Fine Geology Research in Late Stage of Oilfield Development Based on Computer 3d Geological Modeling Technology

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Abstract. According to the previous research and relevant work experience, the working efficiency of oilfield development is gradually reduced with the production time and it is difficult to guarantee the production results in the late stage of oilfield development. At this time, through the use of computer three-dimensional geological modeling technology, the detailed geological study of the oil field will be easier to accurately grasp the distribution of oil field resources, improve the work efficiency in the later stage of oil field development. This paper mainly studies the meaning, concept and the specific method of using 3d geological modeling technology of fine geology research in the late stage of oilfield development, hoping that the reading of this paper can provide some help and inspiration to the researchers in the field of oilfield development.

Keywords: Oilfield Development, Later Period, Fine Geological Study

1. Introduction

Although China is vast and abundant in natural resources and energy reserves, it is undeniable that, as the world's most populous country, China's energy demand is always huge. China has a large number of oil fields under development at present, but due to the late start of China's oil field development and scientific research compared with western developed countries, there is a certain lag behind, resulting in the oil field development process production capacity and economic benefits are not ideal. This situation is more and more obvious in the late stage of oilfield development.

2. Significance of fine geology research in late oilfield development

The significance of fine geologic research work in the late oilfield development can be divided into two main ways. On the one hand, in the late oilfield development, regional geological of oil fields will
witness some change, if the exploitation is carried out in accordance with the previous mining plan, it will cause a decline in work efficiency. At this time, fine geologic research of oil field will do good to master the geology of the regions and the later reasonable adjustment scheme (including stop mining) can ensure economic benefit to a maximization[3]. On the other hand, fine geological research on the oil field in the later development stage will have active effect on the comprehensive utilization of the mining equipment in the later development stage, which can supplement each other in the way of combination to ensure the use effect and service life of the mining equipment and improve the mining efficiency at the same time.

3. Fine geological analysis in the late stage of oilfield development

3.1. Analysis on geological law in the late stage of oilfield development

The exploitation of oil field in our country at present commonly uses the method of water displacing oil. And this way will have high requirement of the amount of underground oil. When the amount of remaining oil is not much, the effect of water displacing oil will drop sharply. Because of previous work, it also will make the whole amount of water in the oil field rise, leading to some geological changes in oil field. At this time, fine geological analysis of the oil field can, on the one hand, can help get a more accurate understanding of the distribution of the remaining oil; on the other hand, it can also help get a better understanding of the actual geological situation of the oil field and choose a more effective mining method[3].

In actual detailed geological analysis, comprehensive analysis will be conducted according to the dynamic change rule of the geological condition of the oil field, and three-dimensional seismic model will be used to obtain the geological condition of the oil field. Moreover, it will be split up for special analyses and researches of different units.

3.2. Dynamic analysis on enhanced oil and water wells

Enhanced oil and water well dynamic analysis can have a very detailed understanding of the geological situation of the oil field. In the process of water displacing oil recovery, if we understand the actual situation of the oil field and the degree of progress and the conduct the dynamic analysis of the mining situation base on this, we can achieve stratified study of the oil field. After stratification, the researchers will analyze the amount and distribution of residual oil in each layer, and then make comprehensive consideration to determine the final mining plan and improve the mining efficiency.

3.3. Reservoir simulation in the late stage of oilfield development

The fine geological research in the late stage of oilfield development is inseparable from the establishment of reservoir simulation model. The separate reservoir model can facilitate the relevant personnel to understand the residual oil situation of the oilfield more intuitively and importantly while the various simulation operations performed by technicians on the reservoir model can facilitate the obtaining of the optimal construction scheme, which can improve the recovery efficiency[3]. The detailed geological analysis of the total late oilfield development is shown in Table 1.
4. Development method under fine geology research in the late stage of oilfield development

4.1. Polymer displacing oil method

As mentioned above, when oil field exploitation is developed in the later stage, the amount of remaining oil reservoir in the oil field decreases significantly and is distributed in the bottom layer. In such a situation, the recovery efficiency of oil recovery by water displacing is already very low. However, once water displacing fails to affect the bottom layer oil and turns it into residual oil due to permeability, the recovery difficulty will be greatly increased. Therefore, for the recovery of residual oil, it is necessary to find a way to replace water flooding. We usually choose polymer flooding. As the name implies, polymer flooding is to replace the traditional use of water flooding. Polymer flooding is actually using the polymer solution for oil displacement, the viscosity of polymer solution has a larger, both ontology viscosity whose inter-facial viscosity and tensile viscosity are better than the effect of the water. Because of it, polymer concentration can make use of the remaining oil viscosity successfully. Moreover, polymer flooding can adjust the water absorption profile to expand the sweep area of the polymer, so the resulting oil is also more pure than the concentration of water flooding oil[4].
However, the cost of polymer flooding is obviously higher than that of water flooding. Therefore, it is not suitable to choose polymer flooding with better effect under any circumstance. Under the condition of sufficient oil in the oil field, we still prefer to choose the way of water flooding.

In order to improve the economic benefits, it is necessary to ensure that the action and sweep area of polymer solution are accurate. Therefore, before polymer flooding, it is necessary to accurately grasp the distribution of residual oil, which reflects the value and necessity of fine geological research in the late stage of oilfield development.

4.2. Actively use new processes

Although the polymer flooding mentioned above has higher efficiency and better effect than water flooding, in theory, water flooding + fine geological analysis + polymer flooding can be applied to many oil fields for exploitation. However, due to the fact that China's oilfield development technology and research theoretical system are not perfect and lag behind the developed countries, there will be a variety of problems in the actual work of oilfield exploitation, which will lead to the low efficiency of the remaining oil exploitation in each step. In the late stage of the exploitation of many oilfields, due to the limitation of exploitation methods, the recovery of the remaining oil will not be worth the cost, which will greatly affect the economic benefits.

And more importantly, due to the different actual situations of oilfield, analysis results gained in the process of mining is a far from what is in reality. Therefore, for any of the fields, the development plan should be done according the real situations. We should choose the right development plan and equipment. What should be mentioned more is that no matter what kind of geological conditions is, the development of the oilfield, especially at the late stage of oilfield development is inseparable from the fine geologic research[6].

Figure 2. Polymer flooding effect
New development process includes enhanced water injection technology, microbial oil recovery technology and so on. The exploration of new technology should also be carried out under relatively mature conditions to avoid accidents and more serious consequences[6]. The total development methods under the fine geology research in the late stage of oilfield development are shown in Table 2.

Table 2. table of development methods under fine geological research in the late stage of oilfield development

| Polymer flooding method | Actively Use New Technology |

5. Conclusion

In a word, oil field development is an important part of China's energy development, which is closely related to the national economy and people's livelihood. We should try every means to improve work efficiency and we should not waste the remaining oil that is difficult to extract in the later stage of oil field development.

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