# Study on sedimentary facies of Niu 74 block

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**Abstract:** Through the study of Niu 74 block, are established in the research area of fan delta sedimentary model, the target layer mainly developed the fan delta plain subfacies and fan delta front.And the sedimentary facies control reservoir physical property and oil-gas-bearing possibility was studied. The results show that it is obviously controlled by sedimentary facies, and sand body of distributary channel are thickness, good physical properties and high oil saturation; sand body of distributary interchannel are thin, poor physical property and low oil saturation.

**Keywords:** *Sedimentary facies; Stratigraphic division*；*Fan delta*

## I.    REGIONAL GEOLOGICAL SURVEY

Niu 74 block is located in Liaozhong City, Liaoning Province, relatively flat terrain, agriculture developed. The region belong to the north temperate zone, is semi humid, semi-arid monsoon climate. The highway traffic is convenient, the block is 60 kilometers away from Shenyang City, 30 kilometers away from Liaoyang city[1,2]. The block is tectonically located at the eastern depression of Liaohe rift , central of Niuju Qinglongtai tectonic belt ,it's north is Niuju oilfield, South is Qinglongtai oilfield, structural area are 15 square kilometers, the main oil layer is the Sha 2 section($E_s^2$). Detailed stratigraphic division is shown in table 1.

Table 1    Niu 74 wellblock layered table

| member | sub-member | reservoir group | sandstone series | small layers |
|---|---|---|---|---|
| $E_s^2$ | the middle part of $E_s^2$ | first | I | I-1 |
| | | | | I-2 |
| | | | II | II-1 |
| | | | | II-2 |
| | the upper part of $E_s^2$ | second | III | III-1 |
| | | | | III-2 |
| | | | | III-3 |
| | | | IV | IV-1 |
| | | | | IV-2 |
| | | | | IV-3 |
| | | | V | V-1 |
| | | | | V-2 |
| | the lower part of $E_s^2$ | third | VI | VI-1 |
| | | | | VI-2 |
| | | | VII | VII-1 |
| | | | | VII-2 |
| | | | | VII-3 |

## II.    STRATIGRAPHIC DIVISION

According to the stratigraphic classification and correlation methods [3-5], through the analysis of drilling, logging, well logging data, combined with the high precision 3-D seismic data,and use sedimentology, sequence stratigraphy, reservoir geology, logging geology theory as the instruction, the target layer of Sha 2 section in the study area was subdivided into three reservoir group , seven sandstone series and 17 small layers.

## III.    SEDIMENTARY FACIES ANALYSIS

Based on the specific sedimentary background, and a large number of geological, logging,well logging and seismic data, according to the research work, combined with previous research results, we establish a fan delta depositional model[6,7](Fig.1). The research area is divided into three phases: fan delta plain subfacies, fan delta front subfacies and pro-fan delta subfacies. The fan delta plain subfacies between distributary channel microfacies, back swamp microfacies; fan delta front subfacies developed underwater distributary channel microfacies, underwater distributary interchannel microfacies, river mouth bar microfacies, frontal sheet sand microfacies; pro-fan delta subfacies developed pro-fan delta microfacies.
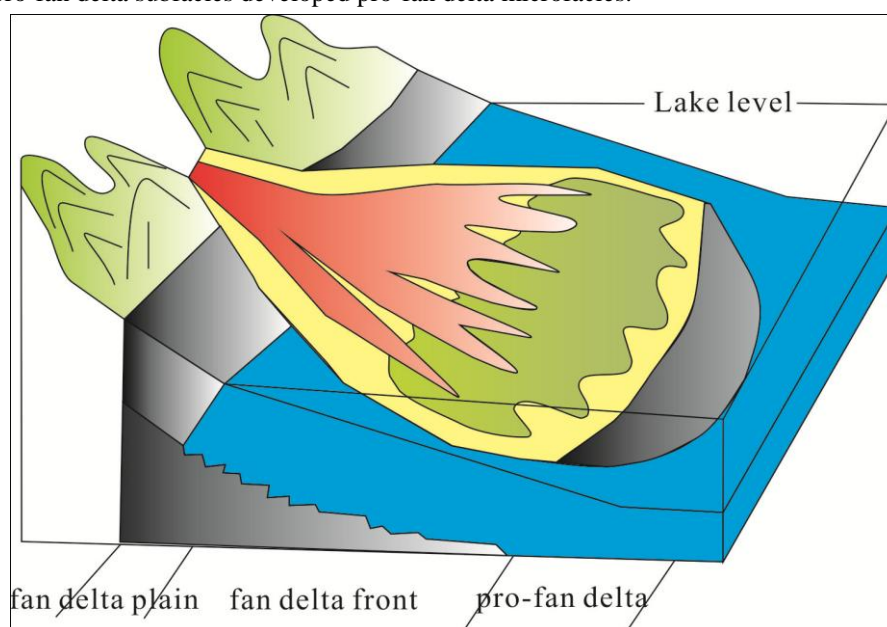


