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New Formula to Prevent Barite Sagging using a Mixture of Manganese Tetroxide/Barite in HPHT Oil-Based Drilling Fluid

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For long time, the most weighting material in drilling oil and gas wells is barite. It can raise the density up to 20 ppg or greater. However, it is less expensive, but the world supply nowadays geographically limited, with high transportation costs. Also, it will settle down which known as barite sagging. To overcome these limitations an alternative weighting material is introduced as manganese tetroxide or "Micromax". Micromax is higher specific gravity and cost than barite, but it can replace the conventional barite to save the drilling operations. The objective of this work is to develop a new drilling fluid that contains a mixture of barite/Micromax to prevent the sag issue. The second objective is to evaluate the effect of adding the Micromax with a different percentage on the drilling fluid rheology and filtration properties.

In this work, different concentration of Micromax/barite were evaluated at the following ratio: 100% barite, 15/75% Micromax/barite, 30/70% Micromax/barite and 45/55% Micromax/barite. The main goal of this work is to optimize the percentage of Micromax that can be used to prevent barite sagging under different conditions, vertical and 45° in the static sag test case at 350 °F and under dynamic conditions at 120 °F. Then, investigate the rheological properties which are plastic viscosity, yield point and gel strength at 350 °F. After that, oscillation amplitude and frequency will be conducted to confirm the elasticity of the mud. Finally, high-pressure high-temperature (HPHT) filter press will be conducted at 500 psi and 350 °F to evaluate the sealing effect and the filter cake properties. The obtained results showed that 30% of Micromax was able to prevent the settling of barite particles in the OBM at 350 °F. The sag factor has reduced from 0.57 to 0.51 and from 0.59 to 0.52 in vertical and 45° decline respectively. The viscometer sag shoe (VSST) reduced from 1.6 to 0.5 at 120 °F. Yield point to plastic viscosity improved from 0.56 to 1.74 which will increase the carrying capacity of the drilling fluid. Also, 10 sec, 10 min and 30 min are consistent with time to guaranty no pumping pressure increased. The viscoelastic measurements showed an increase the storage module (G') to confirm the sag results. HPHT filter press has given no difference when adding 30% Micromax, where the filter cake thickness was 0.12 in.

Biography

Salem Basfar is a PhD candidate from Department of Petroleum engineering at KFUPM. Salem Basfar completed Masters in petroleum engineering at KFUPM 2018 and BS in petroleum engineering at Hadhramout University in 2012.