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Study on the Reservoir Microscopic Characteristics of the West Part of Beisandong in Sabei Development Area

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Abstract: According to the SA beisandong block s II reservoir sandstone rock thin section, high pressure mercury, scanning electron microscopy (SEM) data test data analysis and fine characterization of the reservoir in the study area reservoir microscopic characteristics. Research shows that the study area s II reservoir multi hole infiltration, permeability change is big, strong homogeneous reservoir, pore connectivity, more small pore throat, suggesting that there were potential velocity sensitivity and alkali sensitivity of reservoir.

Keywords: reservoir evaluation; physical characteristics; pore throat distribution characteristics; reservoir sensitivity.

MICRO PORE STRUCTURE CHARACTERISTICS

Classification of reservoir physical properties (physical characteristics)

Physical properties of the reservoir layer typically include its porosity, permeability, pore structure [1]. Wherein the porosity and permeability are the two basic characteristics of the reservoir, the reservoir is a measure of the quality of reservoir properties of the basic parameters. According to the evaluation standard is the oil industry standard(SY/T6284-1997) . (table 1)

Table 1: Classification of reservoir level (SY/T6284-1997)

Reservoir level	Physical property parameter		Reservoir type
	Porosity (%)	Permeability ($10^{-5}\mu m^2$)	
I	≥30	≥2000	Extra high Kong Te high
II	24- 30	500- 2000	High porosity and high permeability
III	14- 25	50- 500	Middle hole infiltration
IV	10- 15	10- 50	Low porosity and low permeability
V	＜10	＜10	Extra low Kong Te low permeability

Study on the physical properties of S II reservoir with medium porosity and medium permeability. The porosity is generally between 14%-25%。The permeability is generally between 50-$500\times10^{-5}m^2$. There is a positive correlation between porosity and permeability, porosity is increased with the increase of permeability.

According to the industry standard storage of reservoir physical property evaluation and B2-322-E81 wells of porosity pooled data of the wells B2-322-E81 and maximum porosity was 31.9%, minimum was 18.3%, porosity from 25% to 30% in section and a large part in more than 30% of the period, a small part in 15% - 25%, indicating that the well layer for high porosity and high permeability layer, a small part of hole infiltration. B2-322-E81 wells of the porosity summary data, maximum permeability value is 5591 x 10-5 g m2, minimum value of 2.15 x 10-5 g m2, permeability is mainly concentrated in 500-2000 x 10-5 g m2, and porosity in 25% - 30% of the corresponding segment, with description of the well layer as a layer of high porosity and high permeability reservoir. But it needs to be explained that the reservoir physical properties of B2-322-E81 well is much better than that of the two types of reservoirs, which does not have the

universal significance and the representative of the study area.

Distribution characteristics of pore throat in reservoir

The pore throat distribution characteristics of sandstone are the size and distribution of the internal pore and the roar of the sandstone [2]. These parameters not only indicate the physical property of the reservoir, but also make the basis for the selection of each configuration in the drilling and completion process. Pressure mercury method carries on the analysis to the capillary pressure, so that we can get the five parameters of pore throat characteristics, respectively, displacement pressure, medium pressure, median radius, sorting coefficient, crooked degree. Analysis of the pressure mercury data of S wells in the study area B2-322-E81 II reservoir displacement pressure is low, the distribution interval is 0.069-0.27MPa, with an average of 0.041MPa, which shows that the maximum throat radius of the reservoir is very large, and the permeability is very good. Median pressure distribution between the 0.065-0.539MPa average 0.1486MPa and median pressure is small; the median radius distribution in the 2.319-11.429 m, average 8.4181 m, throat and micro throat, throat road second, throat distribution range is narrow and uniform description reservoir permeability high, permeability changes and storage layer heterogeneity is strong. The separation coefficient ranged from 2.669-4.386 to, with an average of 3.18, the sorting range was very poor, the pore throat size sorting was poor, and the capillary pressure curve. Well B2-322-E81 skewness ranged between 0.544-0.828, with an average of 0.73, indicating partial distribution of pore throat type pore throat, fine pore throat is more. The characteristic parameters of pore throat of 10 samples of B2-322-E81 well just as table 2.

