IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 06, Issue 01 (January. 2016), ||V1|| PP 01-05

Source rocks evaluation of F,Y Oil Layer in South Songzhan Region ,Songliao Basin

Li Mengyao[1];Wang Baojia[2]
[1]*College of earth science of Northeast Petroleum University, Daqing, Heilongjiang, China.*
[2]*Xinjiang Petroleum Engineering Construction Supervision Limited Liability Company, Karamay, Xinjiang, China.*

Abstract: - Songzhan region is located in the northern Sanzhao depression in Songliao basin, currently F,Y layers have found oil reservoirs and good exploration prospects. But the understanding of oil source in south Songzhan region rather vague. Oil-source correlation studies have shown that: The oil in south Songzhan region is mature, F,Y oil layers were derived from the same source rock—K_1qn^1 source rock in Sanzhao depression, secondly K_1qn^{23} source rock. The main K_1qn^1 source rock for the generation and expulsion period was the Mingshui final deposition to the current moment.

Key words: *south Songzhan, F,Y oil layers, source rocks evaluation, oil-source correlation*

I. INTRODUCTION

South Songzhan area is located in Zhaodong Anmin Town in Heilongjiang Province, the area lying east to the west in general is low. The area is located in Sanzhao depression, which is developed in the sunken(depression) of the central paleouplift. Under the influence of regional tectonic evolution, the area has experienced three major stages of faulted, depression and uplift contraction phase, then forms the tectonic framework now. The structure of South Songzhan is a nose structure to the north of the north east of Sanzhao depression, and the development of structure has obvious inheritance, as a long-term development of ancient construction[1].

II. STRATA AND SEDIMENTARY CHARACTERISTICS

South Songzhan area drills formations from the new to the old which are the Quaternary, the Upper Cretaceous K_1m, K_2s, the Lower Cretaceous K_2n, K_2y, K_1qn and the part of K_1q formation. In addition to deletions of the Neogene and Paleogene deposits, the above of K_1q_2 strata develop completely. South Songzhan oil-bearing strata are P oil layer which is the lower part of Lower Cretaceous K_2y_1 formation and F,Y oil layer of K_1q_{3-4} formation, that is the basin depression stage sedimentary formation.

F,Y oil layer belongs to the Lower Cretaceous K_1q_4 formation, which the thickness has the small lateral variation, and the average thickness is 78.0m. The sedimentary source is Baiquan-Qinggang fluvial sedimentary system, and the source is nearly north-south direction, fluvial sedimentary environment, and sedimentary rocks of the purple, gray-green mudstone and argillaceous siltstone, siltstone interbedded. The reservoirs mainly are channel sand and sand bar, and the reservoir property is medium-low. The porosity and permeability of F reservoir are generally 6.85%~14.15% and $0.01\sim3.5\times10^{-3}\mu m^2$, and those of Y reservoir are generally 5.2%~17.15% and $0.02\sim12.57\times10^{-3}\mu m^2$. Under the control of regional sedimentary background, F,Y reservoir mainly develop sedimentary microfacies such as the river, the river burst, abandoned channel.

III. SOURCE ROCK EVALUATION

According to the geological background of Songliao Basin, the oil source of South Songzhan area may origin from Sanzhao depression, so the source rock evaluation for Sanzhao areas could identify effective source rock, and on the basis of that carry out oil-oil correlation and oil-rock correlation. The information and data mainly come from 8 oil samples of the different blocks and layers in South Songzhan area, which are the family composition, total hydrocarbon chromatography-mass spectrometry, saturated hydrocarbons chromatography-mass spectrometry and pyrolysis, organic carbon, chloroform extract bitumen, organic elements, R_o and so on[2].

3.1Oil-oil correlation

The content of saturated hydrocarbon, aromatic, non-hydrocarbon+asphaltene in P、F，Y reservoir oil samples are 56.4%~70.58%, 17.93%~26.7%, 10.0%~19.8%, then can infer that its oil generation parent material is better. It can be seen from family consists of three components (Fig.1) of P、F,Y reservoir in South Songzhan that the characteristics are quite similar and it may be inferred homology.

