Scholars Bulletin
(A Multidisciplinary Journal)
An Official Publication of "Scholars Middle East Publishers",
Dubai, United Arab Emirates
Website: http://scholarsbulletin.com/

ISSN 2412-9771 (Print)
ISSN 2412-897X (Online)

Studying On the Fluid Identification Method of Complex Lithological Reservoir

Liwei Mu[1], Meiling Zhang[1], Jianhua Lin[2]
[1]Geoscience College, Northeast Petroleum University, Daqing 163318, China
[2]The Wireline Logging Company, Daqing Drilling and Exploration Engineering Corporation 163412, China

***Corresponding Author:**
Liwei Mu
Email: mlwfft123@163.com

Abstract: Complex lithologicical reservoir is the key storage space for oil and gas in the development of oilfield, and the accurate identification of the oil and water layer is the crucial problem in the development of this kind of reservoir. This paper in Moliqing fault depression two segment reservoir is main research group the layer, through the study area exploration wells drilling core data analysis to determine the study area reservoir sandstone and conglomerate, containing gravel sandstone, mud (CA) sandstone and pebbly siltstone. To study area 24 wells 73 test oil, 56 wells 132 layer for data logging data migration, according to the data were established based on different lithology fluid qualitative classification identification chart, various lithologic oil and water layers in the final recognition accuracy reached 85%, fully meet the requirements of oilfield production.

Keywords: Moliqing fault; Complex lithology; fluid identification.

GEOLOGICAL SURVEY OF THE STUDY AREA

Yitong Basin is located in the central part of Jilin Province, double fault basin, which is a large amplitude subsidence, on both sides of the basin provenance from, high deposition rate, resulting in change quickly [1-3]. Studying area in Moliqing fault depression is Yitong Basin is a secondary tectonic unit, its main target layer is Eocene Shuangyang Formation. The double reservoir of the second member of is this article studies the main layer groups. The lithology of this layer is mainly composed of sand conglomerate, gravel bearing sandstone, mud (CA) sand and gravel bearing sandstone [4-5].

STUDYING ON THE DISTRIBUTION RANGE OF PARTICLE AND PORE SIZE

Analysis of the distribution range of Particle size

The study area of Moliqing block 565 slice analysis sample. By analyzing, the maximum size of the rock is generally less than 4.5mm, and the main particle size range is 0.07 ~ 4.5mm. The gravel rocks 148 slice analysis samples, grain size distribution is 0.25 ~ 2.5mm, fine sandstone class 145 slice analysis samples, the grain size distribution of 0.075 ~ 0.75mm, siltstone class 111 slice analysis samples, the grain size distribution of 0.025 ~ 0. 25 mm.

Analysis of the distribution range of pore size

Figure1 is effective porosity and permeability in the diagram, the permeability and porosity of rock have a positive correlation, namely with the effective porosity increasing and the permeability also increased.

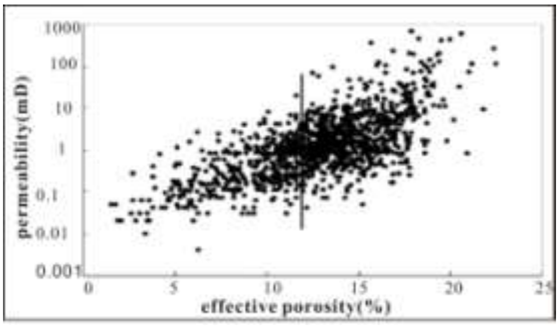

Fig.1: Effective porosity and permeability in the diagram

Figure 2 shows the effective porosity distribution histogram, seeing from the chart, the Moliqing block sheet analysis of effective porosity of samples mainly distributed in 8% - 18%; Figure 3 is histogram of permeability, learned from the chart, permeability distribution range is $0.05 \sim 50 \cdot 10^{-3} \mu m^{-2}$.

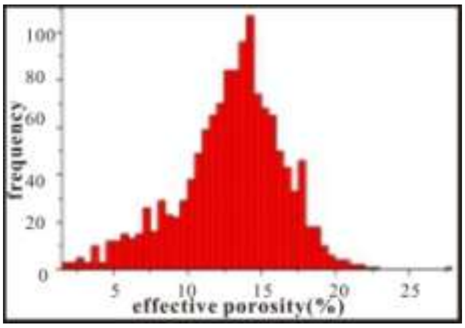

Fig. 2: The effective porosity distribution histogram

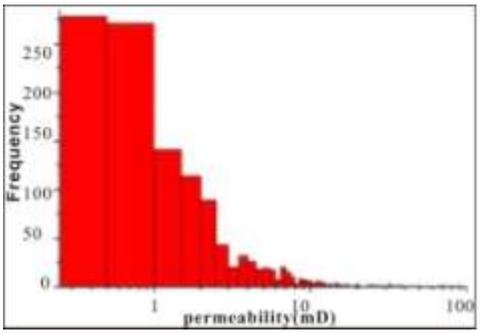

Fig. 3: The permeability distribution histogram

STUDING ON THE FLUID IDENTIFICATION METHOD

Establish the qualitative chart of fluid identification based on different lithology

This paper is based on the 73 testing layers in 24 wells, and 132 producing layers in 56 wells, establishing the data for distinguishing the fluid.

