

Premier Oil Indonesia

Well WL-5x

Natuna Sea – Indonesia

Well Recovery Case History

1.0 WELL HISTORY

The well is in the Natuna Sea Block A PSC Area, located in the north west Natuna Sea, offshore Indonesia, adjacent to Malaysian border. The water depth varies from 70 – 80 m. The well was drilled and tested in 2012 and at the time produced 17MMSCF on full open choke, from a lower gas sand. It was killed with a barite pill and shut in for 5 years without any production. Initially it could not be produced as the pressure was too high for the production facility at the time. Client produced the upper zones, which are now depleted.

While drilling the well, up to 800 bbls of mud was lost into the Lama D sand. Losses were cured with 2 each pills of Form-A-Squeeze and CaCO₃. In the well kill operation after the DST a 20 bbls pill of 200 ppb CaCO₃ LCM was pumped, then 20 bbls of a CaCO₃ pill, 10 bbls of Polypac HT and 60 ppb CaCO₃, and 20 bbls of a 20 ppg barite pill were all pumped.

2.0 PROGRAM OUTLINE

The program was designed to stimulate the target zone of the Lama D sand at 10,662'-10,766' taking into account probable formation damage during well kill operations referenced above. The stimulation/scale dissolver, PentaFlow was used as a preferred preflush treatment, follow by SD27X which is a non-damaging stimulation fluid as the main treatment.

The well was re-entered and recompleted as a Lama Sand gas producer. The H Sand reservoir is depleted down to 6.2 ppge. The Lama sands have not yet been produced and are at their original 10.4 ppge pressure. The Lama gas contains low levels of CO₂ (9%) and H₂S (47 ppm).

The workover programme was to kill the well, recovering the existing completion and dropped TCP guns. The cement plug inside the 9-5/8" casing was drilled out and a 7" scab liner run across the H-sand perforations. The remaining cement plugs and bridge plug were drilled out inside the 7" liner before running the new completion. The well was flowed through a DST package installed on the rig before being hooked back up to the platform system.

3.0 CHEMICAL DESCRIPTION

PentaFlow is a **stimulation/scale dissolver**, for stimulation applications it is used to etch and pinhole the filter cake. The water miscible solvent, strips away any hydrocarbons and reduces any micro-emulsions present. This allows other products that are used, to work faster and more completely. As a scale dissolver it is ideally suited to a wide range of descaling applications as it will **dissolve CaCO₃**, asphaltenes, sludge, and wax in the matrix, whilst dehydrating and breaking up any accumulated clay and shale in the scale matrix. PentaFlow also has the added advantage of being non-corrosive.

PentaFlow is rated GOLD banded in the current UK CHARM system.

SD27X is a **non-damaging stimulation fluid** (as opposed to acid that is a damaging stimulation fluid that only dissolves CaCO₃) that dissolves barite, CaCO₃, some drilling fluid additives, and magnesium, strontium, calcium, and barium sulfate scales. **SD27X will also dissolve up to 50% of the cellulosic LCM material over a 24 hr period.** SD27X is a single phase, alkaline (pH +/-12) chemical that is **non-corrosive**, environmentally benign, and produces no precipitate or gas by-products. SD27X is inhibitive to clays. Also it is inorganic, so has no known temperature limits. SD27X is also unique in that it works significantly faster at a higher capacity than any competitive products. Due to all these attributes SD27X is effective, safe, and easy to use with significant advantages over acid.

Chemical Benefits:

PentaFlow

1. Dissolves Calcium Carbonate (CaCO₃)
2. Dissolves wax, sludge, asphaltenes and other hydrocarbon residues
3. Breaks up emulsions
4. Dehydrates clays
5. Leaves surfaces waterwet

SD27X

1. Dissolves CaCO₃
2. Dissolves Barite
3. Promotes the break up of emulsion blockage
4. Dissolves LCM (cellulosic at 50% over 24 hrs)
5. Dissolves some clays (2-4 grms/liter)

4.0 TREATMENT PROGRAM

1. Perform injectivity test (record pressure & rate)
2. Pump 40 drums (8 IBC's or 50.3 bbls) of PentaFlow.
3. Displace with 10 bbl of 9.5 ppg of KCl made up with drill water as a spacer (80 lbs per bbl of KCl).
4. Follow that with 80 drums (16 IBC's or 100.7 bbls) of SD27X.
5. Displace with 98 bbls of DO or water, whichever preferred.
6. Soak PentaFlow in the Lama reservoir for 4 hours.
7. Displace with 85 bbls of DO or water, whichever preferred.
8. Soak SD27X in the Lama reservoir for 20 hours.
9. Hand over well to operations.

5.0 RESULT

The well has very low permeability, average 1.8 mD. During the drill out of the cement plug in the re-entry, it was anticipated to encounter gas, built up over the 5 year's shut-in. However no gas was seen, most likely because of the low permeability/well kill operations. During initial injection of PentaFlow the pressure was high at 1,800 psi, but it soon went down indicating that PentaFlow was going into reservoir (and doing its job). The program continued with SD27X which was injected at low pressure.

After the stimulation, the well produced 17 MMSCFD and cleaned up after a day to 25 MMSCFD on a medium choke. During post stimulation field test the well could not be tested any greater because of well test burner/burner boom limitations. **The well is now being run thru Clients production facility and is producing 50 MMSCFD.**

As the lower sands have never been produced before this gas is a new development for Client, it opens up opportunity for new gas sales that can go into the pipeline direct to Singapore.