IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 05, Issue 07 (July. 2015), ||V4|| PP 05-08

Yingtai Area in Songliao Basin as the Main Layer Tight Oil "Dessert" Reservoir Prediction

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Abstract: -Tight oil as one of unconventional oil and gas resources are widely distributed, great potential. In recent years, with the development of shale gas and the volume of fracturing horizontal well technology, dense oil and gas has the potential to succeed in the areas of energy exploration and development has become increasingly active, is developing rapidly. The main layer "dessert" predict played a crucial role again when the reservoir development deployment position, aiming Songliao Basin Yingtai area as an example, from seismic attribute analysis are based on a study combining geostatistical inversion.

Keywords: *Tight oil; Songliao Basin; Geostatistical inversion; Phase shift process;*

I. INTRODUCTION

Unconventional oil and gas resources in the northern part of Songliao Basin, especially tight oil resources in a huge amount, including Gaotaizi oil source within the tight oil, shale oil and some green Fuyang reservoir permeability less than the next source 2mD. In line with the oil 2014--2015 annual Changyuan periphery Fuyu oil and Heidimiao raise productivity of horizontal wells, reserves upgrade research study, implementation of control reserves for Fuyu oil source 7 Zhaoyuan area well area, expand the "sweet spot" Reservoir forecasting, aiming English Taiwan English well region 86 Heidimiao stable mouth bar sand bodies have taken the seismic attribute analysis processing based on a phase shift-based techniques, the use of geostatistical inversion accurately portray the estuary flat bar sand distribution, and ultimately complete the main floor, "dessert" forecast.

II. REGIONAL OVERVIEW

Yingtai area is located in Zhaoyuan County, Heilongjiang Province and Duerbote County territory, the main located Qijia - Gulong sag, North England region 36 wells, reservoirs and Bayanchagan phase, southwest of the Nen River Valley world, east and Puxi, Xinzhao new station adjacent fields, the region has been the Nen River from the northwest to east Nanliu, low-lying, blisters, canals, dams distribution. Ground elevation between 126.99 ~ 155.0m.

Located on tectonic zone central depression of the northern Songliao Basin Qijia - Gulong Depression southern end of the main targets for the Putaohua oil exploration, oil and Saertu Heidimiao. Information about area 450.0km2 dimensional work area, this research work is mainly for the British Ministry of the well region 86 Heidimiao Sec deploy assessing control wells, the purpose is through the block of seismic geological research, evaluation of horizontal wells and infrastructure development, the focus on "dessert reservoir" prediction method to obtain a high sandstone and oil drilling rate and enhance individual well production.

III. RESERVOIR " DESSERT " RESERVOIR PREDICTION

Horizontal wells will focus on aspects of the deployment of a "sweet spot" reservoir prediction, horizontal wells in reservoir development only deployed position, in order to obtain a high sandstone and oil drilling rate and enhance individual well production.

3.1 seismic attribute analysis

Based on lithology, electrical characteristics were carried out against Heidimiao for HII2 oil group attribute analysis, the corresponding strata were studied slice properties, phase shift processing data volume, relative wave impedance characteristics, micro seismic facies waveform clustering qualitative group of Black HII2 favorable reservoir sand body position.

3.1.1 Heidimiao strata slice attribute analysis

Seismic data commonly used technologies include horizontal slice slice, slice along the layer formation information reflected in two different sections. Also known as time slicing slice level, it reflects the same geological characteristics of the ground time domain isochronous surface, can show abnormal seismic attribute

spatial distribution, determine the direction of extension of the deposition system, which applies to sheeted and supine formation, so as to The seismic attributes and other information with the horizontal plane parallel to the deposition system contains extracted. Horizon slice refers to the purpose of the layers along the surface of the slice, known as seismic sections along the floor, it is not only adapt, but not prostrate mat-like formation, but also to adapt to fluctuating formations, especially to reflect more accurately inclined strata geological characteristics and changes of sedimentary reservoirs. Slicing through the layer can show the ups and downs along the inclined anomalies and seismic attribute spatial distribution, determine the direction of extension of the deposition system, it is for the inclined plane parallel to the depositional system in order to ensure that when the extracted seismic attribute information, etc., for the inclined plane not parallel deposition system, his presence in the layer time slicing through the phenomenon of change information within the sedimentary system under seismic attribute information extraction and other frameworks do not reflect lithology.

