Research on the Causes and Treatment Measures of the Test Instruments for Water Injection Wells

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Abstract. Based on the development demand of comprehensive treatment of water injection wells in oil fields, in the process of carrying out maintenance operations, comprehensive analysis is carried out from the angles of water injection well test resistance, tracking description, etc., so as to improve the practical application effect of water injection well test instruments, and play a positive role in improving the treatment effect of water injection well test instruments. Combined with the actual application of water injection well testing instruments, this paper analyzes the reasons for the resistance of water injection well testing instruments, and optimizes the maintenance of water injection well testing instruments and the treatment of pipe corrosion and scaling, so as to improve the treatment effect of water injection well testing instruments.

Keywords: Water injection well testing instrument, Testing, Data analysis.

1. Introduction

Water injection well testing instruments will have a direct impact on the operation and stability of water injection wells. Moreover, from the perspective of maintenance operation of water injection wells, in the process of ensuring oilfield development, it needs to be analyzed from the perspective of comprehensive treatment of water injection wells. This has a positive effect on the production and comprehensive development of water injection wells. Water injection well test is blocked and stuck, which will have a direct impact on the practical application effect of water injection well test instrument. This paper analyzes the reasons of resistance of water injection well testing instrument, and discusses how to deal with the resistance of water injection well testing instrument, which has a positive effect on ensuring the practical application effect of water injection well testing instrument [1].

2. Analysis of the reasons for the resistance of testing instruments in water injection wells

2.1. Analysis of water injection well test resistance and sticking out

In the research and analysis of the practical application of water injection well testing instruments, the maintenance operation of water injection wells in oil fields is taken as the research basis. In the research and analysis, the application of water injection well testing instruments developed in this oilfield is blocked as shown in Table 1.
Table 1. Resistance of test instruments for water injection wells

| Operation construction times | Number of encounters and drops | Proportion of construction wells | Unsealing times of packer | Leakage times of pipe string | The number of times the stopper can't be thrown in | Other cause analysis |
|-----------------------------|-------------------------------|---------------------------------|---------------------------|----------------------------|-----------------------------------------------|---------------------|
| 1932                        | 751                           | 41%                             | 563                       | 237                        | 139                                           | 142                 |

To analyze from the perspective of maintenance operation of water injection wells, comprehensive analysis should be made from the perspectives of maintenance operation of water injection wells and the reasons for resistance. In the research and analysis, the blockage and falling phenomenon will have a direct impact on the actual operation of water injection well testing instruments [2]. Blocking and falling of water injection well testing instruments will have a direct impact on oilfield development and actual production of water injection wells. Therefore, the test instrument of water injection well is blocked and the reasons are analyzed. This has a positive effect on further improving the practical application effect of water injection well testing instruments. This paper analyzes the reasons of resistance of water injection well testing instrument, and comprehensively controls it in combination with treatment technology, so as to improve the practical application effect of water injection well testing instrument [3].

2.2. Analysis of the reasons for the resistance of testing instruments in water injection wells

In the research of water injection well test instrument resistance, because water injection wells use decline method to test interval water volume. Water allocation is controlled by throwing and fishing plugs with fishing tools and adjusting the diameter of water nozzles. In the process of testing and analysis, pipe string scaling, downhole sand production and casing deformation will have a direct impact on the actual operation and application of water injection well testing instruments [4]. In the research and analysis of field tracking and historical data of water injection well operation, the main reasons for the blockage of water injection well test instruments are as follows:

(1) The water quality of injected water is not up to standard, and the pipe string corrosion and scaling are serious. In the process of long-term use of water injection wells, pipe string scaling is very easy to occur. After scaling, the cross-section of the pipe string will increase the water injection resistance, and the inner diameter of the working cylinder of the water distributor will also decrease, which will make it very easy to throw and fish, and the resistance and falling of the test instruments of water injection wells will increase.

(2) The well washing facilities are not matched, which affects the well treatment. In the process of daily opening and closing and anti-overflow, the formation pressure will change and sand spitting will occur. Moreover, whoever cleans the water injection well will also use the recovery device for treatment. However, in the process of actual operation, the simple well washing device can not be used for treatment, and most of them are constructed by conventional operation, acidizing treatment and profile control, which cannot meet the well washing requirements of injection wells. In the research and analysis, the washing wells in sensitive areas do not have the washing conditions. Moreover, it is in a state of being unable to wash wells for a long time, which will have a direct impact on the practical application of water injection well testing instruments.

(3) The deployment of water injection well testing instruments is relatively heavy, and the deployment process is to test the flow rate through the decline method, which has systematic errors in actual operation. The replacement of water nozzle is handled by wire fishing, which takes more than one hour for each fishing, and the average single well test time is 4.5 days. In the practical application of water injection well testing instrument, its measuring and adjusting efficiency is low, and there are many falling accidents, which will have a direct impact on the practical application of water injection well testing instrument.

(4) The form of casing damage is severe, and the deformation of casing is serious. The well conditions of casing water injection wells are complex and the test is difficult, which will have a direct
impact on the actual operation and application of water injection well test instruments. In the process of analyzing the resistance of water injection well testing instrument, the casing deformation is home, and the water injection string bends at or near the eccentric position, which will have a direct impact on its actual operation.

