Research on increasing oil production through fracturing

Zuo Wei1, *, Gou Jian2, Liu Bo3, Huang Wenfeng3, Li Haitao3, Li Feng4 and Dong Ling5

1 Downhole Service Company of XDEC (Reservoir Stimulation R&D Center), Karamay, Xinjiang, 834000, China
2 Baikouquan Oil Production Plant of Xinjiang Oilfield Company, PetroChina, Karamay, Xinjiang, 834000, China
3 No.5 Oil Production Plant of Huabei Oilfield Company, PetroChina, Xinji, Hebei, 052360, China
4 Downhole Operation Company, CNPC Xibu Drilling Engineering Company Limited, Karamay, Xinjiang, 834000, China
5 No.7 Oil Production Plant of Daqing Oilfield Co. Ltd., PetroChina, Daqing, Heilongjiang, 163000, China

*Corresponding author e-mail: zuowei@cnpc.com.cn

Abstract. The main measures to increase the production of oil field are to expand the formation channels or open up new channels. The increase of production of oil field plays a very important role in the process of oil field exploitation in our country. It is one of the fracturing methods that people often use, which can effectively improve the exploitation efficiency of oil field and guarantee the exploitation quality of oil field. With the development and progress of oil well fracturing technology, we should continue to innovate and improve, promote the continuous increase of oil well production in China, and promote the stable development of oil fields in China.

Key words: oil well; fracturing; oil increase; effect; measures.

Oil well fracturing is one of the most effective methods to improve oil well production. In the process of oil production in China, with the increasing difficulty of exploitation, it is more difficult to guarantee the production of oil wells and the quality of oil well fracturing, so as to improve the oil production efficiency of oil wells.

1. Factors affecting fracturing oil increase

(1) Construction quality: according to the actual situation, the correct selection of materials has a direct impact on the effect of oil well fracturing. Therefore, we should attach great importance to the selection of materials in the construction process. The direction and length of cracks must be fully considered in the construction design, and the design of construction scheme needs to be feasible. Through the analysis and Research on the data of fractured wells, we can formulate several sets of fracturing measures to maximize the oil well production, and then select the most suitable scheme from several sets of schemes according to the actual situation, record the disease, sort out the effective fracturing parameters,
continuously optimize the geological conditions and resources, and promote the improvement of production.

2) Injection production relationship: the injection production relationship is closely related to the oil production increase. The continuous improvement and innovation of the injection production relationship is the main measure to improve the oil production increase. With the improvement of the injection production relationship, the utilization rate of oil wells is further improved, and the improvement of the injection production relationship can also extend the service life of oil wells.

3) Refracturing: some construction enterprises tend to pay more attention to the times of squeezing, but ignore the quality problems, which leads to the gradual decline of oil production in the process of refracturing, resulting in unnecessary waste of oil well resources.

4) Geological factors: the amount of oil after pressure increases with the continuous reduction of oil drainage area, which leads to the increasing difficulty of oil well development and the unsatisfactory effect of oil well development. At the same time, the influencing factors causing the difficulty of oil production are the incorrect selection of oil well location and the failure to select the area with relatively large oil production. Because of the small area of oil drainage, the efficiency of oil production will decrease, which will lead to the immature development conditions of oil wells, increasing the difficulty of color development, and the incorrect selection of mining area, the mining effect can not reach the expected goal, resulting in the waste of resources. After pressurization, the phenomenon of increasing fluid but not increasing oil often occurs. The main reason for the above situation is the pressure channeling phenomenon between adjacent water flooded layer and high aquifer.

2. Ways to increase oil production

(1) Improve the supervision: in the construction process of petroleum enterprises, the whole process supervision is the premise to ensure the construction quality, so petroleum enterprises should organize professional supervisors to supervise and manage the construction quality, including the quality of fracturing sand, the use of fracturing proppant, the gelling time of fracturing fluid, etc. In the process of supervision and management, supervision and management personnel must strictly perform their duties, stress the implementation of construction supervision and tracking management, and record the process of supervision and management, so as to provide an important basis for the subsequent improvement of oil production.

(2) Optimization of fracturing design: there are many kinds of oil well fracturing design schemes, so when we design the oil well fracturing scheme, we must fully consider the actual situation of fracturing, and adopt a scientific and reasonable way to optimize the fracturing design, especially the correct selection of fracturing fluid, proppant and construction string. The fracture length of oil well directly affects the production of oil well. After we measure the water content of oil well, we find that there is no obvious change between the fracture condition and the initial stage.

(3) Optimize the geological conditions: collect and analyze the relevant data of fracturing wells, find effective methods and measures to improve the fracturing measures from a large number of data, analyze the important data and information, formulate effective optimization measures, continuously improve the oil production rate of oil wells, and optimize the resources under the same geological conditions.

