Analysis on Application of fracturing stimulation technology in Oilfield

Junxiong Yu 1, *, Hongzhi Xu 2, Xiaopan Liu 2

1 CNOOC China Limited CFD Operating Company, Tianjin, 300459, China
2 CNPC Engineering Technology Research Co., Ltd., Tianjin 300451, China

*Corresponding author e-mail: yujx@cnoociraq.com

Abstract. With the continuous progress of modern science and technology, in the process of oilfield production and operation, the traditional fracturing technology has been unable to adapt to the fracturing construction technology of modern oilfield. There are some problems in the construction safety, fracturing technology and environmental protection production in the construction process. Therefore, we should continue to explore the fracturing technology and develop new technology Technology is imperative, so as to meet the actual requirements of oilfield in different development stages.

Keywords: fracturing stimulation; transformation technology; countermeasures; application.

This paper analyzes the current situation of fracturing technology in Oilfield and the main problems in the process of fracturing construction, and analyzes the reform and technical breakthrough of fracturing technology in the process of modern oilfield production and operation, including single layer fracturing technology, multi-layer fracturing technology and well pattern fracturing technology, etc., and finally carries out Fracturing on the oilfield The improvement of cracking technology is studied.

1. Application status and problems of oilfield fracturing technology

1.1. application status of oilfield fracturing technology

With the continuous development of oil fields, many oilfields have entered the middle and late stage of production and production. In order to improve the production status of oil wells, more and more fracturing technologies are used, including the integrated fracturing technology, development fracturing technology and bipolar high-energy gas fracturing technology. The whole fracturing technology and development fracturing technology are widely used in oilfield, and bipolar high-energy gas fracturing technology is a new fracturing technology developed in recent years, which has not been widely applied. Although the bipolar high-energy gas fracturing technology can greatly improve the oil field production in the actual application process, its actual application cost is relatively high. In short, the existing fracturing technology is basically based on the "pressure principle" process to develop, but the specific fracturing technology has been optimized and innovated on the basis of fracturing principle.
1.2. **main problems in the application of oilfield fracturing technology**

The application of fracturing technology in the oilfield production process has accumulated rich experience, but many new fracturing technology in the process of technological innovation must fully test out its possible problems, so as to effectively avoid risks in the actual fracturing construction. After fully combining with the production practice, the following main problems of fracturing technology application are summarized.

1.2.1. **Safety issues.** Most of the fracturing equipment used in the process of oilfield fracturing technology is large-scale equipment, while the fracturing truck and other equipment are often used for fracturing in relatively concentrated blocks during the pressure construction. Therefore, once the operation is improper or the construction technology is handled improperly, serious safety accidents will occur.

1.2.2. **Technical aspects.** The production and mining process of the oil field involves a wide range of fields, and the safety risks in the production process are relatively large. Therefore, in the production process, we should fully ensure the advanced nature and reliability of the technology, so as to continuously enhance the safety of the oil production operation, and also effectively enhance the efficiency of oilfield production.

1.2.3. **Environmental protection.** The production and operation process of oilfield is generally faced with high temperature and high pressure production environment. If the pressure is not properly controlled in the fracturing construction process, it may lead to oil and gas leakage accidents, and even cause some underground toxic gas to diffuse into the atmosphere, causing environmental pollution. In the current situation that people pay more and more attention to environmental protection, fracturing technology innovation we must strengthen the control of environmental protection.

2. **Analysis of oilfield fracturing technology and determination of breakthrough point**

According to the composition, the fracturing technology can be divided into three types: single layer fracturing technology, multi-layer fracturing technology and well pattern fracturing technology. In view of the oilfield fracturing technology for technical transformation, the first choice to grasp the technical breakthrough point, so as to smoothly implement the technical transformation.

2.1. **analysis and breakthrough point of single layer fracturing technology**

Single layer fracturing technology in the implementation process is mainly to take the target fracturing interval as a point to set the relevant parameters, and other factors will not be considered in this process. When the technology is innovated, the limited conductivity model should be applied to accurately calculate the stimulation margin of the target interval, and the difficulties of technical innovation can be determined under the model. Through the analysis and calculation of the diversion model and the practical experience of fracturing operation, it is concluded that reducing the base value is the breakthrough point of single layer fracturing technology innovation.

2.2. **multi layer fracturing technology analysis and breakthrough point**

In the process of implementation of multi-layer pressure technology, the target layer of the whole well section is regarded as multiple points on a line to implement parameter setting. Through the analysis and calculation of Multi-layer Reservoir, the breakthrough point of this technology innovation is to reduce the base value and fracture damage.

2.3. **well pattern fracturing technology analysis and breakthrough points**

Well pattern fracturing technology is mainly for the unit combination of the whole well pattern for fracturing construction. Therefore, the implementation of well pattern pressure technology should be fully combined with the actual situation of water injection and production of well pattern unit. Therefore,
it is necessary to analyze each independent reservoir unit first, and then establish a model to carry out technical transformation on the overall well pattern unit fracturing scale and fracturing parameters. After analysis, the author concludes that the breakthrough point of the fracturing technology reform is still to reduce the base value and fracture damage.

3. Technical analysis of oil field fracturing stimulation

According to the above analysis, the oilfield should focus on the reduction mechanism and fracture damage when carrying out fracturing stimulation. Meanwhile, the safety, environmental protection and technology of fracturing technology should be fully considered in the process of fracturing technology reform.

