

# Application of oil and water well dynamic monitoring data in dynamic analysis of oilfield development

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**Abstract.** With the continuous development of social economy, oil field industry has made ideal progress in the current development, while meeting the needs of people's production and travel, and making common progress with the industrial industry and other fields. This paper analyzes the dynamic analysis of oilfield development under the condition that the stratification of underground oil layer is more and more complicated. Oilfield well dynamic monitoring is mainly aimed at monitoring downhole technology, formation pressure, oil and water output, etc., mainly to provide accurate downhole dynamic data for oilfield development operators, so that the staff can better carry out dynamic analysis, so that oilfield development effect is more ideal.

**Key words:** Oilfield development; Oil and water Wells. Dynamic analysis; monitoring

## 1. Introduction

The distribution of most oil and water Wells in China is more and more complex, which is not conducive to the dynamic acquisition of information. The efficiency of dynamic analysis on the basis of manpower is not high, and one day the benefits of enterprises are significantly reduced. Oil and water well dynamic monitoring can meet the needs of oilfield development operators, so that operators can obtain the dynamic situation of Wells at any time, provide treatment basis for the problems existing in oilfield development process, help people solve the problems, and promote the healthy development of the oil industry. This paper mainly analyzes the content and current situation of oil and water well dynamic monitoring, expounds the actual dynamic, and puts forward countermeasures to ensure the reasonable and scientific development of oil field.

## 2. Application of dynamic monitoring data

Dynamic monitoring data are the eyes of geologists and the main means to understand underground reservoirs. After obtaining dynamic monitoring data, geologists can adjust the exploitation mode of oil and water Wells according to the data data to ensure the accuracy and reliability of oil increase scheme. The content of dynamic monitoring of oil and water Wells is mainly divided into three aspects: firstly, the whole process of monitoring and control of downhole conditions is realized. For example, in an oil field with high sand production, one fifth of the

Wells are selected every year and the diameter of the well is measured twice continuously. In order to find out the cause of casing damage, we can provide reliable data for maintenance work. Secondly, the formation pressure of oil and water Wells is monitored. According to dynamic monitoring, the formation pressure of production Wells is measured. The actual measurement method is to measure the pressure at a suitable time after the well is shut down, and then test the well repeatedly to test the formation pressure. Thirdly, the underground production of gas, oil and water is monitored. This part is mainly carried out in the measurement vessel. Through sampling and testing, the water content proportion of the sample is measured, and the output and quality are determined through the orifice plate or turbine flowmeter. Finally, the water absorption profile and output profile are monitored. The monitoring of water absorption profile of water injection well is mainly carried out by radioactive tracer method, and the output profile is mainly measured by well temperature instrument and deep well flowmeter. The monitoring frequency is once a year, and the proportion of monitoring points is mainly determined according to the actual situation of oil field. Lithologic reservoirs need to select a small number of well monitoring units, the final data can get ideal prediction results.

With the continuous progress of the oilfield industry, China's oilfield industry is making continuous progress, the scale and quantity of oilfield are also expanding, and the oilfield industry has gained more and more economic and social benefits. The expansion of oilfield development scale leads to the increase of oil storage in China, which is not conducive to the sustainable development of oilfield industry. In order to ensure the

accuracy, rationality and effectiveness of reservoir dynamic analysis, oilfield staff need to constantly adjust the dynamic changes of oil and water Wells, do well in the monitoring of downhole conditions and formation pressure, and ensure the smooth development of oilfield [1].

### 3. Use of well performance monitoring data

#### 3.1 Dynamic analysis of pressure measurement data of oil well

(1) Affected by the heterogeneity of the reservoir plane, the distribution of the oil field is not uniform between the points on the plane, and the high formation pressure in local areas leads to high recovery. The water cut rise of oil Wells is accelerated, and the oil well production is poor. Therefore, the pressure measurement data is used to analyze the injection-production relationship, and the injection-production system is adjusted according to the data, which is used to guide the reasonable exploitation of the oil field.