3. Treatment measures of water injection well testing instrument blocking

3.1. Solve the problem of scaling
The anti-scaling pipe of tubing itself needs to be changed into three-proof pipe, and the downhole tools also need anti-corrosion treatment, so the scaling speed of tubing string will slow down relatively. If there is serious influence of corrosion and scaling, the tubing needs to be replaced. In the process of operation and construction, according to the work arrangement, replace the water pipe string that has not been replaced for more than five years, so as to solve the scaling problem and reduce the occurrence probability of test resistance. In the process of dealing with scaling, it is necessary to inspect and deal with the tubing. For water injection wells with serious scaling, high-pressure jet pipe washing treatment can be carried out, so as to meet the resistance treatment requirements of water injection well test instruments. In the research and analysis of scaling, the effectiveness of water injection in water injection wells can be ensured by optimizing the pipe string. On the basis of layered water distribution process, it can be controlled from the perspective of layered flow test, so as to ensure the oilfield development effect.

3.2. Optimization of injection process and improvement of test mixing efficiency
In the process of layered flow treatment, the flow rate of water injection wells can be tested in the way of layered flow treatment, and the test accuracy of layered flow rate can be improved by using decreasing method. In the process of testing and analyzing the stratified pressure, there is no need to throw the plug, and the normal state is not changed. Thereby eliminating the interference between layers and improving the testing accuracy and rapidity of the water injection well testing instrument. This has a positive effect on improving the actual testing efficiency of water injection well testing instruments. In the process of synchronous measurement and adjustment of eccentric water injection wells, it is necessary to connect with the adjustable plug adjusting square head through the adjusting arm, and realize inspection and analysis through the measurement and adjustment process. In the process of resistance treatment by using the synchronous measurement and adjustment technology of eccentric water injection wells, it is necessary to test the formation after stable water injection. After the test, the well cleaning methods and management are optimized to meet the well cleaning requirements of water injection wells. In the process of optimizing the well washing method, in order to realize continuous well washing, the four-way device is used, three tankers are connected, and the well washing is controlled by valves, so as to achieve the purpose of continuous sewage discharge, avoid the need of intermittent tank dumping when a single tanker is hauled for well washing, and avoid the drop of suspended solids related impurities in the wellbore, thus ensuring the basic quality of well washing. In the process of treatment by closed well washing method, the sewage is directly recovered by oil return pipeline of oil production well and controlled by high pressure hose line. In the process of prevention and treatment of casing damage wells, it is necessary to control them from the point of view of centralized treatment in blocks, and in the process of casing damage control, it is treated by means of leakage plugging. After the overhaul, monitor its subsequent putting into use. In the study of water absorption of casing damage, the water injection well string and formation pressure can be increased to monitor and control. On the basis of increasing the hydraulic pressure of producing wells, casing damage can be controlled by reducing injection pressure to ensure polymer injection effect. The injection rate is controlled to improve the polymer injection effect. On the premise of controlling the injection rate, comprehensive analysis should be made from the perspectives of reservoir structure and sand body connectivity, and on the basis of controlling the discharge pressure, the casing damage can be managed and controlled.
3.3. Improve the repair speed of casing damaged wells

In order to speed up the repair of casing damaged water injection wells, it is necessary to control from the angle of water injection well treatment, increase the repair granularity of casing damaged wells and control the number of casing damaged wells, so as to meet the actual needs of casing damage treatment. In addition, on the basis of increasing the application granularity of casing damage repair technology and perfecting the injection-production relationship of well groups, the workover standard of water injection wells can be improved and convenient conditions can be provided for subdivided water injection. In the process of casing damage treatment and control, comprehensive adjustment should be made from the perspectives of abnormal well treatment and centralized treatment, so as to improve the practical application effect of water injection wells on the basis of ensuring the repair speed of casing damage wells. In the process of strengthening the daily well washing and maintenance of Zhenhu water well, comprehensive control should be carried out from the actual operation and parameters of water injection well. On the basis of controlling the operation state of Zhenghu well, the repair treatment effect of casing damage well can be improved. In addition, in the process of controlling the resistance of water injection well testing instruments, comprehensive adjustment should be made from the perspectives of corrosion and scaling treatment of tubing inner wall, so as to further improve the treatment effect on the basis of optimizing the treatment process.

4. Conclusions

To sum up, in the process of research and Analysis on the resistance of water injection well testing instruments, comprehensive adjustment should be made from the perspectives of string optimization and non rapid flow test. On the basis of improving the operation of water injection well testing instruments, the testing efficiency and quality of stratified flow rate should be continuously improved, so as to ensure the basic development effect of the oilfield. With the increasing extension of water injection time, it is necessary to optimize the synchronous measurement and adjustment technology of water injection wells, so as to improve the practical application effect of water injection well testing instruments. On the basis of controlling the resistance of water injection well testing instrument, it can strengthen the daily well cleaning and maintenance of water injection well, improve the workover standard of water injection well and improve the practical application effect of water injection well testing instrument in oilfield development.

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