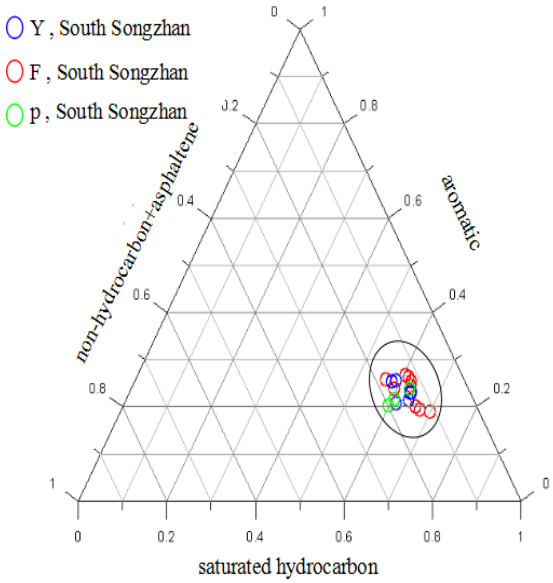

Fig 1 The family consists of three components of oil sample in South Songzhan

The crude n-alkanes distribution pattern of South Songzhan is unimodal, and the range of carbon number distribution is nC_3~nC_{35}, and the peak carbon atoms are nC_{23}; The content of Isoparaffin is lower than that of the adjacent normal-paraffin. As can be seen from the distribution and peak of n-alkanes, the general characteristics of the rude oil in South Songzhan are relatively similar, reflecting the crude oil with similar depositional environment and source parent material inputs (Fig.2).

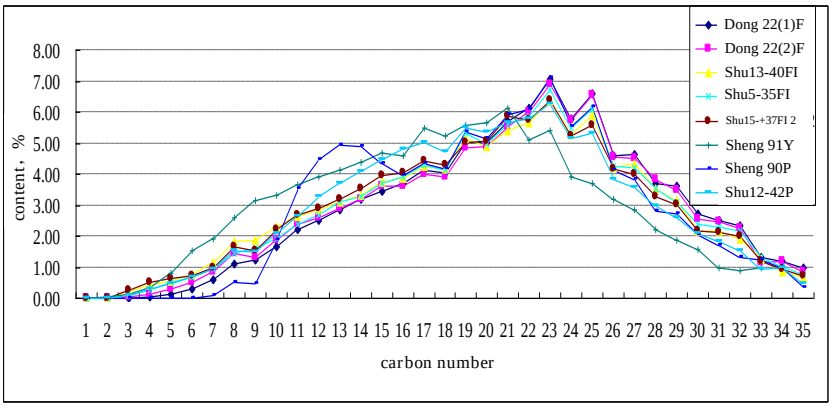

Fig 2 The n-alkanes distribution of crude oil in South Songzhan

The Pr/Ph and Pr/nC_{17}、Ph/nC_{18} values change with depth in South Songzhan and Sanzhao depression are similar, and illustrate that both of them have roughly the same oil source and deposition environment (Fig.3、4).