(4) Acid fracturing: the main fracturing fluid of acid fracturing is acid fluid, which does not need to add proppant. The fracture mainly depends on the hydraulic effect, and then through the erosion effect of acid fluid, the fracture can be eroded to achieve the effect that the fracture can not be closed, so as to realize the continuous improvement of formation permeability.

3. Control method of fracturing low efficiency well

(1) Rock thickness: the effect of fracturing has a certain influence on the thickness of fractured sandstone and the boundary of effective thickness, and at the same time, we should pay attention to the limit of formation pressure;

(2) the limit of fluid production and water cut of fractured well: firstly, we analyze and study various data in the fractured well, summarize the growth law of oil content in the initial stage of fracturing well,
then record the stimulation effect in the later stage of fracturing, and finally analyze the effect of fracturing well. Compared with the recorded data, we can find the plan to optimize the oil well production.

(3) Well selection and layer selection: well selection and layer selection is a very important work content in the process of oil well repeated fracturing, which is the key to improve the utilization rate of oil field and oil well production. With the continuous development of oil wells in our country, the repeated fracturing work is gradually increasing, so we need to attach great importance to the work of injection production system, and also attach great importance to the work of well selection. As far as possible in the distributary channel sand body protruding position to select wells and layers, which will cause the fractured sandstone to be banded and lump shaped, and effectively improve the oil production rate and fracturing effect of oil wells.

4. Stimulation method innovation of oil well fracturing

The principle of fracturing is that the formation is opened by pressure to form fractures, which mainly form a vertical or horizontal shape. Fractures are mainly supported by proppant to prevent closure, promote the flow of liquid, and achieve the purpose of oil production.

4.1. Innovation of high energy gas fracturing method

High energy gas fracturing method mainly uses the sudden rise of pressure to cause formation fractures. Such fractures are more durable and will not close easily. The fractures will be accompanied by some debris, which will automatically support the fractures. At the same time, the asphaltene, wax and gum in the pores can be dissolved in high temperature, and the viscosity of oil will increase. It can also drop at high temperature.

4.2. Hydraulic fracturing

The main principle of hydraulic fracturing is that the high viscosity liquid is sucked into the well by the surface high-pressure pump group with the force exceeding the formation suction. At this time, high pressure appears at the bottom of the well, which will cause the formation to produce fractures. Proppant enters the formation through fractures, which plays the role of diversion and promotes the increase of oil well production. The main principle of hydraulic fracturing is to change the state of fluid permeability, so as to reduce the fluid resistance and energy consumption in the nearby formation.

4.3. Acid fracturing method innovation

Acid fracturing mainly uses acid instead of fracturing fluid, and does not use proppant. Fractures are generated under the action of water. Acid flows into the formation along with fractures, which erodes the formation, causing uneven fractures on the surface of formation fractures. Fractures will not close after pressure relief. Fractures can also effectively play the role of diversion and improve the permeability of the formation. It has improved. Acid fracturing method and hydraulic fracturing method are basically the same in working principle and goal. The main difference is the way of diversion. The solubility of acid liquid directly affects the formation conductivity.

5. Conclusion

With the increasing exploitation of China's oil resources, there has been a shortage of oil. At present, the huge problem faced by oil companies is the increase of oil production. Oil well fracturing methods affect the effect more, mainly including technology, geology, construction factors and so on. It needs close cooperation between various departments, and continuous improvement and innovation of fracturing technology, so as to promote the development of oil wells, increase and stabilize production, extend the service life of oil wells.
References

[1] Geng Qingfu. Application of aerodynamic stimulation technology in xn oilfield [J]. Chemical engineering and equipment, 2018 (04): 162-163

[2] Feng Yina. Discussion on the effect of fracturing technology on oil well stimulation [J]. Chemical management, 2018 (10): 182

[3] Wang Ji. Investment management and benefit evaluation of oil well stimulation measures [J]. Modern economic information, 2015 (02): 360

[4] Hao you, Hu Yuanlin. Discussion on the role of fracturing technology in oilfield stimulation [J]. China Petroleum and chemical industry standards and quality, 2013,33 (19): 79

[5] Li Huijun, Liu Biyu, Zhu Zhiwei. Status and progress of staged fracturing technology for horizontal wells in tight reservoirs [J]. Energy construction at home and abroad, 2018, 37 (10): 78-79

[6] Zhang Hailan, Niu Wanda, Cao Yongzhe. Research progress and development trend of hydraulic coal seam permeability enhancement technology [J]. Acta coalae Sinica, 2018, 44 (07): 63

[7] Liang song, Li Yingsheng, Huan Guoliang. Feasibility analysis and design calculation of deep well hydraulic jet fracturing [J]. Petroleum drilling technology, 2018