilling fluid system must be targeted.
Abstract

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Drilling fluids range widely in composition and properties. Drilling fluids’ selection depends on many factors, such as (but not limited to): Surface/subsurface conditions, equipment capability, the overall effect of the drilling fluid on the pay zone productivity and on the total well cost.

Traditionally, drilling Fluids are classified as: Water-base Drilling Fluids, Oil-Base Drilling Fluids, Gaseous Drilling Fluids. Water based polymer drilling fluids have been widely used, under the impression that relatively high viscous thick polymer drilling fluids have better efficiency due to their relatively high carrying capacity. It is true that carrying capacity is much affected by drilling fluids’ plastic viscosity that should be relatively high at the annulus, where drilling fluids are subjected to moderate to low shear. But laminar flow causes accumulation/balling of drill cutting around the drill bit, i.e., low penetration rate & poor hole cleaning, especially at horizontal sections. Therefore, a low solids non-dispersed polymer drilling fluid system with smart thin-shearing characteristics had been designed to have a turbulent flow around the drill bit and laminar flow at annulus and at surface facility of the drilling rigs. Lab & field experience showed that such good performance can be achieved with thin polymer drilling fluids of yield points < 10 lbf/100 ft² those could be obtained at polymer concentrations 0.3 – 0.5 ppb of up to 10 ppg drilling fluids. Formation damage would be minimal at such low concentrations of good polymer products (such as: XC Polymer gum) those should be properly selected as per highly sophisticated standards/evaluation procedures. Thick polymer drilling fluids of yield points > 10 lbf/100ft² require higher concentrations of above mentioned polymer product(s), i.e., higher potential for formation damage. Practical application of above-mentioned “Non-damaging thin polymer drilling fluid” resulted in:

- Major protection of environment from pollution by avoiding/minimizing the need for acid stimulation jobs on many newly drilled/worked over oil wells (of relatively permeable/not tight pay zones), i.e., no flaring due to no acid jobs;
- Fast drilling rates, clean well bores, better cement jobs, major cost saving, etc.