Analysis of influencing factors of wells with high operating pressure and suggestions for the next step

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Abstract. At present, due to the high pressure and large overflow of the operation well, the operation cycle is long and can not be carried out normally, and the operation can not be carried out except by means of controlled injection and depressurization, shut-in and depressurization, and pressurized operation. As a result, the normal production of oil and water wells is seriously affected, the utilization rate of oil and water wells is reduced, and the production of oil fields is affected. Therefore, the influencing factors of wells with high operating pressure are analyzed and suggestions are made in the next step. In this paper, the main influencing factors of the wells with high operating pressure are found out by investigating the current situation of the wells with high operating pressure and analyzing the causes. All the factors are classified, and detailed analysis is carried out according to the corresponding influencing factors. The effective treatment methods and tracking mechanism are put forward to reduce the number of wells that can not operate normally due to high operating pressure.

Keywords: High working pressure; Overflow; Measure operation.

1. Introduction
In the past two years, due to the regulations of the two methods, the requirements for environmental protection and safety in construction operations are strict. At present, the situation that can not be implemented due to high operation pressure and large overflow flow must be solved by means of controlled injection and depressurization, shut-in and depressurization, and operation with pressure, which leads to a long operation cycle, seriously affecting the normal production of oil and water wells, reducing the utilization rate of oil and water wells and affecting the crude oil production. Therefore, the investigation is carried out for the wells with high operating pressure in the oilfield, and the corresponding management countermeasures are formulated by analyzing the influencing factors of the wells with high operating pressure, so as to put forward practical suggestions for reducing the wells with high operating pressure in the next step.

2. Investigation on the current situation of high working pressure
At present, due to the high operating pressure and flowing production, there is no relevant pressure standard for the standard that cannot be operated, which is mainly measured by measuring the
instantaneous overflow. The oilfield company stipulates that the overflow per hour exceeds 15m³, which is regarded as the reference standard with high operating pressure and large overflow.

From 2015 to May 2016, a total of 6,809 wells were operated, of which 206 wells had high operating pressure, accounting for 3.03% of the total wells.

According to statistics, there are 200 wells with high operating pressure from 2015 to May 2016, of which 76 wells with high operating pressure in a certain mine area are at most.

In terms of the types of measures, there are many high-pressure wells, such as pump inspection, pump replacement, water plugging and pumping down after pressure reduction. Pump replacement is mainly due to sufficient formation energy and long-term high liquid level; the water plugging is mainly due to the perfect injection and production around, and the fluid volume of this well is relatively high; Pumping down after fracturing is mainly due to effective fracturing.

3. The raising of questions
According to the statistical analysis of wells with high operating pressure at present, the number of wells operated by pump inspection and replacement is relatively large, while the number of wells with stimulation measures such as fracturing and hole supplementation is relatively small. Due to the high operating pressure, the operation cycle is prolonged, which not only seriously affects the utilization rate of oil and water wells, but also directly affects the crude oil production. According to statistics, since 2015, due to the high operating pressure, the average single well operation cycle has been extended by 35 days, which has affected the liquid production by 362,200 tons and the oil production by 14,400 tons. Therefore, it is necessary to analyze the wells with high operating pressure, study the specific influencing factors of high operating pressure, and put forward effective suggestions to reduce the probability of wells with high operating pressure.

4. Analysis on influencing factors of wells with high operating pressure
There are many factors causing high formation pressure, such as adjustment of water injection scheme, large injection-production ratio, pressure difference between well groups and long-term injection without production. Through the analysis of production data of 200 high-pressure wells before and after operation, the main factors causing high formation pressure are the long period of shut-in and waiting for operation, high regional formation pressure, adjustment of surrounding water injection wells and other reasons.

4.1. Long period of shut-in and waiting for operation
According to the statistics of shut-in period of high operating pressure wells, 50 wells were shut-in for more than one month, accounting for 25% of the number of high operating pressure wells, mainly because the pump condition was not checked for a long time, and the relative injection-production ratio between well groups was large; The well to be overhauled has been shut down for a long time, which is caused by injection without production for a long time, among which 24 wells belong to pump inspection and well to be overhauled.

4.2. The formation pressure in the operation well area is high
From the statistics of the total formation pressure difference of wells with high operating pressure, the wells with high operating pressure are mainly located in the range of 1~3MPa, which indicates that the wells with high operating pressure are located in the high pressure area, which is caused by the high formation pressure in some areas due to the adjustment factors of water injection during water injection development.

