The study on sedimentary microfacies distribution rule of Putaohua oil layer at East area ,Pubei oil field

Weijian Cao[1], Yunfeng Zhang[1], Liang Wang[2], Ye Xu[3]

[1](College of Earth Sciences, Northeast Petroleum University, Daqing, Heilongjiang 163318, China)
[2](Logging and Testing Services Company of Daqing Oilfield, Daqing, Heilongjiang 163414, China)
[3](Logging and Testing Services Company of Daqing Oilfield, Daqing, Heilongjiang 163414, China)

Abstract: - Pubei oilfield is located in the south of Daqing Placanticle large rivers in deltasedimentary system Using the principle of high-resolution sequence stratigraphy, isochronous stratigraphic frame work is established. 11 small layers in 472wells,26 sedimentary time units in the study area has been fined and unified, repeatedly omparisoned as a wholeUsing the data of core and well log curve data on the basis of the isochronous stratigraphic frame work, sedimentary evolution history in the study area,and the analysis of Putaohua reservoir in the coring interval of single well core's sedimentary microfacies,we established six well logging facies models, including main underwater distributary channel, underwater distributary channel, edge of underwater distributary channel, main sand sheet,sand sheet and bay mud between distributary channels. We also draw the sedimentary time unit of sedimentary microfacies. Byanalyzing the initial productivity and oil production testing data in the study area,we make an anatomy of the reservoir on the whole region.

Keywords: - *sedimentary microfacies,Characteristic,Pubei oilfield*

I. THE REGIONAL GEOLOGICAL SURVEY

Portugal's north oil field is located in the northern Songliao basin, the south of Daqing Changyuan, north latitude 45°- 46°, east longitude 124°30 '- 124°45'. Pubei oilfield belongs to large rivers - delta deposit system, main reservoir is located in Yaojia a combination of a gray powder sandstone and celadon silty mudstone in PI group.

Portugal's north oil field as a whole is in the south of Daqing Changyuan delta front sedimentary facies belt. The tectonic area is large, gentle inclination, dome shaped; Tectonic zone fault for east-west, north and south to fault coexist, is "the hard - base" in section combination model. Portugal north oil field mainly anticline reservoir, sand body distribution trend of article from north to south in the belt or intermittent zonal distribution, the average thickness of sand body in 0.8 m or so, for the combination of the celadon sandy mudstone reservoir.

II. THE SEDIMENTARY FACIES TYPES AND CHARACTERISTICS AND LOGGING MICROFACIES MODEL

2.1 The sedimentary facies types and characteristics

Generally conventional planar sedimentary microfacies research includes:statistics on a single well in every layer of strata thickness, sandstone thickness and sand ratio and other data.Considering the well logging curve of each paragraph,with well points as control points, drew the contour map in the work area,and analysis and in the plane distribution of sand body condition and the sedimentary microfacies distribution determine the work area[1].

But there are few develop wells in the east regions.Precision is not enough when we research the distribution of sedimentray microfacies only by the well information .In view of the above situation,on the basis of dense well pattern fine anatomy in the development area,use the way of combination with well shock,study the area with the Comprehensive logging, core data and stratigraphic section of the sedimentary microfacies .In the study ,by phase conversion technology , generate 90 °phase conversion data volume .On the basis of improving resolution,generated Three seismic work area of the stratigraphic section:Pubei,Pu 47 and Tai 30.It has been verified by comparing that slice images with sand body alignment is higher in the time unit of PI5~PI6, and it has a certain reference value [2].Depend on the reference strata slicing ,we can depict sand body distribution rule,and through the thickness of sand body and each unit layer of logging curve characteristics to identify each facies types of the well,map the of sedimentary microfacies of the study area(Fig.1).
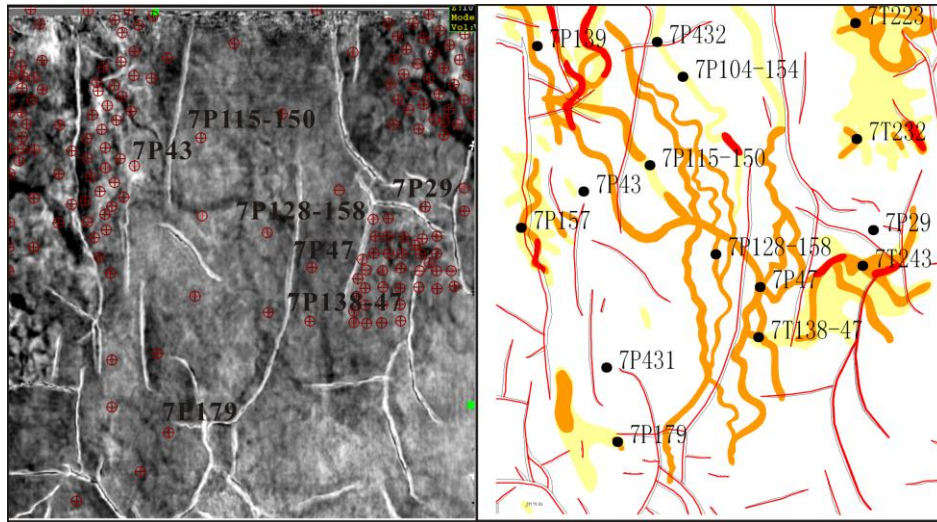
Fig.1 Strata slicing and sedimentary microfacies comparative verification