Fig.1 The sedimentary facies model

The sand source of sediment in the study area are derived mainly from the northeast, Niu 74 block in Sha 2 section mainly developed fan delta front, the specific sedimentary microfacies are underwater distributary channel microfacies, underwater distributary interchannel microfacies, back swamp microfacies, frontal sheet sand microfacies and river mouth bar microfacies. The provenance from the north and    north east direction, the main distributary channel is NE-SW trending, main channel development of grey pebbly sandstone, fine sandstone. The channel in each period with different development degree. From the VII-3 layer mainly development of underwater distributary channel microfacies , upward channel gradually atrophic, narrow, the number of branches of the channel has gradually increased. To the IV layer, then the underwater distributary interchannel sedimentary microfacies development of a large area. In subsequent deposition period, the channel gradually developed, the dominant, the water body becomes shallow gradually, sand body sedimentary promote, to the I layer deposition period, channel sand body development of a large area.

Throughout the development of sand bodies in Sha 2 section of Niu 74, the characteristics of sedimentary facies and microfacies types,it can be seen that, the Sha 2 section of the study area experienced the

evolution of water from shallow to deep, and then by the evolution process of deep to shallow, and the sand body is also showing the development –no development -  development.

### IV.  THE CONTROL ACTION OF SEDIMENTARY FACIES TO RESERVOIR PHYSICAL PROPERTY AND OIL-GAS-BEARING POSSIBILITY

We have 42 wells and 592 physical property data show that sedimentary microfacies of Sha 2 section control of reservoir physical property has obvious effect. By Fig.2 and Fig.3, from underwater distributary channel sand body to former fan delta, reservoir porosity and permeability gradually reduced. Underwater distributary channel microfacies has high porosity and permeability respectively are 8.01% and 8.08 mD, porosity and permeability of channel mouth bar is a bit poor are 7.73% and 3.29 mD, porosity of the underwater distributary channel and frontal sheet sand are less than 7%, also obvious lower permeability, were 7.87 mD and3.61 mD , according to the Petroleum and natural gas industry standard, belongs to low porosity and low permeability reservoir.
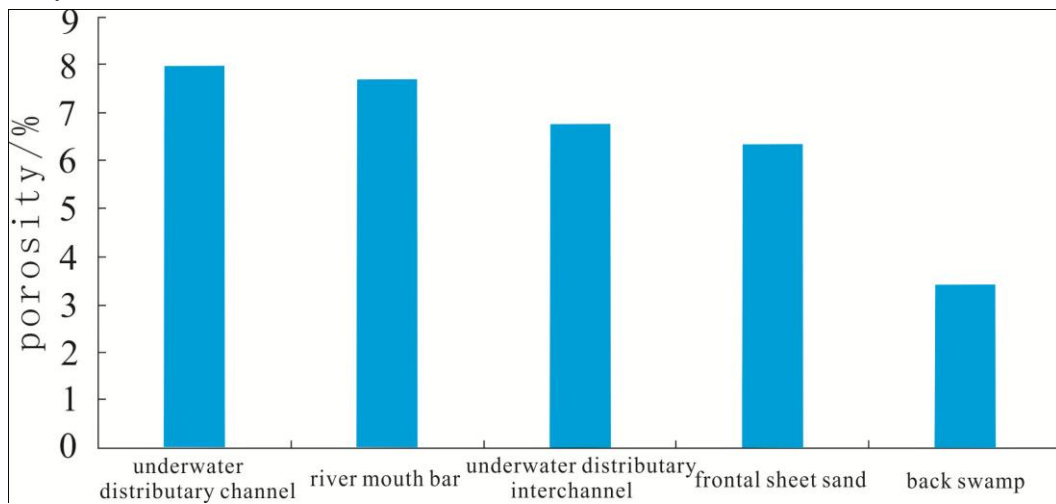


Fig.2    The relationship between porosity and sedimentary microfacies
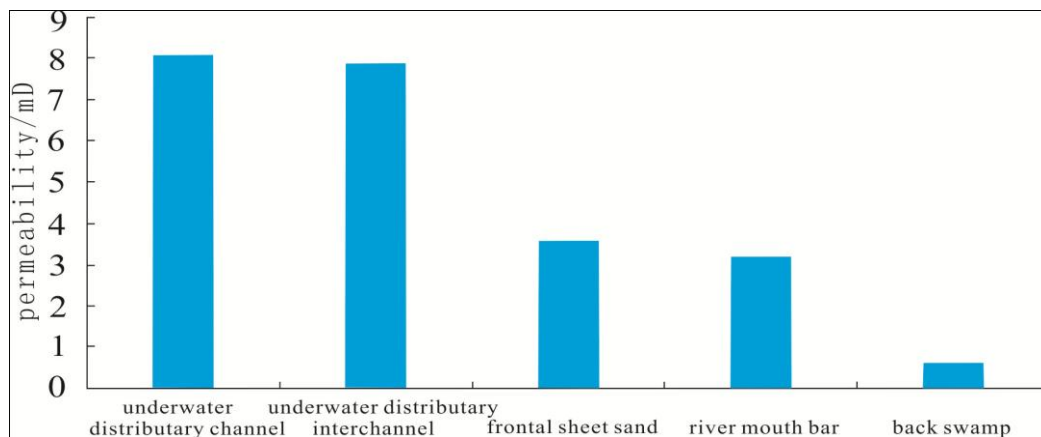