Case: In November 1999, well area 108~106 of an oil field was put into production. There were 37 oil Wells and 18 Wells, with a ratio of 2.06:1, oil recovery rate of 11.5%, cumulative injection ratio of 1.64 and oil recovery rate of 3.17%. According to the wellhead dynamic data, the average pressure of the three Wells in the well area is 13.48MPa, and the total pressure difference is -0.87 MPa. In the actual monitoring, there was a well with extremely low pressure and great plane pressure difference. According to the analysis of the actual situation, it was caused by the difference of formation conditions and injection-production relationship. In order to improve the exploitation situation, the oil well is adjusted in the later stage to achieve the effect of adjusting the pressure system and improving the development structure.

Practical application: first, it provides basis for well selection, layer selection and oil well evaluation and analysis. Combined with the geological work of this project, the mining potential of the mine area is gradually decreasing, and it is more and more difficult to take measures to select Wells and layers. Stratified section well test can obtain formation pressure, permeability, skin coefficient and so on, which can provide reasonable basis for well and layer selection and lay a good foundation. Thus, it is beneficial for technicians to analyze the casing loss and lay a good foundation for controlling the casing loss. Within the formation pore pressure imbalance is one of the factors of casing damage, oil and water Wells casing damage occurred when don't need all layer pressure is high, only need a few high pressure layer formation pore pressure is not balanced, will cause a displacement of the rock mass, the layered pressure data sheet to prove interlayer is larger, there is water enter the channel is easy to produce a piece of casing damage. It can be seen that the dynamic geological data can be used to analyze and control the casing damage. The pressure difference of various oil layers can be understood by using stratified pressure data, and the injection-production

structure can be used to adjust the work and reduce the pressure difference between layers and planes to control the damage degree of casing damage [2].

**Table 1** Comparison of water absorption profile before and after profile control for a well group

Well	Injection interval	Formation thickness	Sandstone thickness	Effective thickness	Permeability	Adjustable injection (m <sup>3</sup> /d)	After adjusting the relative water absorption
118-108	I	2	1.6				8.8
		3	1.4	1.4	65	17.9	10.78
108-108	II	41	2.2	1.6	55	74.9	54.25
		42	2.0			7.09	26.09

#### 3.2 Data of liquid production profile and water absorption profile

According to the monitored dynamic data, the data of industrial profile and water absorption profile are obtained, and the injection-production contradiction and adjustment effect are analyzed by using the data of the two profiles. The reservoir development of this project is poor, with thin thickness and serious heterogeneity. In the process of water injection development, the thin interlayer cannot be injected. According to the data of water injection profile, increasing profile control can achieve good results. For example, taking a well group 118-108 as an example, after measuring the thickness and effective thickness of the whole well, the thickness is 7.2M and the effective thickness is 3.0M. Water injection is divided into two sections, but the formation is complicated, resulting in the phenomenon of single-layer inrush due to the contradiction between layers. According to the dynamic data, the relative water absorption of the main water absorption layer is confirmed in the water absorption profile data, which is 74.97%. After the same, the water content in the oil well rises. The well group is thin and difficult to subdivide and adjust. Therefore, according to the survey data, profile control was carried out for the whole well, after profile control, the water absorption of the well group was improved, and the water absorption was also increased. After profile control, an additional water-absorbing layer was added, and the thickness of water-absorbing sandstone was increased by 1.6M on the original basis. The water-absorbing capacity of a certain layer in the well was reduced from 74.94% to 54.25%, down 20.69 percentage points on the original basis. After frequency modulation, the well achieved remarkable frequency modulation effect, the daily fluid decreased by about 1t, and the daily oil increased from 6.2t/d to 6.8t/d. The water content decreased significantly and the dynamic liquid level was stable.

### **3.3 Dynamic adjustment of injection well**

According to the data of water absorption profile, the water injection well situation is carried out appropriately. The main purpose of dynamic adjustment in water well is to expand the displacement and range and improve the ability of supplying liquid from poor layer, so as to meet the needs of injection production balance. In oilfield development, it is necessary to conduct dynamic analysis of well group every quarter. For the well group with large underground dynamic change, the specific test results can be achieved by using isotope water absorption profile. Combined with the fluid production profile of oil well and the dynamic data of other oil and water Wells, the strong and weak water layers are distinguished, the reinforcing layer and limiting layer of water Wells are determined, and adjustments are made according to the actual situation [3].

