IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 05, Issue 06 (June. 2015), ||V2|| PP 42-46

The Application Of Geological Model In The Region Of Xinli Oilfield VI

Qingguo Zhang[1], Jiayu Zhou[1], Qifan Yi[1], Shiyue Wang[2], Zitong Li[1]

1. *Northeast Petroleum University, Daqing, Heilongjiang, China, 163318*
2. *CNOOC Ltd.- Zhanjing, Zhanjiang, Guangdong, China, 524057*

Abstract: -The reservoir geological model is an important part of reservoir description, which has a particularly important role to guide exploration and development of oil and gas. This article takes full advantage of the data of seismic, drilling, logging to establish Xinli Oilfield VI region's structural model and facies model by Petrel software, then using the method of Sequential Gaussian Simulation to establish the model of attribute (porosity, saturation) under the facies model's constrain, these models can provide a strong geological reference to predict the distribution of remaining oil and adjust the remaining oil development plan.

Keywords: *- geological model, structural model, facies model, attribute model*

I. INTRODUCTION

The region of Xinli Oilfield VI is located in the western part of Fuyu production plant of Jilin oilfield, whose reservoir belongs to a low permeability reservoir of structure and lithology, and the average saturation is $11.05\times10^{-3}\ \mu m^2$, the average porosity is 14.4%. The original formation pressure is 12.2 MPa, saturated pressure is 9.6 MPa. The development purpose layer is the Fuyu and Yangdachengzi reservoir, which locates the Quantou Formation's top of Lower Cretaceous. The reservoir is mainly consisted of fine sand, which belongs to the river delta sedimentary system. The reservoir of Fu Yang is vertically divided into nine Sandstone groups, which includes 26 small layers, and the main oil layer is 8, 14 and 16, the average depth of these layers is 1277.2 m.

II. BASIC DATA SORT

It is the first and most crucial step for modeling to sort out its various kinds of data. Only if these conditions, the rationality and integrity of data, are fulfilled and guaranteed can the subsequent geological modeling be correct. For the geological modeling of this region, I mainly sort the following data: the location coordinates of wells, the deviation data of wells, the well logging curves interpretation and results, the tops data of every well, the polygons of fault plane and sedimentary facies, etc. According the corresponding formats of software to load and modify these data.

Ⅲ. STRUCTURE MODEL

Structure model is a core part of the geological model, which mainly reflects the reservoir space lattice and accurately describes the detailed structural characteristics. In Petrel, structure model consists of fault model and layer model, and the fault model is the basic framework of the 3D space, together with the layer model built by the precise geological top data, composed the basic structure model.

3.1 Fault model

The grid size of this model scale is (20 m×20 m×0.5 m), there are nine faults in this work area, whose relationship of cut is relatively simple, so the fault stick consisting of three points pillar are created by the polygons on the three surfacies, then according to development of the region's fault, structural map and the associated seismic interpretation data to adjust faults as soon as possible to achieve the plane of fault fully consistent with the breakpoint's location of drilling well[1]. We can contrastively find that characteristics of every fault including angle and tendency almost are same between the fault model in petrel software and the 3D view of faults' interpretation in discovery software (Figure 1).

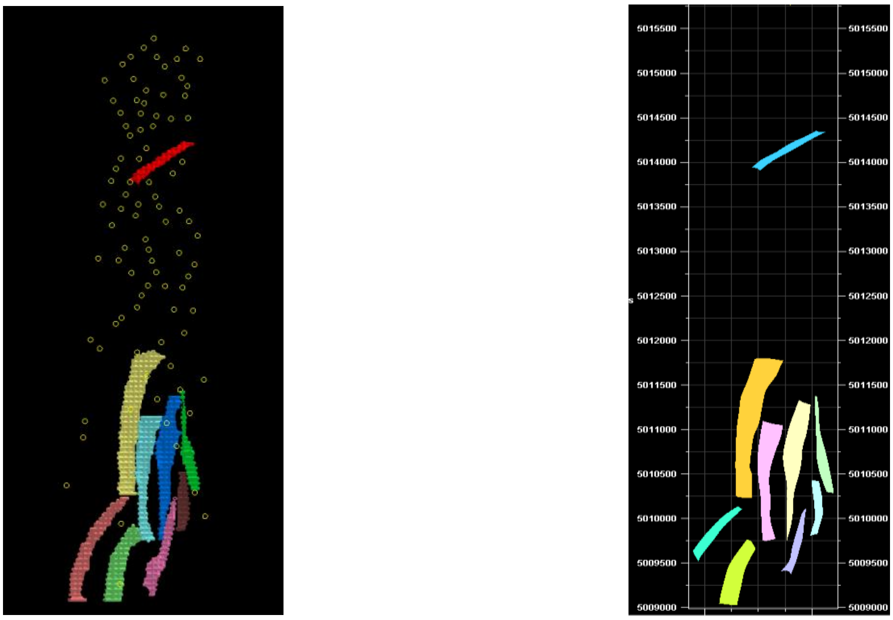

Figure1 the comparison map between fault model in petrel and 3D view fault in discovery