2.2. Logging microfacies model

Because there are too many wells in the syudy area,and most of wells have no cores,so we use the logging data in the small plane sedimentary facies study.Therefore establishing logging microfacies model is particularly important .

Tab 1 Putaohua reservoir PI group subdivided sedimentary microfacies of sedimentary units

The sedimentary facies			Sedimentary unit	Distribution characteristics of sand body	Forming background
Phase	Subdivided phase	Microfacies types			
Outside the front	Lake into outside the front	The main sand sheet; Non the main sand sheet; lenticular sand.	1_1 1_2 5_3	With thin sand layer and into distribution.	Delta die period is long,the development of the lake facies sediments is good
Transition phase	Lake into transition phase	the distributary shallow river;The main sand sheet; Non the main sand sheet; lenticular sand	2_1 2_2 2_3 3_1 3_2	Sand bodies are intermittent zonal distribution	The lake is variable deeper,lake wave action becomes strengthen
Inside of the front	Lake into inside of the front	underwater distributary channel main body;the distributary shallow river;Distributary shoal;Split between the lenticular sand.	4_1 4_2 5_1 5_2	Sand bodies are intermittent zonal distribution	The lake is deeper,the effect of jet flow is weak
waiqianyuan	Stable inside of the front	underwater distributary channel main body;the distributary shallow river;Distributary shoal;Split between the lenticular sand.	6_1 6_2 71 7_2	Sand bodies are intermittent zonal distribution	Provenance supply abundant,the various conditions are stable
	Lake retreat inside of the front	underwater distributary channel main body;the distributary shallow river;Distributary shoal;Split between the lenticular sand.	8_1 8_2 9_1 9_2	Sand bodies are intermittent zonal distribution,compound sand is main body	The effect of jet flow is strong
Transition phase	Lake retreat transition phase	underwater distributary channel main body;The main sand sheet; Non the main sand sheet;	10_1 10_2	Sand bodies are intermittent zonal distribution	The effect of jet flow is strong;the effect of lake wave is weaker
Outside the front	Lake retreat outside the front	The main sand sheet; Non the main sand sheet; lenticular sand	10_3 11_1 11_2 11_3	The sand body is thick and stable, continuous distribution in the plane	Lake retreat background

In the coring interval single-well sedimentary microfacies based on detailed analysis,we use layer corresponds to the selected with the well logging curve characteristics summarizes the microfacies characteristic factors of log facies.And through the same microfacies characteristics of multiple well log facies ,summarize the factors of log facies characteristics of microfacies in common[3].Thus we can establish the microfacies model of logging microfacies(tab 1).

III.   SEDIMENTARY MICROFACIES DISTRIBUTION RULE OF DEVELOPMENT ZONE

According to the research area of sediment grain size analysis, core observation and well logging curve, lithology, granularity, and sand body distribution,we dissect P128 and Tai232 blocks ,summarize the development zone of the distribution characteristics of sand body in the plane.PI oil reservoir of Pubei north oilfield is an underwater delta front deposition.It iss stable after a decline under the background of in the lake, the lake, the lake formed under the background of the sedimentary environment of rising , and has many classes depositional cycle[4].

