

MULTI-ZONE ACID FRACTURING IN CARBONATE DEPOSITS WITH SUBSEQUENT MONITORING OF THE EFFICIENCY OF BOREHOLE SECTIONS

CHALLENGE

Acid stimulation of the bottomhole formation zone using coil tubing (CT) is the principal method for increasing oil recovery in horizontal wells drilled in carbonate reservoirs. This operation is standard for the Middle East countries and some regions of Russia, while hydrochloric acid based formulations are traditionally used. The uniformity of the borehole conditioning is a critical success factor of acid stimulation in a horizontal well.

SOLUTION

GeoSplit monitored the horizontal borehole performance of one of the wells stimulated by multi-zone acid fracturing (hereinafter - MZAF).

Well No. 9183 of the Vereiskian horizon of the Aktash area of the Novo-Elkhovsky field served as a candidate well. The well featured four zones for acid stimulation.

The MZAF was carried by utilizing a unique technology from «top» to «bottom» using a piercing perforator and CT with the injection of acid through the annular space. Acid fracturing zones were separated by the axial array packer. Upon completion of stimulation works and after putting the well into operation, reservoir fluid samples were taken from the wellhead and subsequently analyzed to determine the number of tracers of each code.

Based on the obtained analytical data, the horizontal borehole flow profile was built, allowing to analyze the stimulation efficiency for each of the acid fracturing stages. The results of the flow profile study after acid fracturing are shown in Fig. 1:

- Flow in Zone 1 is 0.
- Flow in Zone 2 and Zone 3 is 19% and 23%, respectively.
- The maximum flow was recorded in Zone 4 (58%), which is confirmed by the well blowout after hydraulic fracturing of this section.

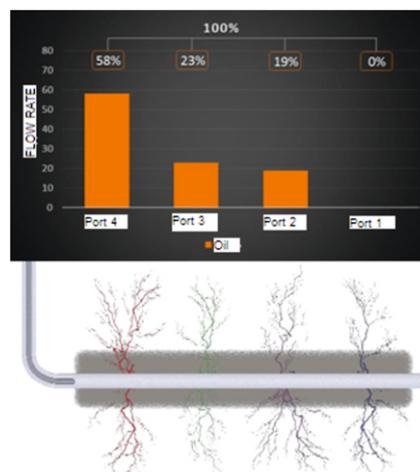


Fig. 1 - Results of the study of the flow profile after acid fracturing

CONCLUSION

For the first time ever the flow profile of the horizontal well with carbonate reservoir type was studied using the multi-stage acid fracturing, during which the inflow indicators were placed in etched acid fractures to ensure long-term selective interaction of tracer particles with the reservoir fluid.

Unlike traditional methods of horizontal well examination, the applied technology requires no special tool delivery means, eliminates the risk of seizure, ambiguous interpretation of data, as well as is relatively cost-effective.