3.2 layer model

We mainly use drilling well tops data, combined with the geological understanding of this region, to creat the model of layer by mathematical interpolation, then all layers' model are stacked as the reservoir basic spatial framework. Because the number of well on the bottom of this work area is few, we adopt overall structural trend to fulfill its bottom 3D structural shape.

Ⅳ. SEDIMENTARY FACIES MODEL

Through the analysis of the regional sedimentary characteristics and the research of core's data, I define the classification of sedimentary facies that Fuyu reservoir's facies is delta and the Yangdachengzi reservoir's facies is meandering river, then the delta is divided into delta plain and delta front and the meandering river is divided into alluvial flat , embankment and riverbed according to the layer ,on the premise of five kinds of subfacies they are divided again into 14 kinds of microfacies, in order to satisfy the requirement of the secondary development of oilfield, specific see table 1.

The model of reservoir's sedimentary facie is the distribution of different subfacies's types internally, which can quantitatively describe the type and shape of sand. There are two methods of facies model commonly, the first method is that draw polygons of every facies' border outside, the other method is that digital facies' picture inside, finally to ensure that every polygon is closed by editing and modifying[2]. The first approach is used in this facies' model, at first, every microfacies is given a different value in the facies of software module, then every microfacies separately generates surface, the following is that all surfacies are unified to a same surface by calculations of software module, at last I take advantage of the method of stochastic simulation to creat microfacies' picture of every layer by the assign values of software module, figure 2-a and figure 2-b are the facies' picture of the first and fifteenth layer.

facies	layer	subfacies	microfacies
delta	F4 - F14	delta plain	distributary channel
			crevasse splay
			interchannel thin sand layer
			distributary interchannel
	F1 - F3	delta front	underwater distributary channel
			underwater crevasse spray
			transportation of sand
			subsea river
			sheet sand
meandering river	Y15- Y26	river flood	alluvial flat
			abandoned channel
		embankment	crevasse splay
			marginal bank
		riverbed	bottom stranded deposition

Table1 The sedimentary facies division of Xinli Oilfield VI

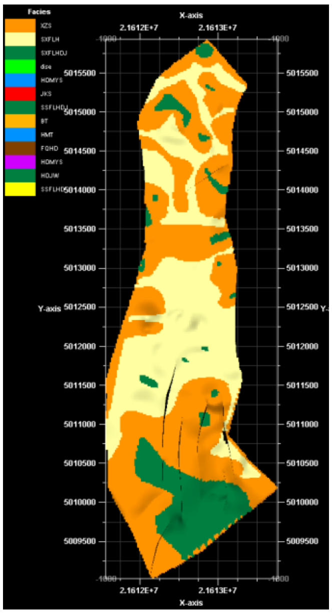

Fig2-a The first lay's facies' picture

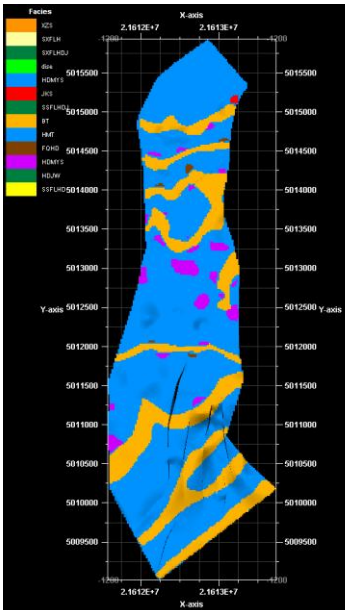

Fig2-b The fifteenth lay's facies' picture

V. ATTRIBUTE MODEL

Attribute model mainly reflects the distribution and variation of reservoir's property parameters in different microfacies, which is an interpolation process among wells' 3D grid by stochastic modeling. In the different types of sedimentary microfacies, we need count their internal attribute, whose statistics result must be in accord with normal distribution[3].

