

Research and application of water flooding injection and production technology after polymer flooding

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Abstract. For reservoir water flooding after polymer flooding injection points existing in the mining process of high temperature resistant performance is poor and multistage unlock difficulty, examination, and the sealing problems such as in-depth study and analysis, innovation to a new set of return to spit points injection points production technology, to produce more suitable sealing high voltage can be found on a variety of well conditions return to spit points a column technology, is helpful for better improvement points injection tube service life. At the same time, it can effectively solve the problem of clogging downhole concentric test and adjustment unit. Oilfield exploration into the follow-up after water flooding stage, the well will show the water fast, fast production decline, the characteristics of a return so often need to take back to spit on mining technology, but the technology has high pressure resistance and multistage unlock difficulty problem, makes the life of the mining process is shorter, so according to the technical problems existing in the in-depth study and analysis, The effective outcome measures are put forward to provide necessary technical support for reservoir benefit after polymer flooding.

Key words: Reservoir water drive; Separate injection and production; Technology research.

1. Technical string composition and process principle

1.1 Technical string composition

In the process structure of reservoir water injection and production after polymer flooding, the development of the water distributor and the high pressure differential nozzle is helpful to improve the auxiliary tool technology such as the low-damage hydraulic anchor and the small diameter anti-reflux injection pipe. By this way can effectively adapt to high pressure difference and improvement points injection pressure, the purpose of the performance in the technical part of the tubing string, can pass the pressure check valve backflow prevention principle of ways, can effectively prevent the polymer to return to spit into the purpose of the tubing, and pressure from the oil lantern ring hole is able to be delivered to the tubing in the purpose of [1]. The pipe string of reservoir water flooding and fractional injection and production technology after polymer flooding is mainly composed of eccentric water distributor, packer, eccentric water distributor with pressure transmission and anti-reflux, pressure limiting single flow valve and slit screen.

1.2 Process principle

In the process of polymer reflux into the tubing, through the design of anti-backflow eccentric water distributor, in the eccentric water distributor outlet design of the corresponding spring return single-flow valve, can effectively achieve the compression of the spring during water injection, so as to achieve the purpose of opening the single-flow valve. In this way, it can not only effectively stop the spring reset and the purpose of closing the single flow valve when water injection, but also better prevent the formation spit polymer in the throttling plug into the water distributor caused by the exit and tubing design, and finally achieve the purpose of preventing the blockage of pipe and water distributor nozzle. In the design process of the bottom wash valve, a combined controllable wash valve must be designed because it needs to be considered not only to meet the opening of the bottom wash valve, but also to consider the way not to open when testing the step-down or injection stop [2]. For the components of the single flow valve and slit screen, according to the bottom water absorption condition, set a higher opening pressure way of the single flow valve, in order to realize the backflow phenomenon when the pressure difference between inside and outside the tubing is lower than the set pressure. The viscosity of the respitting polymer in the slotted screen section must be

reduced during secondary shearing to prevent clogging of the string and common problems in the nozzle.

2. Research and analysis of the main supporting tools

2.1 Study on eccentric water dispenser for preventing vomiting

The anti-reflux eccentric water distributor is usually composed of an upper connector, a water distributor body, a rotating core, a fixed nozzle, an anti-clog mechanism and a lower connector. Its working principle is to ensure that the original fixed core plays an axial and radial role in limiting and positioning the electromagnetic concentric adjusting instrument through the anti-clog downhole adjustable unit and the special electromagnetic concentric measuring and adjusting instrument, and effectively adjust the fixed nozzle during the rotation of the rotating core [3]. For T seal, piston and piston accessories such as the use of, want to better achieve injection Wells water injection piston seat open, you will need to injection Wells in stops the piston can realize the function of automatic shutdown, can effectively realize the function of polymer Wells back to spit proof, thus preventing stop note when the underlying return sand spit out. In the study of anti-reflux eccentric water distributor, the corresponding technical parameter requirements include pressure resistance parameters of 35MPa, temperature resistance of 120°C, outer diameter of 100mm, inner diameter of 46mm, total length of 974mm, and maximum rotational torque of 82N·m.