Outside the front layer thickness of thin sand body, and a stable, large continuous distribution on plane, the main development main body is sand sheet,non sand sheet and the subjects are widely distributed in PI1, PI53, PI103 ~ PI113 time unit[5];Transitional facies sand body is intermittent article sheet strip and unstable, poor connectivity, continuity, main development shallow underwater distributary channel, sand sheet, the subject of sand sheet, and widely distributes in PI21 ~ PI32 and PI101 ~ PI103 time unit ;Within the frontal sand body thickness is larger, a discontinuous ribbon, roughly north-south distribution, main mainly develops distributary main channel, underwater distributary shallow river sand sheet and subject, widely distributed in PI41 ~ PI92 time unit(flag 2).
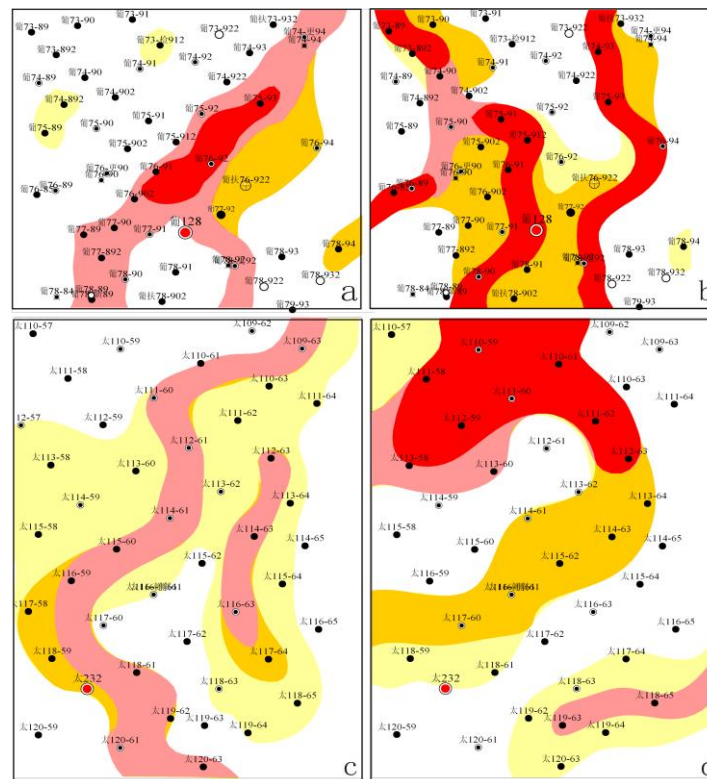
Flag 2 Sedimentary microfacies of Pubei oilfield development zone in the east

IV.   CONCLUSION

PI oil reservoir of Pubei north oilfield is an underwater delta front deposition.It iss stable after a decline under the background of in the lake, the lake, the lake formed under the background of the sedimentary environment of rising , and has many classes depositional cycle.According to the regional sedimentary data and core observation and large amounts of log data ,recognize the microfacies types of putaohua oil layer development have 5 kinds:underwater distributary channel main body, the distributary shallow river,the main sand sheet,non main sand sheet ,Split between the mud.On the basis of lithology, electrical, physical property, oiliness research results, it is concluded that the distributary channel sand body, the main reservoir for this area.

REFERENCES

[1] Samuel O K J，Cornford C，Jones M，et al. Improved understanding of the petroleum systems of the Niger Delta Basin，Nigeria[J]. Organic Geochemistry，2009，40(4): 461-483.

[2] Camassa R，Holm D D，Levermore C D. Long-time effects of bottom topography in shallow water [J]. Physica D: Nonlinear Phenomena，1996，98(2): 258-286.

[3] Kinnon E C P，Golding S D，Boreham C J，et al. Stable isotope and water quality analysis of coal bed methane production waters and gases from the Bowen Basin，Australia[J]. International Journal of Coal Geology，2010，82(3): 219-231.

[4] Lang J，Winsemann J，Steinmetz D，et al. The Pleistocene of Schöningen，Germany: a complex tunnel valley fill revealed from 3D subsurface modelling and shear wave seismics[J]. Quaternary Science Reviews，2012，39: 86-105.

[5] Pichler T，Veizer J. The precipitation of aragonite from shallow-water hydrothermal fluids in a coral reef，Tutum Bay，Ambitle Island，Papua New Guinea[J]. Chemical Geology，2004，207(1): 31-45.