At first, we must coarsen and discrete attributive parameters of every well loging in the software module-scale up well logs, then we need to analyze the parameters of reservoir in the software module-data analysis, the most important part of this step is how to choose the variogram, which demands us to have a comprehensive understanding to this region. I choose input truncation method and normal score method for this simulation of parameter and Spherical model for this variogram. Variation reflects the space's relativity of reservoir parameters, we determine the primary, secondary direction and variable range depends on the development direction, width, extended length of river and vertical sedimentary unit thickness, space between wells, then according to the specific details of the work area, these relevant parameters of variogram are ensured, the fig 3 reflects the final result of adjustment. Finally, we adopt the sequential gauss method to simulate these parameters of reservoir by using data analyzed on the front step, and establish all layers' pictures of porosity and permeability, fig 4 for the first layer's attribute model.

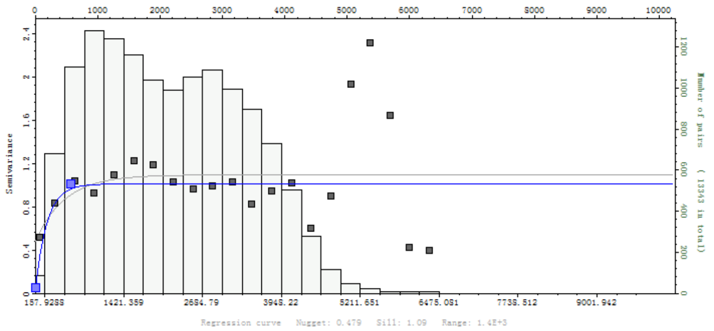

Fig3 The schematic diagram of variogram

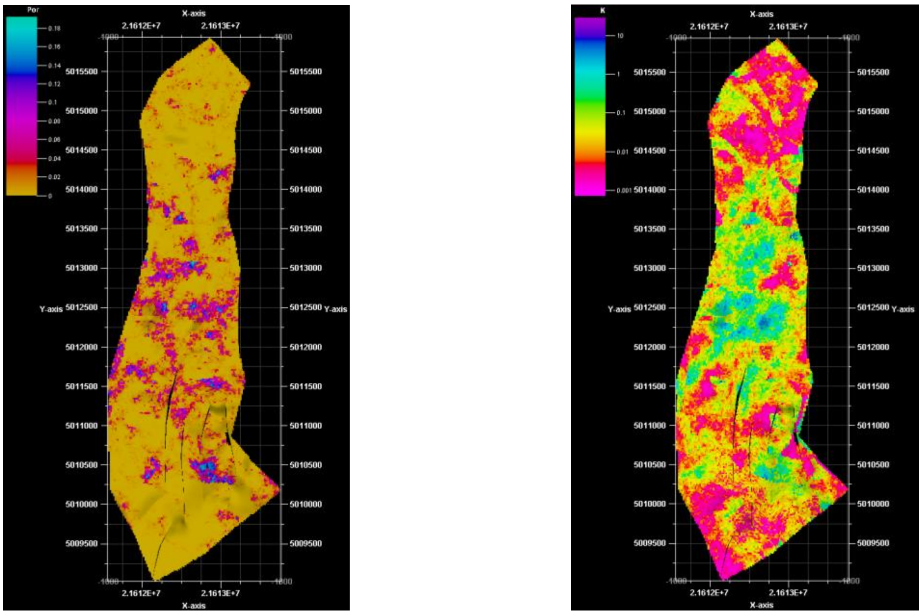

Fig4 The first layer's attribute model.

Ⅵ. CONCLUSION

1) The geological model established by petrel software can intuitively display of underground reservoir's structure, sedimentary characteristics, which will provide reasonable basis for description of reservoir and waterflood development in the late.

2) Combining with the data of productive dynamic and static and the modeling results ,we can well predict where are remaining oil distribute in the area, provide a correct development plan, optimize the deployment of well pattern[4].

REFERENCES

[1] Shenghe Wu, Yupeng Li, Present situation and prospect of reservoir geological modeling[J]. Marine Origin Petroleum Geology, 2007, 12(3): 53-60.

[2] Yongbin Wu, Yitang Zhang, Zenggui Wu, The 3D visualization geological modeling based on petrel software. Computer Applications of Petroleum, 2007, 15(1): 21-24.

[3] Wei Liu, Hongqi Liu, Jianping Li, A application of reservoir geological modeling based on petrel software, World Well Logging Technology, 2010, (175): 20-21.

[4] Tianxiang Duan, Xiaomei Liu, Yajun Zhang, A few understanding of petrel model, Lithologic Reservdirs, 2007（2）.