According to the distribution area of wells with high operating pressure and the formation pressure, it can be seen that the wells with high operating pressure are mainly distributed in the first area and a certain area of a certain northwest block.
4.3. Water injection adjustment of surrounding water injection well scheme
According to statistics, there are 200 wells with high operating pressure, among which 47 water injection wells around the wells have been adjusted by adding water in the scheme in the past year, and the daily water injection has increased by 825m³, resulting in local increase in formation pressure of surrounding oil wells. Scheme adjustment is mainly divided into pre-measure training, post-measure protection, and increased injection in the well area, which results in high formation pressure and high operation pressure for the purpose of improving liquid and efficiency. Therefore, it is normal for such wells to have high pressure during operation. Among them, 28 wells belong to pre-measure culture, and through injection control, pressure operation and self-flowing production after measures, the oil increase effect after measures is poor, and only 12 wells have increased oil by more than 4t at the initial stage, which affects the effect of measures.

4.4. Implementation of safety law and environmental protection law
The high operating pressure and overflow are mainly caused by the high flowing pressure at the bottom of the well caused by sufficient formation energy, which makes the liquid in the pipe gush out of the wellhead. According to the regulations of the two laws, the requirements for environmental protection and safety are strict during construction, and overflow is not allowed to be discharged during construction, resulting in no operation.

5. Governance countermeasures
By analyzing the situation of high working pressure, we can prevent and take corresponding countermeasures according to specific influencing factors.

5.1. Pressure balance of injection-production adjustment
In view of the well area with high operating pressure, the formation pressure should be adjusted in time, so as to adjust the guiding direction for water wells, make the analysis and adjustment in place, stabilize the formation pressure and avoid the high operating pressure caused by long-term high formation pressure.

5.2. Strengthen the daily tracking management of oil and water wells
First, the wells with pump condition problems should be handled in time. For wells with pump condition problems, find, report and deal with them in time. According to the theory of unstable well test, with the prolonged shut-in time and continuous injection of injection wells, the pressure in the well bore will rise continuously, which leads to the need for controlled injection or mud killing during operation. In order to put an end to this kind of high pressure situation, it is required that the oil production mine report the pump condition problem of this kind of well to the operation within 2 days, deal with the problem well site in time, arrange the operation plan according to the output impact and the well lying time after the
report, take the pressure before the operation, immediately connect the pipeline for blowout when the pressure is high, and track and observe the pressure change.

Second, optimize and adjust production parameters in time. For wells with shallow liquid level and high formation pressure, it is necessary to strengthen the optimization and adjustment of production parameters or take timely measures to change large pumps to avoid long-term pressure production.

Third, strengthen the daily well cleaning management. In view of wax blockage, the oil production team is required to conduct well washing treatment in time, strengthen daily well washing and pump condition management, and immediately wash the well when the pump condition deteriorates, and close the production gate for operation after washing.

5.3. Study and popularize the corresponding supporting technology
First, for key wells such as high-yield wells and measure wells, increase the research and application of internal blowout prevention tools.

Second, for the key wells such as training before the measures and replacing large pumps, and the wells that cannot be operated normally, carry out operation under pressure.

5.4. Establish pressure and overflow tracking mechanism
For wells with high pressure in the well before fracturing, the original well will be pulled out by the minor repair team, and completed with smooth tubing and one-way valve, and then handed over to the downhole fracturing team for construction. Determine the quantitative judgment standard of high pressure wells, sort out the pressure and overflow tracking mechanism, and clarify the specific responsibilities of relevant departments.

Figure 2. Operation workflow with high operation pressure

6. Some understandings
(1) Do a good job in pressure analysis, timely adjust injection-production in high-pressure wells according to the comparison of total pressure difference, balance formation pressure, and reduce the proportion of wells with high operating pressure caused by long-term high formation pressure.
(2) For wells to be overhauled, track the overhaul situation in time. For wells that cannot be overhauled in the short term, adjust the water volume of surrounding wells to avoid pressure rise caused by long-term shut-in.

(3) When working out the plan, it is necessary to classify the conditions of high culture pressure and inability to pump down before fracturing, and do a good job of preventing high pressure in advance.

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