Fig.3    The relationship between permeability and sedimentary microfacies

Not only to the physical property of reservoir sedimentary facies have obvious control effect, but also has some influence on oil-gas-bearing possibility. There are 222 groups of test data form 24 wells shows that (Fig.4), reservoir in underwater distributary channel, frontal sheet sand, underwater distributary interchannel and channel mouth bars with the proportion of 86.1%, 6.5%, 6.1% and 1.3% respectively. Most reservoir distribution in the underwater distributary channel microfacies.
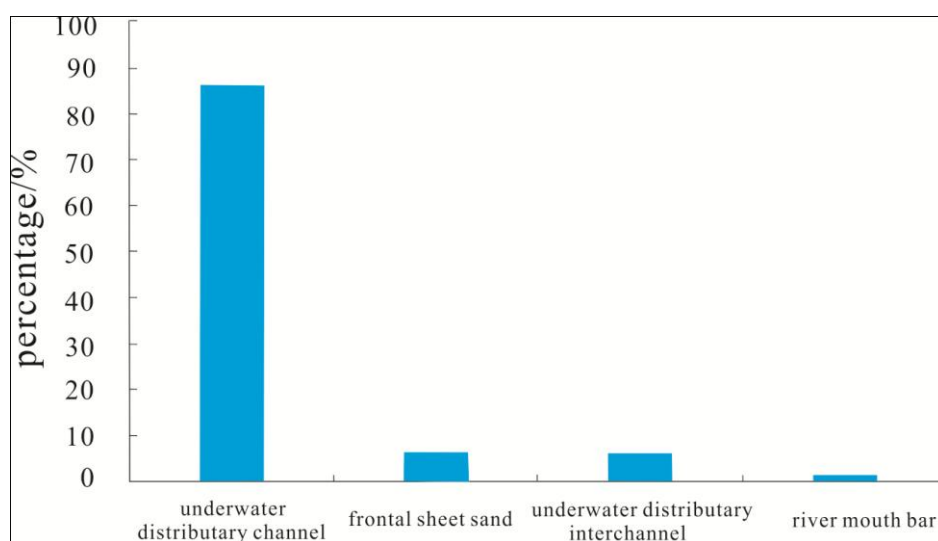
Fig.4 The relationship between capability of bearing oil and gas and sedimentary microfacies

## V.    CONCLUSION

(1) Sha 2 section can be divided into three reservoir group, seven sandstone series, and 17 small layers.

(2) Niu 74 block development fan delta sedimentary, Sha 2 section can divided into two phases:fan delta plain subfacies and fan delta front subfacies, and mainly developed fan delta front.

(3) The reservoir physical property and oil-gas-bearing possibility are obviously controlled by sedimentary facies, and sand body of distributary channel is thickness, good physical properties and high oil saturation; sand body of distributary interchannel is thin, poor physical property and low oil saturation.

## REFERENCES

[1]    Li Guoyu, Lv Minggang．China's oil and gas basin atlas [M]．Petroleum Industry Press，2002．

[2]    Duan Yongxu. Condition analysis of hydrocarbon accumulation in Niu 74[J]．West-china Exploration Engineering，2008，9：65-66．

[3]    Huan Xi Ling oilfield Huan 17 pieces of xinglong station reservoir fine reservoir research [J]. 1988，7(4)：25-31．

[4]    Zhao Hanqin. Formation correlation of fluvial-deltaic deposition in daqing oil fied[J]. Petroleum Geology & Oilfield Development in Daqing．1988，7(4)：25-31．

[5]    Shanley K W，McCabe P J．Perspective on the sequence stratigraphy of continental strata [J]．AAPG Bulletin．1994，78(4)：544-568．

[6]    Xue Liangqing，Galloway W E. Fan-delta, braid delta and the classication of delta systems[J]．Acta Geologica Sinica．1991，2：142-150．

[7]    Xue Shuhao, Liu Wenlin, Xue Liangqing．Lake basin sedimentary geology and oil and gas exploration[M]．Petroleum Industry Press，2002．