

ViscosEnergy

First Binary Mixtures Application test in the US proves stimulation of heavy watered mature oil fields possible

Challenge

Applying binary mixtures technology on light crude fields at the end of the life cycle:

- Fields that historically were producing aggressively thus having heavy water cones around well
- Reactivating wells that were effectively shut in and haven't produced more than a few barrels of liquid or nothing at all during a period of 2-4 years
- Establishing communication between treatment well and producers in a typical old field not designed for 5-spots or similar EOR methods

Solution

Viscos Energy's binary mixture technology was applied on an end of life cycle field to test if reaction would happen, to test proper Chemical solutions and wellside equipment needs

Results

- Heated reservoir to over 300C and re-pressurized field by up to 600-1800psi (260 psi after treatment)
- Eliminated water cones and established production of 28-30 barrels of oil per well short-term (approximately the same as original well production)
- Tested sensitivity of binary mixture treatment to 20-day stoppage in production
- Sourced successfully all Chemicals and wellside equipment in the US

Viscos Energy executed a test series on heavily watered mature oil wells in Eastland County, Texas. The tests have proven the resilience of binary mixture technology on water cones and deteriorated field conditions.

Non-producing oil field in Texas as test bed

Viscos Energy selected a mature oil field with significant water cut to test its Binary Mixture Technology in an adverse environment. For that purpose, a field was acquired that over its life time produced 85'000 bbls, was produced aggressively, and effectively shut down for most of the last 10 years.

The field had a very high water cut of between 80% to 99%, and no reservoir pressure. The binary mixtures were applied to two out of more than ten wells in the field to perform the following research objectives:

- Apply binary mixture technology to low-quality mature field with little field workover
- Overcome water coning issues and put test wells in temporary production
- Verify post treatment production options

Field characteristics

The lease in Eastland County, Texas, consisted of 12 wells spread over 50 acres. It had its main production from 1981 to 1989 and wells were at a depth of approximately 1300 feet. The water cut was not known initially, but assumed high. From initial tests, it appeared to be over 80%. Porosity was good.

Stimulation

The two wells were treated with up to 13m³ of chemicals (mostly ammonium nitrate and sodium nitrite) after an HCl solution was used to control the PH value in order to create the right Chemical initiation environment.

The treatment time itself was only a few hours, after which the well was closed and the reaction monitored.

Based on the measurement results, the liquids in the well bore reached temperatures between 300^o-450^oC. Packer remained fully operational despite high well temperatures. Pressure readings indicated that most chemicals reacted in the formation, as pressure reached 200-250 psi in a steady state a few days after treatment.

Results

Well number 8 was reopened and started pumping with a PC pump around 33 barrels of oil per day until it was shut in for further tests. The pumped oil had a temperature of up to 100^oC. As desired, some surrounding wells showed a pressure increase of 30-50 psi, which proved that the communication between wells had been established with the binary mixture treatment.

It was demonstrated that the Viscos Energy binary mixture technology was able with the initial reaction to restore reservoir pressure, increase significantly



Figure 1 - Well treatment

inflow of fluids, and neutralize the water coning problems.

Further tests were conducted to explore the sensitivity to production stoppage, whereby the well was closed for 20 days. The temperature and pressure gradually subsided to pre-treatment levels. When production was restarted, the oil

production fell to approximately 2 barrels a day with an oil cut below 5%.

Outlook

The Eastland field was and will be used for further tests on mature wells. These tests confirmed that:

- Binary mixture technology can be successfully applied to highly watered mature fields with significant water coning present
- No special equipment (i.e., tubing or casing) is required to successfully apply the technology and well workover can be kept to a minimum. However, Viscos has now designed a improved packer und coiled tubing to make the application even simpler
- High water concentrations are no obstacle to treat wells from a technical point, they impact however the economics
- All required Chemicals and needed equipment can be sourced easily in the US