1) Identification chart without induction wells series

As shown in Figure 4 for no induction exploration department of class identification chart, the establishment of depth and deep lateral resistivity cross plot, from the figure that oil layer, oil-water layer and water points more clearly divided into their respective interval. According to figure 4 and table 1 for the chart of comprehensive compliance rate of 86.8%, but the water identification accuracy is low.

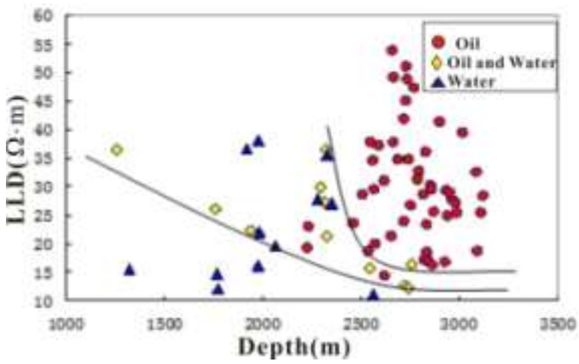

Fig. 4: Identification chart of exploration department of class without induction

Table 1: The chart of comprehensive compliance rate

Reality Determine	Oil	Oil and Water	Water	coincidence rate
Oil	50	3	0	94.3%
Oil and Water	1	10	0	90.9%
Water	0	6	6	50%
Comprehensive coincidence rate=66/76=86.8%				

2) Identification chart with induction in glutenite

Figure 5 is the oil and water layer identification chart with induction glutenite, establish acoustic travel time and $(RLLD*RILD)^{1/2}$ cross plot chart. As known from the graph, high porosity, permeability conditions and with high resistivity layers are more probable oil layers, and water layer showed a characteristic of low resistance.

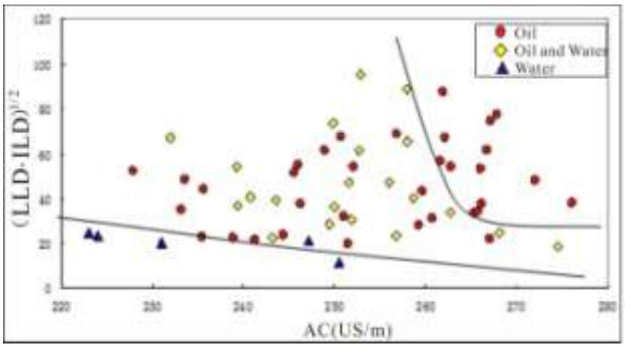

Fig. 5: The oil and water layer identification chart with induction glutenite

3) Identification chart with induction in fine siltstone

Figure 6 shows induction fine sandstone oil and water layer identification chart, the establishment of sonic value and $RLLD*RILD^{1/2}$ intersection graph identification chart, the good will oil layer, oil-water layer, water identification; Figure7 induction fine sandstone oil and water layer identification, establishment of natural gamma ray relative change quantity and interval transit time cross plot to recognize a chart in mixed in the reservoir oil-water layer. Comprehensive statistics of oil water layer identification coincidence rate 23/24=95.8%.

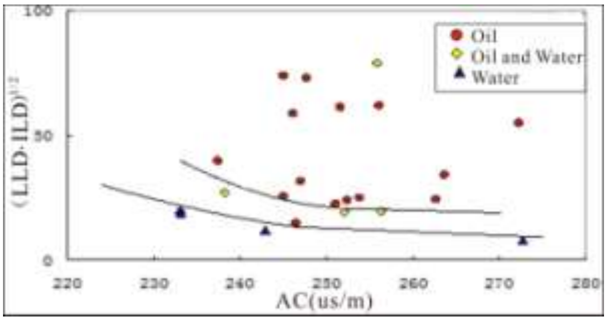

Fig. 6: Oil and water layer identification chart with induction in fine sandstone

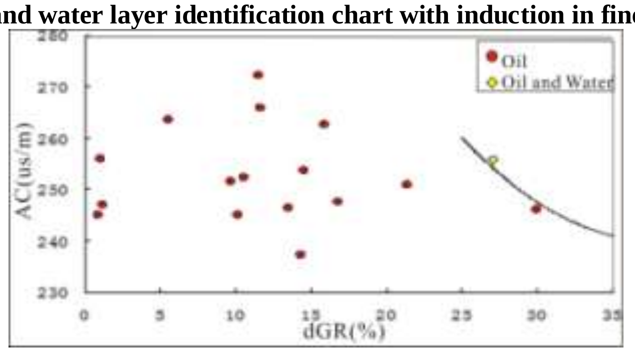

Fig. 7: Oil and water layer identification chart with induction in fine sandstone