3.1.2 Phase shift process

Bandwidth seismic waves directly affects the level of resolution, to ensure no loss of low-frequency component of the premise, the resolution was a positive relationship with the bandwidth, zero-phase wavelet highest resolution. Seismic data processing seismic wavelet is often assumed that the minimum phase wavelet, minimum phase asymmetric waveform, and the sub-Bourbon lobe longer, can not simply take advantage of the peaks and layer interface or correspondence between the layers. Therefore, before seismic interpretation, to be converted into a minimum-phase wavelet zero-phase wavelets. For thin, especially thin interbedded geologic conditions, even if they can obtain a zero phase wavelet, still have to face the top of the formation, the end of the interface question reflection indistinguishable, so to improve the thin, thin interbedded interpretation accuracy, but alsoWe must rely on well constrained geological knowledge and data. In general, the results of seismic data processing phase existing data volume is essentially zero phase is not, therefore, in practice, the need to determine the polarity and phase angle seismic data, seismic data, based on the original by turning the corresponding phase angle, so that the purpose of the seismic data interval phase angle approaching 90 °, more suitable for the direct application of thin reservoir prediction of seismic information.

3.2 Seismic inversion

3.2.1 Sandstone quantitative prediction method

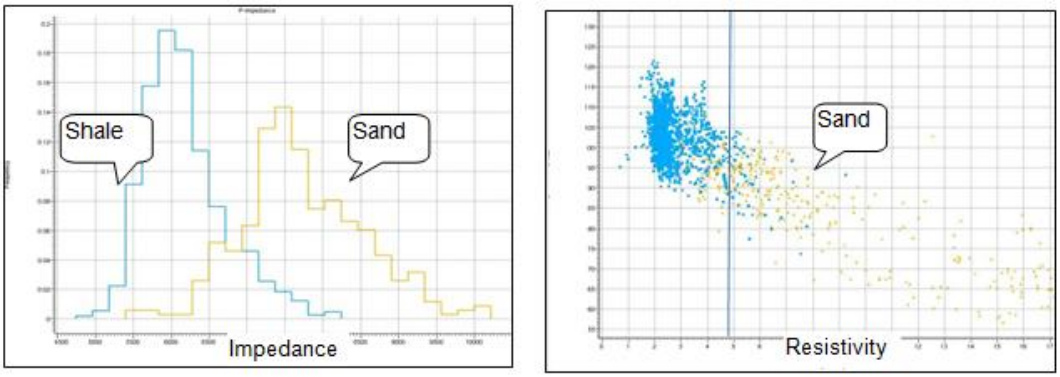
Sandstone quantitative forecasting methods currently used in the well - seismic impedance inversion based, multi-well constrained inversion to logging data-rich high-frequency information and a complete complement to the low-frequency components of seismic limited bandwidth, access high-resolution formation impedance and various logs Association simulation data volume. It provides initial exploration into the development phase of the corresponding inversion method: recursive inversion, constrained sparse pulse inversion, stochastic simulation and stochastic seismic inversion and reservoir characteristics of the integrated inversion. Wherein the geostatistical inversion using seismic data, logging data, and establish a high-resolution geological modeling or pattern matching to get the main component of the reservoir model, is a model-based inversion method, focusing on the thin and fine prediction reservoir description. The principle is: seismic data volume for each channel can be represented in a linear combination of a few of its neighbor, which reflects the relationship between the coefficient matrix of this linear combination, reflects the subsurface variation from one point to another point. And this law is unique, it will be applied to log data body, get well logging constrained seismic inversion. Closely integrated with the seismic data, the two mutual restraint, in time, establish the correct time-depth relationships through sonic depth of field on the curve, and thus the entire seismic data for various logging curve.

3.2.2 Forecasting process and quality control

First, a variety of data loading, including seismic data, interpret the data, well log, hierarchical data, etc., and various well region of the curve, each year, different instruments obtained was normalized; secondly extracting wavelet, making synthetic records, repeatedly adjust wavelets, so that the resulting synthetic seismogram and seismic traces the well reaches the maximum correlation, thus establishing the initial model. Then inversion according to the model, the study area Heidimiao H Ⅱ2 small layer of sand low GR, significantly high resistance characteristics, based on geostatistical impedance inversion on feature GR and resistivity curve random co-simulation, multiple attribute comprehensive prediction sand body distribution; Finally, based on the inversion data volume, by logging data analysis to determine the purpose of sand and shale layer threshold values and calculation purposes sandstone thickness and effective thickness, and finally the plane of FIG.