2.2 Study on Pressure Limiting single flow valve

The structure of pressure limiting single flow valve is mainly composed of upper connector, baffle, reset spring, single flow valve ball and lower connector. In the working principle of pressure limiting single flow valve, since there is no external pressure action, the single flow valve ball of pressure limiting single flow valve sits on the seat on the lower joint, and the purpose of external hydraulic action can be realized by the way of positive closing and sealing, which can achieve high pressure design requirements. This is because the pressure limiting single-flow valve can realize internal and external communication by pushing the single-flow valve ball to compress the spring, and the function of the spring resetting the single-flow valve seal can be realized after the high-pressure well washing fluid enters the tubing interior from the outside for backwashing [4]. The single flow valve ball and the compression spring design of the centralizer can help to prevent the spring and the valve ball from misalignment. At the same time, an effective space is designed between the inner diameter of the centralizer and the working cylinder, which is conducive to the flow of liquid flow. The reasonable design of the structure, but also can effectively ensure the reliability of the single flow valve ball open, to avoid the single flow valve ball is blocked, the technical parameters of the pressure limit single flow valve, the pressure parameter is

35MPa, the opening pressure is between 2 and 3.5mpa, the outer diameter is 95mm, the total length is 450mm.

2.3 Study on Y341 step - by - step unseal waterflood packer

The structure of Y341 step by step unsealed water injection packer is mainly based on the requirements of the layered sand control process of the injection well after polymer flooding, and the water injection sealing is performed on the area of the well washing channel by improving the supporting outer diameter. Generally, the improved outer diameter is $\phi 115\text{mm}$. The structure of packer is composed of upper joint, center pipe, well washing sleeve, special rubber cylinder, well washing valve, piston, cylinder liner and lower joint. Therefore, the working principle of Y341 step-wise de-seal water-injection packer is as follows: the rubber cylinder can be compressed and set by internal and external pressure difference, and the locking claw and locking sleeve can be locked tightly. When de-sealing, the upper pipe string and the friction force of the rubber cylinder and casing will cut the de-seal pin, which will lead to the retaining ring being moved, and with the recovery of the rubber cylinder, The Y341 step-by-step unseal waterflood packer was unsealed and caused the string to be isolated [5]. In the technical parameters related to the Y341 step-wise unseal water-injection packer, the corresponding sealing and decompression parameters are 30MPa, the setting pressure difference is in the range of 7-8mpa, the operating temperature shall not exceed 125°C, and the backwash well displacement is in the range of 30-40m³/h.

3. The establishment of numerical simulation model

3.1 An overview of oilfield engineering

In the study of water flooding and fractional injection and production technology after polymer flooding, a certain oilfield in northwest China is taken as an example to select the simulation model. The polymer area of the oilfield is 9.04km², the geological reserve is 1367*104t, and the pore volume is 2477*104m³. The production layer belongs to the PI II-4 reservoir. The thickness of the drilled sandstone is 16.8m/ piece, the effective thickness is 12.8m, the effective permeability is 670*10⁻³μm², and the original formation pressure is 11MPa. The saturation pressure is 10.06MPa, the average reservoir burial depth is 958.97m, the formation temperature is 47°C, the viscosity of underground crude oil is 9.6mPs, the crude oil density is 0.803g/cm³, the original oil-gas ratio is 47.3m³/t, and the original formation water salinity is 7178mg/L. In the analysis of dynamic and static characteristics of the field, to take measures and test methods such as oil and water Wells, oil and water Wells and fully considering the heterogeneity, distribution of sedimentary facies, relative permeability, porosity, etc., and realize the fine simulation of field data, and with the aid of the Eclipse of the method of simulation software, also can realize the hermit, 3 d and 3-facies black oil

simulator, So that the calculation results become more accurate.

3.2 Static data interpolation calculation

The formation parameters of oil field the actual thickness, effective thickness and porosity of related parameters, such as data interpolation calculation, can use phase interpolation approach, when top deep phase interpolation problem, need according to the library to extract data from layer related way, implement effective interpolation on the depth of the upper mouth and get the top data model USES. In the in-depth study and analysis of fine strata, the effective control of the precipitation phase zone diagram is helpful to realize the specific calculation and analysis of the interpolation of each formation parameter in the phase zone content, and the effective control of the heterogeneous parameters in the formation. For sand strata in the vertical permeability of the composite parameters was described, two contact network must be composite sand location is analyzed, according to 10% of the network block print permeability values at the same time, in the case of compound sand body anatomy, realize effective exchange of both material, in this case, the corresponding vertical permeability coefficient is zero, FIG. 1 shows the distribution of thickness, permeability, porosity and pore volume of each rock layer [6].

