Hello,

Would like to tap into the international community regarding several cementing issues we are seeing.

Horizontal wells at +/-1600mMD/675mTVD with 800m lateral. Intermediate csg set at 90deg incl. The area has been water-flooded for decades. Sandstone is still considered depleted wrt PP.

Our issues started in 8-3/4” intermediate hole. We drill with a flocc water system 8.43ppg (1010kg/m3) then close the system at +/-700mMD and let MW climb to 9.2ppg (1100kg/m3). We then maintain MW and treat the mud with solids control and gel chems. There are a couple of Bentonite stringers just above the pay zone which have been pretty benign in the past and typically working through these stringers a few times gives us enough time to run casing without issue.

This particular well we did not see any flow while drilling.

Our 2-slurry cement blend is a conventional ‘G’ for lead (12.5ppg) and a proprietary (vendor) recipe with 3% KCl (dry KCl) tail at 14.8ppg. Both slurries have chems for free-water, fluid loss, bond enhancer. Mix water heated to 23C, BHST 25C.

Once we bumped the plug (and cement to surface) we noticed instantly that water was flowing up through the cement. Every fluid we pumped was heavier than our MW which leads me to believe it is not a overbalance/underbalance issue but it appears the cement has some sort of affinity to collect the water from somewhere downhole.

Samples from cmt truck were set up and samples from returns were ‘pudding’ consistency contaminated.

The water samples caught do not represent any known water used for injection, water flood, mix water, formation water, etc. Summary of water tested below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample Test from well bore annulus** | **Test #1** | **Test #2** | **Source/Mix Water** |
| pH | 12.7 | 13.3 | 7.4 |
| Ec (Electroconductivity) | 40 mS/cm | 35 mS/cm | 0.7 mS/cm |
| Cl (Chlorides) | 2880 ppm | 3858 ppm | 32 ppm |
| Na (Sodium) | 4600 ppm | 2600 ppm | 80 ppm |
| NO3 (Nitrates) | 200 ppm | 130 ppm | 40 ppm |
| S04 (Sulphates) | > 1600 mg/L | > 1600 mg/L | 200 mg/l |
| TDS (Total Dissolved Solids) |  | 24500 | 490 |

The CBL showed terrible cement bond across the lead slurry and decent bond across the tail (KCl blend). In reaction to this on our second rig (which was drilling next door a day or two behind) was to run an external casing packer (ECP) and cmt stage tool on the intermediate string and cement 2-stage with the full KCl blend.

Prior to cementing on the second well’s intermediate string our mud was coming up gelled and clumpy with pudding consistency and gas cut. With interm csg on bottom we C&C and treated the mud until returns were ‘normal’.

That second interm cmt job went ‘well’ but in my mind the ECP only “band-aided” the problem.

Production lateral we drilled with 9.2ppg WBM and after seeing gas/oil cut mud we increased MW to 10ppg. Section drilled OK.

Ran our 4-1/2” production casing with frac sleeve jewelry and while C&C on bottom noticed gas/oil cut and clumpy mud again. C&C and treated until mud returns stabilized. Pump our cement job with single stage KCl blend. We did get spacer to surface and TOC believed to be at 368mMD. Confirmed with CBL.

I appreciate any guidance or comments regarding mud systems and cement designs/tests we can run to successfully drill in this area.