Scholars Bulletin
(A Multidisciplinary Journal)
An Official Publication of "Scholars Middle East Publishers",
Dubai, United Arab Emirates
Website: http://scholarsbulletin.com/

ISSN 2412-9771 (Print)
ISSN 2412-897X (Online)

Types and distribution of remaining oil in the area of Daqing Oilfield

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Abstract: The long time of exploitation of water injection in Daqing oilfield is now in the high water cut stage, the oil water distribution in the reservoir becomes more and more complex, and its motion law is more and more difficult to predict. The reservoir dynamic analysis and numerical simulation method to study the remaining oil, to maximize the use of existing test and production data, study the high water cut period within the reservoir remaining oil distribution, realize the rule of oil-water movement and accurate pre measured remaining oil distribution characteristics. The results show that there are 5 kinds of distribution types of remaining oil in the study area: 1)The remaining oil of good sand edge scattered; 2)The main good sand sand edge continuous distribution difference of regional distribution difference of reservoir sand body in;3)The difference in sand layer due to the shielding layer form a contiguous distribution of remaining oil;4)The difference of sand sand alone due to imperfect injection production of remaining oil distribution in the contiguous;5)The difference of reservoir sand body alone too imperfect injection production formation of scattered remaining oil. The remaining oil from the vertical upward research area is the following 5 types of distribution:1)Remaining oil in the low permeability layer of the section;2)Remaining oil in the low permeability layer of the high permeability layer in the section;3)Remaining oil in thick layer sand body;4)Sand pinch out area of the remaining oil in the section;5)The remaining oil sand perforation is not perfect.
Keywords: Remaining oil type, remaining oil distribution, northern area of Daqing oilfield.

Geological Survey

Daqing Sabei oil field area is located in the western end of the anticlinal structures in the northern part of Saertu oil field, river delta developed in the study area, belongs to clastic rock reservoir.The white in the system development of Saertu oil layer (s), Putaohua reservoir (P), Gaotaizi reservoir (g) and other three sets of oil reservoir is in overall depression of Songliao basin sedimentary filling formation. Namely, the formation of the late stage of the water cycle of the blue mountain pass group (K_2q) to the Yao family (K_2y) - Nenjiang formation (K_2n) in the early stage of the water cycle, the total thickness of the deposit is about 380m.From 1964 in the 50 years, study of block main Saertu oil layer reservoir, Putaohua reservoir has experienced three big adjustment. At present, there are seven sets of well today in this area has already entered high water cut development stage. Underground oil and water distribution is more complex, the remaining oil difficult to predict.The author uses the method of dynamic analysis, to maximize the use of its own test and production data, using a combination of qualitative and quantitative research methods, on remaining oil distribution was studied, provides a good basis for the development of an oil field [1].

Remaining oil prediction method

There are many methods to study the remaining oil, which can be divided into two categories: direct method and indirect method. Direct method has the core analysis and test method, it can directly determine the status of the remaining oil. Indirect method of seismic, logging, well testing method, geological analysis, tracer method, micro structure, water drive characteristic curve method, material balance method, numerical simulation method, the method is not directly on the remaining oil were measured, but through certain processing, calculation, is derived and the distribution of the remaining oil. In this paper, the author uses the dynamic analysis method in the indirect method to study the remaining oil, which is worth paying special attention to two parties: first is preliminary basic data collection, collation, the obtained information, the unreasonable parts removed, to provide convenience for the subsequent research; second is along the sequence of development time to study the fine geological model, sedimentary facies model, to single injection production well group as a unit, with a single layer as the object, make full use of new data to the analysis and verification of the model, analysis of injection water level and exercise, in order to analysis the accuracy. Specific processes are as follows:

- Data collection and collation. The formation of the stratigraphic division is changed after the perforation data is updatedand the new layer is matched with the perforation data.
- According to the oil well production curve for

effective features. If the liquid production curve shows the liquid producing amount of fluctuation obviously, but of short duration that is affected by some external factors, similar as the pump inspection, fracturing, acidizingif as a result of these factors cause the liquid producing quantity fluctuation, it will not be well the characteristics of effective. When the display produced fluid volume continued to maintain a high level can see produced liquid rate rise, increasing water yield, it may well effective [2].