Table 2: B2-322-E81 Well 10 Sample pore throat characteristic parameter list

Well	Median pore radius	Sorting coefficient	skewness	Median saturation pressure	Displacement pressure
B2-322-E81	1.418	4.386	0.544	0.539	0.069
B2-322-E81	10.96	3.198	0.828	0.066	0.034
B2-322-E81	11.429	2.669	0.725	0.065	0.027
B2-322-E81	11.182	2.759	0.805	0.065	0.034
B2-322-E81	2.319	3.573	0.571	0.329	0.069
B2-322-E81	10.083	3.308	0.794	0.074	0.034
B2-322-E81	13.11	2.729	0.774	0.057	0.027
B2-322-E81	6.554	3.151	0.742	0.112	0.048
B2-322-E81	10.489	2.893	0.788	0.069	0.034
B2-322-E81	6.637	3.134	0.725	0.11	0.034
average value	8.4181	3.18	0.7296	0.1486	0.041

DISTRIBUTION CHARACTERISTICS AND SENSITIVITY EVALUATION OF RESERVOIR CLAY

Reservoir sensitivity refers to the phenomenon that the clay minerals in the reservoir can be expanded, the particles move or precipitate and then plugs the pores to reduce the permeability [3], when the reservoir is in contact with the external fluid. The clay minerals of the reservoir damage is very serious, should pay attention to [4].

The type of clay mineral is different, and the damage caused by oil and gas layer is also different. Oil and gas reservoir in the presence of clay mineral types are common: montmorillonite, illite, kaolinite, chlorite, illite / smectite layer, a green / smectite six, they and reaction of fluid and reservoir caused by reservoir sensitivity also has difference.

1. Illite is the most common clay mineral in sandstone. The potential impact of illite on the reservoir is divided into two types according to the origin of illite: 1) fibrous and hairy illite in the gap of the alternate distribution of the formation of a large number of honeycomb microporous the original intergranular pore space into a large number of micro pores, the fluid in the pore flow channel more twists and turns, reducing the permeability. 2) In the case of high flow velocity, the fibrous and the hair like illite are easily fragment, and the pore throat channel is blocked with fluid migration. So illite is mainly the quick sensitivity factor. The content of illite in reservoir is relatively low, and the average relative content is (14.14%). So the potential damage of the reservoir is not high.

2. Illite / smectite mixed clay minerals is the most common type. In general, illite / smectite illite and montmorillonite have the problem of reservoir sensitivity. It has a strong expansion rate and cation exchange capacity, easy to adsorb a large number of polar water molecules, which lead to the volume expansion of clay minerals, thereby blocking the throat, the destruction of the reservoir. The study area of illite / smectite average relative content of 21.35%. There is low potential water sensitivity in the reservoir.

3. Chlorite is acid sensitive minerals. This reservoir of chlorite mainly in needle leaf like structures filling in granular pores. Chlorite is sensitive to hydrochloric acid and oxygen system. Acid treatment of the reservoir, chlorite can easily be dissolved in hydrochloric acid and iron release. When the acid is exhausted, the formation of ferric hydroxide colloid precipitation and ferric hydroxide particle size larger, it is easy to plug pore throat, cause damage to the reservoir [5]. The study area relative content of chlorite was low; the average relative content is 18.61%, only higher than that of illite. Green mud stone is not high degree of latent acid sensitivity damage.

4. The potential effect of Kaolinite on the formation of the reservoir is due to the poor adhesion of the kaolinite aggregate to the debris particles, and the bonding strength between the chips is weak [6]. Therefore, under the action of shear stress of the fluid with high flow velocity, kaolinite is easily beaten to pieces, which will be migrated with fluid in the pores. The existence of kaolinite is one of potential quick sensitivity factors. In addition, kaolinite and alkaline fluid cation exchange, silicate dissolution and precipitation, causing reservoir damage. Therefore, kaolinite is one of the potential alkali sensitive factors in the reservoir. The kaolinite content in this area is higher. The average relative content of kaolinite was 62.55%. Therefore, it is inferred that there are potential velocity sensitivity and alkali sensitivity in the reservoir.

CONCLUSIONS

S II reservoir of multi hole infiltration and porosity in general between the 14%-25% and permeability distribution in 50-500 * 10-5m2, porosity and permeability is positively related to the relationship between, that is, the porosity increases with the increase of permeability.

According to the mercury injection data, the permeability of S II oil layer in the study area is high, and the variation of permeability parameter is large, and the reservoir heterogeneity is strong.

By studying the average relative content of the six kinds of clay minerals, the aim of the study area was to have the potential of quick sensitivity and alkali sensitivity.

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