Identification chart of the high resistance water rock

According to containing water rock layer of high resistivity of the premise caused by the complex lithoclast, selection and recognition of adjacent strata, the thickness is more than 2 meters of low resistivity and high natural gamma mudstone, reading the induction logging value, as the surrounding resistivity of stratum identification value. The induction resistivity logging value /rock resistivity to deep lateral resistivity value identification chart (Figure 8), respectively for the online part establish acoustic time difference value to the deep lateral resistivity value identification chart (Figure 9), part of the line to establish natural gamma ray relative variation to induction resistivity logging value / rock resistivity curves (figure 10). Comprehensive compliance rate of this chart was 106/115=92.17%.

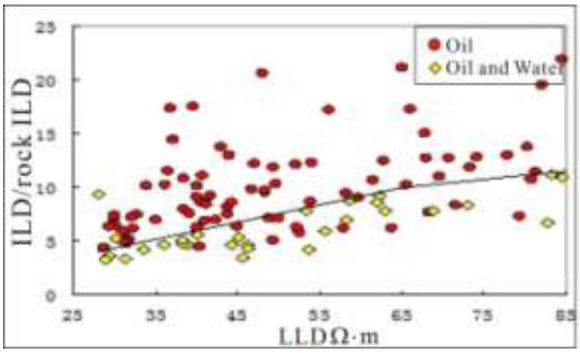

Fig. 8: Induction resistivity logging value /rock resistivity to deep lateral resistivity value identification chart

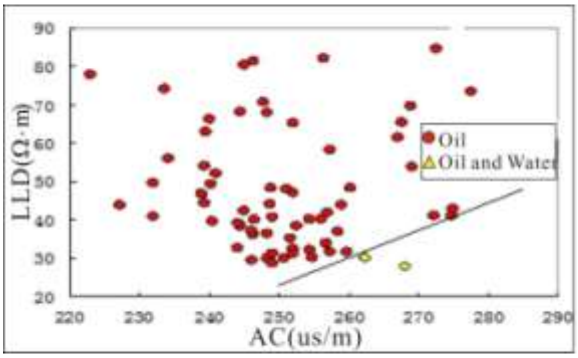

Fig. 9: Identification chart with acoustic time difference resistivity

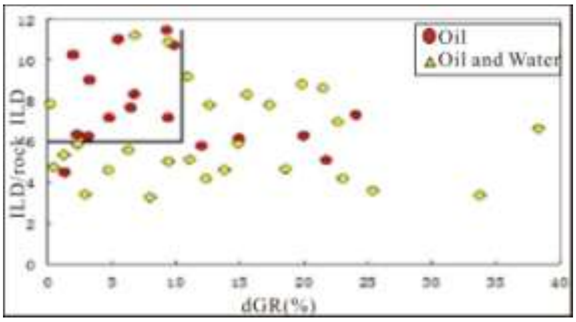

Fig. 10: Part of the line to establish natural gamma ray relative variation to induction resistivity/rock resistivity

CONCLUSIONS

Through the use of induction and deep lateral resistivity values to identify the studying area high water resisting strata, in which no induction wells series identification chart the coincidence rate can reach to 86.8%, water layer has a low recognition rate. Induction glutenite oil and water layer identification chart coincidence rate of 55/61=90.2%. The development wells are 92.3% and 77.7% of exploration well. With induction fine sandstone oil and water layer identification chart of the oil-water layer identification coincidence rate are 23/24=95.8%.Using induction resistivity logging value/rock resistivity and deep lateral resistivity value identification chart identifies the aqueous layer of high resistivity and the coincidence rate of the chart is 92.17%.

REFERENCES

1. Change, C., Zhen, L., & Shouwei, D. (2015). Dynamic evaluation for the deep reservoir in the northwest of Yitong basin. Journal of China University of Mining & Technology, *44*(1):116-124.
2. Wang, R. F., Lv, X. H., & Guo, D. B. (2012). Feature parameters of micro pore throat in deep section high pressure and low-permeability sandstone reservoir. *Journal of China University of Mining & Technology*, *1*, 012.
3. Xin, Y., & Wenmin, Y. (2005). Reservior evaluation for the low porosity and permeability sandstone of upper paleozoic in the Daniudi Gas Field, Ordos Basin. *Journal of Mineralogy and Petrology*, *25*(2), 104-109.
4. Wang, Y. Z., Cao, Y. C., & Song, G. Q. (2008). Application of production test data to evaluation of the effective reservoir in deep clastic of Bonan Sag. *Acta Petrolei Sinica*, *29*(5), 701-710.
5. Guo, R. (2004). Supplement to determining method of cut-off value of net pay. *Petroleum Exploration and Development*, *31*, 140-144.