- Find the corresponding injection production relationship. Look for water injection wells is looking in the range of about near the oil well 400~500m; on the other side and uses the water injection well as the center and then spread to open along the sand body distribution in and around the perforation to find the corresponding relationship between injection and production. Dynamic analysis of remaining oil not only need to study oil wells are corresponding well is what water is to add oil energy, but also to study the history of oil wells and wells around the configuration of that history is what wells once injection into the well, which is water layer and water flooded layer. Only ready for more of a large number of basic data, the remaining oil analysis can effectively develop.
- The injection production relation can be judged by the comparison of the injection production curve. If the injection wells in a certain period of time through a large amount of water, oil well production curve of liquid production has increased significantly. At the same time, the water injection well stop than water injection or reduce water injection, production curve on the oil well liquid production immediately drop, so there is a strong relationship between the water injection well and the oil well, that there is a strong injection of the corresponding relationship between the two. Conversely, water injection wells, production curve show the oil well liquid producing capacity is not subject to the influence of injected water volume, or injection wells reduce water injection or stop than that of water injection and production curve of oil well liquid producing capacity and not because of the injected water reduced, still maintained high liquid, between this kind of oil wells is non injection production relation.If there is a correspondence between the injection of oil and water wells in between the two, you need to refer to other basis to make judgments [3].
- According to the perforation of oil and water wells, the water injection profile and the data to determine the effective layer and water flooded condition.
- Determine the flooding level of the oil well, can be divided into the following 6 types:①Water content in the 0%~20%, for the not flooded;②The moisture content in 20%~40%, for weak water flooding; ③Water content in the 20%~60%, for the medium water;④Water content in 60%~80%, for the medium and strong water;⑤The water content in 80%~90%and for strong water flooding;⑥The water; at a rate above 90%, severe flooding.
- Through the previous research data as well as the corresponding injection production relationship between the oil and water wells, draw the stratified water flooded diagram [4].

Characteristics of sand body development

- There are 33 oil sand bodies in Saertu oil layer, which can be divided into 3 types: river sand body, delta front sand body and delta front sand body. Channel sand body is mainly divided into river sand body, and divided into 2 types of high bending and low bending; the delta front sand body can be subdivided into 3 types through the form. Branch, branch - Tuo transition shape, lump; delta front sand body according to the stability and divided into stable and unstable.
- There are 18 oil sand bodies in the grape flower oil layer, which can be divided into 2 types: (split) channel sand body and delta front sand body. The (split) channel sand body comprises a channel sand body, a high bend flow channel sand body, a low bend flow channel sand body and a small river channel sand body. Channel sand body distribution, large scale, reservoir porosity and permeability are good, too thick reservoir. Permeability at around 500~800mD, sand body distribution area is large in scale and due to sand permeability and continuity of its reservoir sand body is also very good. Narrow, is thick and the storage layer is almost not been pinchout area. High sinuosity distributary channel sand body on a large scale, reservoir, river bifurcation and confluence, banded distribution, large curvature; permeability higher connectivity, low bending distributary channel sand body is narrow, flat and curved strip belt shaped, the main channel sand body boundary show no sharp bends in the place, the overall smooth curvature lower in channel sand body on both sides of the development of sand bodies in the lateral sand body continuity is poor; small channel sand body, a straight microbend strip, narrow strip or intermittent podiform, the main sandstone thickness is

small, permeability is low, but the internal uniform permeability only 2 ~5 times, there is no obvious high permeability layer segment. The poor distribution of the main body of the distribution of sandbodies in the delta front sand body is divided into dendritic branches - tuo transitional type 2 types. Branched delta front sand body continuity is good, the direction of the obvious point, to the north and south direction, the channel sand body is irregular banded sand body and dendritic distribution, the main strip is better, but the main strip edge of thin sand is poor; the branch inch it transitional type delta front sedimentary sand body of water channel sand body is narrow banded distributed discontinuously, river between banded sheet sand, sand body size and thickness is relatively small, continuous phase for branched Delta water channel, sheet sand is connecting together, but in the communication is relatively good.

- Gaotaizi reservoirs in total 27 oil sand body and delta front sand body and delta front sand bodies of two types. Its characteristic and the grape flower corresponding to the type of the storage layer characteristics are similar.

CONCLUSIONS

- Starting from a geological point of view, analysis of the middle district No.6 of apricot of remaining oil forming factors, layer of sand bodies developed in the distributary channel microfacies, distributary upper part of river and channel sand body side of high concentrations of remaining oil reservoir of the mainoil-bearing formation; branched delta front sand body of river channel and remaining oil concentrated in irregular banded part; development of thin sand reservoir layer sand body of reservoir layer is poor, the remaining oil is more enriched, oil wells and water injection production corresponding poor well area part, representing an enrichment of remaining oil.
- Through the central six to apricot and the distribution of remaining oil research, summed up the block of five types of remaining oil distribution: 1. Good sand sand in the corner of the body parts scattered distribution of remaining oil; II good sand sand body of continuously distributed poor distribution of sand bodies in the contiguous poor reservoir; 3 sand due to the formation of interlayer shielding contiguous distribution of remaining oil; cyclophos phamide sand due to sand body alone injection production faultiness of contiguous distribution of remaining oil; the difference of reservoir sand body too lonely injection imperfect form of scattered remaining oil.
- Through the study of apricot six central vertical to the remaining oil distribution, summed up the block of five types of remaining oil distribution: section and residual oil layer of low permeability; section II and in high permeability layer in the low permeability reservoir during the remaining oil; third section and thick sand body in the remaining oil; cesarean section and of sandstone pinchout area of remaining oil; fifth, sand body imperfect perforation remaining oil.

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