## **4. Application of dynamic monitoring data in dynamic analysis of oilfield development**

### **4.1 Application of low permeability field development**

In current oil exploitation, low permeability oil field is common, which is characterized by high water content and low crude oil production. The main reasons for low oil production are low permeability of oil reservoir, backward surface exploitation facilities, unreasonable distribution of oil and water Wells, etc., which lead to problems in oilfield development. There is a significant pressure difference between reservoir pressure and surface pressure in low permeability oilfield, and the distribution inside reservoir is not uniform, resulting in a large amount of oil produced at each position. Oil and water Wells dynamic monitoring data can provide accurate data for the development of operation personnel, make accurate and comprehensive understanding of this part of the personnel and the actual situation of reservoir, pressure within the reservoir condition is analyzed, at the location of the mining right, improve the development efficiency of low permeable oil fields, development quality, to enhance the overall quality of the oil [4].

#### **4.1.1 Stratified pressure measurement data**

Stratum and well selection in oilfield exploitation has strong reference function. The phenomenon of casing damage of oil well often occurs in the actual exploitation process. The main reason of this phenomenon is that the pores of oil and water Wells are not uniform, which leads to the uneven pressure of the strata and endangers the construction of oil and water Wells. The production of oil well decreases greatly after casing damage. In this case, certain measures must be taken to eliminate or reduce the phenomenon of casing damage. Therefore, according to the actual situation of the oil well, stratification data can be obtained, and dynamic analysis and monitoring of stratification can be carried out to the permeability and stratification pressure of the oil well. Have exact data

selected layer after layer is clear, under the theoretical support to help people finish to choose layer, well, monitoring materials can also analyze the root causes of casing damage problem, after analysis of reasons, find a solution, to improve the quality of oil well drilling is reliable, accurate, thereby improve the quality of oil well drilling.

#### **4.1.2 Water absorption profile, liquid production profile**

Combined with the above cases, there may be a series of problems in reservoir production, including poor reservoir development, insufficient reservoir thickness and heterogeneity. Choose more Wells water injection mode, therefore, to solve the problem of case use water more instant noodles, from two aspects of vertical and plane adjustment effect, analyze the actual situation, paying attention to the data, under the technical support for producing fluid with the parameters of the injection profile, for the well group dynamic change is big, you need to take reasonable treatment, the strength of the analysis of water flooded layer, So that the limiting layer, the strengthening layer can be determined.

#### **4.1.3 Improve the accuracy of oil and water well dynamic monitoring data**

First of all, do a good job in the inspection and maintenance of the equipment. The equipment plays an important role in the dynamic monitoring of Wells. If the equipment has problems and cannot operate normally, it will bring trouble and affect the monitoring data. Therefore, do a good job of checking before the operation of the equipment, check the vulnerable point and the handover position, fundamentally eliminate dirty, messy, poor and other phenomena, ensure the correct use, ensure the service life of the equipment to provide cost for the project construction unit. Secondly, a dynamic monitoring group was established [5]. For dynamic monitoring work to develop smoothly, improve the precision of monitoring data, field engineering unit should establish a monitoring group, to dynamic analysis of team members, improve the comprehensive quality, so can make the dynamic monitoring of oil and water Wells work orderly, strengthen supervision and at the same time, let the monitoring within the monitoring staff to grasp well, promote the orderly conduct of work. Finally, the dynamic monitoring technology of oil and water Wells is constantly updated. Based on the support of modern science and technology, the dynamic monitoring technology of oil and water Wells is constantly updated. Due to the complex situation of oil and water Wells, the existing monitoring technology can monitor downhole communication and pipe channeling, so as to ensure the orderly development of dynamic monitoring work.

## 5. Conclusion

To sum up, the current oil and water well dynamic monitoring technology can provide effective supervision for oilfield development, provide perfect data as a reference, and make oilfield development faster, more efficient and more stable. The dynamic monitoring of oil and water Wells is accurate and scientific. Based on this, it is necessary to use the technology correctly, improve the monitoring technology and equipment, and lay a good foundation for the exploitation of oil and water Wells.

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