3.3 Geostatistical Inversion

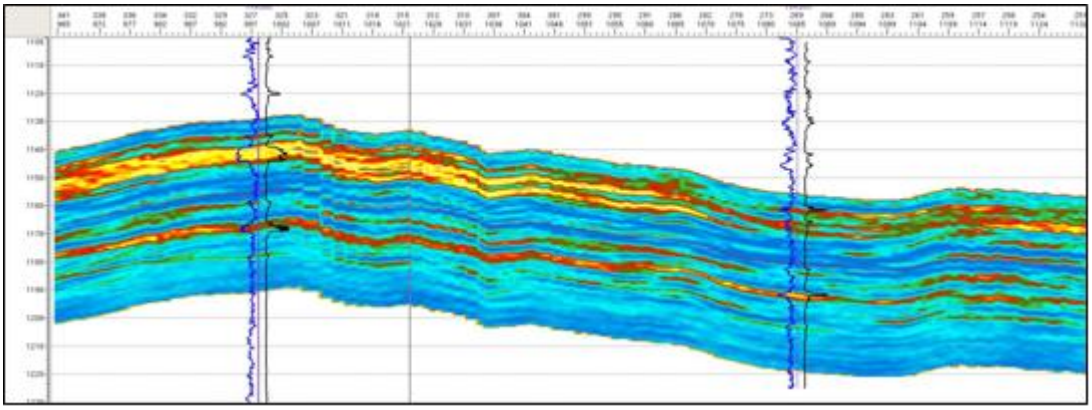
Geostatistical method steps are as follows: 1) analysis of the variogram data; 2) find the relationship between seismic and log data to find the variation between the correlation analysis; 3) the use of the known data analysis to determine the law to get the space distribution of the control points. Commonly used tool is the Kriging method.



Picture 1 petrophysical analysis

From geological point of view, the Spatial characteristics of the reservoir space geometry, material properties and other parameters are in effect under the law of a series of geological origin of the formation. Picture 1 is a well region 86 British Heidimiao impedance curve and lithology analysis histogram intersection of gamma ray and resistivity analysis diagram, of which only divided the sandstone and mudstone are two, we can see that the impedance curve of sand and shale It has some ability to distinguish between the impedance value of less than 6800 grams per cubic centimeter is mudstone, greater than 6800 grams per cubic centimeter is sandstone, but can also be found in the use of impedance lithology distinguish, in histogram lithology overlap region remains to distinguish the effect be affected.

Through the above process, we can build low-impedance model Figure 5-2-19 even Inami impedance model can be seen in the initial model is reasonable, and there is no obvious outliers, and finally through the congruency map and seismic inversion can ability to distinguish thin geostatistical inversion seen stronger, higher accuracy (Picture 2).



Picture 2 Well even low-impedance model

IV. CONCLUSION

(I) Yingtai area Heidimiao sandstone thickness small, lateral heterogeneity is strong, well-seismic joint using geostatistical inversion as the core technology to quantitatively predict sandstone, the main purpose is to accurately identify the main Heidimiao HII2 the spatial distribution of sand, and finally through the congruency map and seismic inversion can be seen in the ability to distinguish thin geostatistical inversion stronger, higher accuracy.

(II) It does this by obtaining a static data and dynamic data have been combined, were the main layer " dessert" identification guide the regional deployment of new wells, strengthening of the recovery and improve the reservoir prediction accuracy to achieve the effective development of tight oil in Songliao basin.

REFERENCES

[1] Stephen A. Sonnenberg, Aris Pramudito. Petroleum geology of the giant ElmCoulee field,W illiston Basin. AAPG Bulletin, v.93, no. 9 (September 2009), pp. 1127～1153.

[2] Mackey,S.D.and Bridge,J.S.Three-dimensional model of alluvial stratigraphy:theory and application.Journal of Sedimentary Research,1995,B65(1):7~31.

[3] Clavier C, Coates G, Dumanoir J. The theoretical and experimental bases for the “dual water” model for interpretation of shaly sands. SPE 6859, 1977. 1—27.

[4] Clavier C, Coates G, Dumanoir J. The theoretical and experimental bases for the dual-water model for interpretation of shaly sands. SPEJ, 1984, 24(2): 153—168

[5] Cander H．What is unconventional resources[R]. Long Beach，California：AAPG Annual Convention and Exhibition，2012.

[6] GarberM.China:nearly half reserves are in marginal reservoirs[N].18WPC News of WPC,2005，78～89