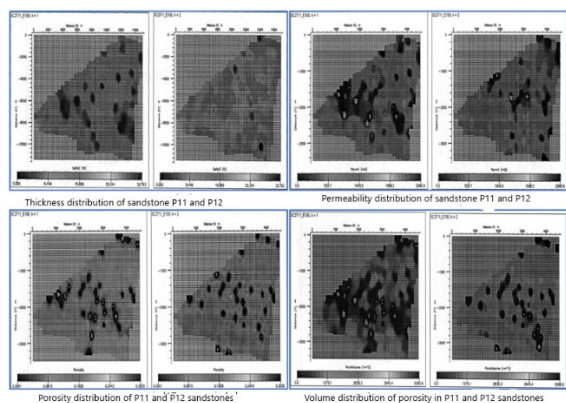


Figure 1: Distribution of parameters in interpolation calculation of static data

3.3 Fluid properties and their distribution

The distribution of fluid properties, aiming at the rate of the relative permeability curve of indoor result analysis comparison, usually need to larger data in the rate of penetration curve, to guarantee the precision of the data and curve smoothness requirements, to give time to calculate, then helps to realize the calculation precision of ascension. For different Wells between rock and fluid blocks through analyzing the relative permeability curve, generally take four different relative permeability curve, can realize the different between the geological conditions and rock fully consider regional quality analysis, finally can effectively achieve the liquid convection affect the thorough analysis, Corresponding permeability curves and adaptive formations are shown in Table 1.

Table 1: Relative permeability curves fit stratigraphic table

Relative permeability curve number	Adaptive formation
The first curve	Permeability above 800md
The second curve	Permeability between 400 and 800md
The third curve	Permeability between 150 and 400md
The fourth curve	Permeability less than 150md

3.4 Oil field production dynamic data analysis

After data collection and sorting according to the dynamic characteristics of the oilfield, the oil production and water mixing can be divided into each day according to the month, and then the data can be received by Eclipse software, so as to form the analysis of the corresponding dynamic data stream. At the same time, the relevant parameters such as oil production and water production can be corrected and analyzed. The corresponding time step division, treatment measures, isotope data and annulus water search data can be obtained [7]. And in the process of time step some effective division, want to better realize the oil Wells in the oil and water production status, the time step can be planning for a month's time, and within the minimum time step for the oil and water Wells, to ensure the production and shut down within the prescribed period of time, eventually be able to form the corresponding curve and data requirements. , and in the process of acidification and fracturing and fill hole processing, the problems of water shutoff must be carried out in accordance with the corresponding time input bit, in order to better realize the dynamic change of the parameters of effective judgment and isotopic parameters, and repeatedly in the process to modify the parameter simulation measures the formation parameters of control. In isotope data, the oil Wells in the reservoir pollution, assignments, and other measures of common water absorption layer change, isotope in the course of the simulation and the effective detection, finally combined with the actual situation to calculate the single well in oil Wells of interlayer contradictions, to reach the final change effectively in accordance with the results. For the annulus water search data, with the help of the current relevant data to carry out in-depth analysis of a single well layer, it can be found that the final simulation results are mainly based on the corresponding test data to achieve effective analysis, so the simulation experiment has a high credibility.

4. Conclusion

Reservoir water flooding after polymer flooding injection points mining technology can effectively solve the related problems of the original points injection process, such as resistance to high pressure difference, process defects such as short service life, through innovative perfect return to spit points a mining technology, to produce more effective resistance to high pressure sealing can be found

on a variety of well conditions return to spit points process injection string, thus has excellent anti reflux vomiting and test functions, This has a great effect on improving the service life and test efficiency of water-flooding injection and production technology in reservoir after polymer flooding. After verification, the reliability of this technology makes the technology more perfect and developed.

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