3.1. refracturing Technology

After the first fracturing operation of oil wells, there are many hydraulic fracture failures, which will seriously affect the production and production efficiency and production quality of some low permeability oil wells. In addition, the surrounding environment may be polluted due to the leakage problem. Once the above phenomenon occurs in oil wells, it is necessary to carry out fracturing technology transformation, and the main transformation technology is refracturing technology. At present, the application of real number of refracturing in coal field is relatively frequent, but the innovation space of its technology is still relatively large.

3.2. water fracturing technology

At present, the main application of this fracturing technology to the formation damage reduction technology, such as water fracturing agent, has been taken into account. And it can also play a good environmental protection effect, but the specific implementation cost of this technology is relatively high, and the precision control requirements of concentration are very high when fracturing fluid configuration is carried out. Therefore, it is necessary to strengthen the exploration of fracturing fluid formula to make the working fluid more reasonable and economic.

3.3. horizontal staged fracturing technology

However, the most effective fracturing technology is still used to increase the production level of oil wells the problem. The horizontal staged fracturing technology can only complete two vertical recovery operations in the specific implementation process, but its actual cost consumption includes the horizontal construction cost and two vertical construction costs. It can be seen that the actual technology and economic potential of this technology are also very large. It can ensure that the fracture damage is fully reduced and the actual oil recovery of oil wells can be improved as much as possible.

4. Application of fracturing technology in fractured reservoir

In order to solve the production problems, we should comprehensively understand the matrix seepage capacity, well pattern conditions and water breakthrough law of fracture direction. The first is to continuously evaluate the correlation between reservoir quality and fracturing parameters through the production effect of old wells, so as to guide the design of key parameters for new wells more scientifically and reasonably; the second is to carry out comprehensive research and field test on large-scale sand fracturing technology and improving fracture bandwidth technology, so as to fully transform the reservoir and achieve good sand and enough sand.

4.1. identify the main control factors of fracturing well in design, and provide basis for the optimization of fracturing parameters of new wells

The blocks with the same fracturing process, equivalent displacement of 3.8 m³/m, constant sand/liquid ratio and strong regularity are taken as statistical objects. Through the analysis of new wells, the initial production and stable production after fracturing have a strong corresponding relationship with material base and sand fluid volume. Under the same physical properties and resources, the produced
4.2. The traditional vertical well fracturing completion mode should be changed to improve the construction success rate

The traditional fracturing method is packer + tubing fracturing. When the displacement is about 4m³/m, it is close to the construction limit pressure of 55MPa. The construction pressure is high and unstable. The net pressure is 3.1 ~ 3.5Mpa, and the dynamic fracture width is 3.8 ~ 4.5mm, which leads to insufficient reservoir reconstruction and difficult sand adding. In order to reduce the risk of sand plugging, it is necessary to increase the pressure limit to increase the net pressure and fracture width, and comprehensively promote the casing fracturing technology. According to the construction pressure, the casing pressure at different well depths is calculated, the casing combination of different steel grades is matched, and the fast drilling bridge plug technology is matched. The displacement is 12-6m³/m, the net pressure is 7-8mpa, the dynamic joint width is 8-10mm, and the construction pressure is low and stable, which meets the requirements of geological transformation.

4.3. Increase the thickness of thin layer and effective sand layer

It is difficult to optimize the scale and construction of large longitudinal span thin interbed. In ideal condition, the subdivision layer can be reconstructed. However, in the actual situation, only one layer of thin interbed is reconstructed, and the penetration ratio is out of control, and the water well is communicated. For reservoirs with large longitudinal span and large stress difference, casing temporary plugging fracturing is adopted; for reservoirs with large longitudinal span and small stress difference, perforation thickness and hole density are adjusted and variable displacement construction is carried out through corresponding hole friction calculation under different displacement.

4.4. On the plane, intensive interference fracturing can increase the sweep bandwidth and improve the horizontal transformation degree

Taking the small platform as the unit, the geological contradiction is clarified. According to the connection of small layers and the well pattern position, the fracturing technology and fracture parameters are optimized, and the reasonable penetration ratio is controlled, so as to realize the reasonable matching of fracture and water drive radius, so as to maximize the effect of well pattern. Conventional large-scale, intra fracture diversion and variable displacement fracturing are adopted for the dominant wells in Northeast and east-west water injection; fracture network fracturing, alternate injection and sequential interference fracturing are adopted for the weak directional wells of water injection in the north-south direction, so as to realize the overall transformation finally.

4.5. Combined with the characteristics of water production pattern in the upper well, see the pattern of reservoir formation in different directions

The technical adaptability evaluation of three different fracturing technology modes is carried out in different blocks, and the effect after fracturing is compared to form the main construction mode of different blocks. For wells with good reservoir conditions and development situation and low construction difficulty, conventional fracturing technology can meet the development requirements.

5. Conclusion

The main technology used in the process of oilfield stimulation is fracturing technology. Therefore, only by understanding the current situation of fracturing technology in detail, can we clearly recognize the shortcomings in the development process of fracturing technology, carry out targeted research on pressure technology transformation, find out the breakthrough point of technical transformation, so as...
to lay a solid foundation for the reform of oilfield fracturing technology. Solid foundation, constantly expand the application scope of fracturing technology, provide technical support for oilfield stimulation, and effectively improve the efficiency of oilfield production.

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