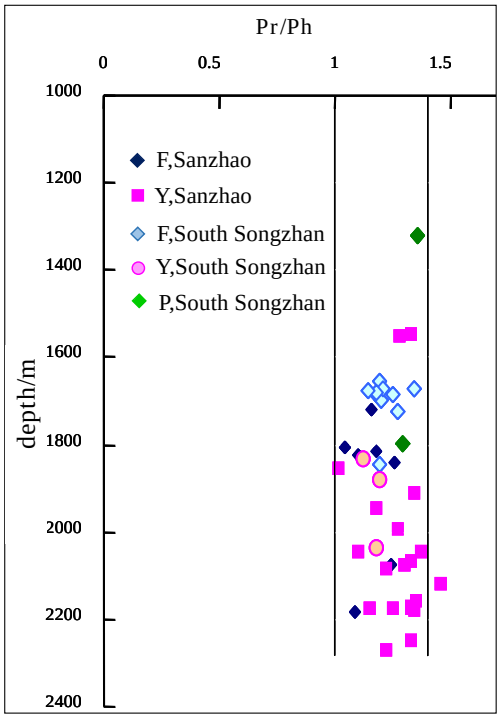

Fig 3 The Pr/Ph value changes with depth of oil in South Songzhan and Sanzhao

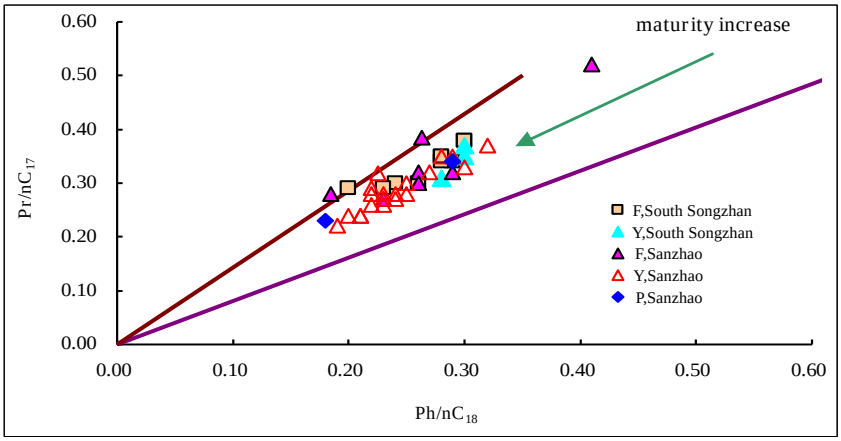

Fig 4 The Pr/nC_{17}、Ph/nC_{18} values changes with depth of oil in South Songzhan and Sanzhao

In summary, the oil in South Songzhan and Sanzhao depression show the same of parent material type and deposition environment, and on the hand of maturity, the oil in the same horizon of Sanzhao is higher than that of South Songzhan. Therefore, the oil in South Songzhan and Sanzhao might have the same source.

3.2 Oil-rock correlation[3-4]

The OEP average value of South Songzhan samples is 1.12, and in the range of 1.04 ~ 1.18.The OEP average value of Sanzhao K_1qn^1 source rock is 1.131, and in the range of 1.01 ~ 1.363, which is similar to the South Songzhan. And the mudstone of K_1qn and crude oil samples has the best overlaps, therefore the possibility of K_1qn as the oil source is the largest, especially the K_1qn^1(Fig.5).The Pr/Ph value of South Songzhan oil with depth remained unchanged, reflecting crude parent material has the same depositional environment. From the Pr/Ph value changes with depth of the source rock layers in Sanzhao area, the Pr/Ph value distribution of K_1qn^1 source rock is similar to the oil sample, so the K_1qn^1 source rocks may be the source of South Songzhan crude oil(Fig.6).

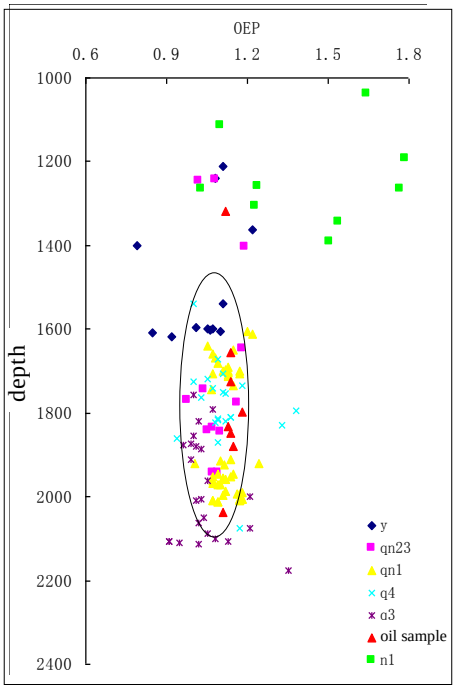

Fig 5 The relationship between OEP and depth of Sanzhao source rock and oil sample in South Songzhan

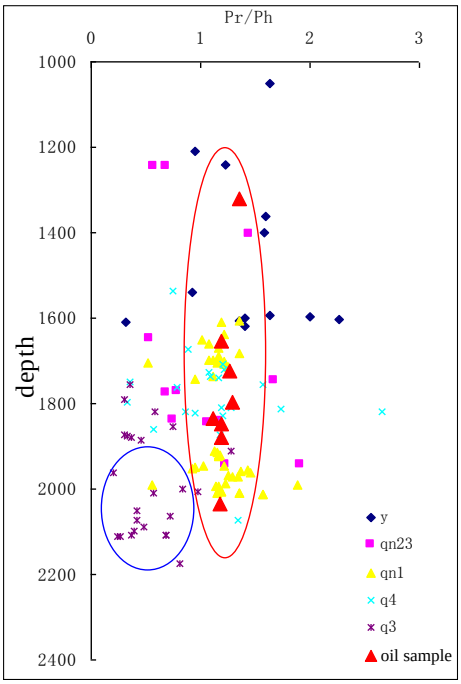

Fig 6 The relationship between Pr/Ph and depth of Sanzhao source rock and oil sample in South Songzhan

Isoprenoid alkane type compounds have affinity with the parent source. It can be seen from the Pr/nC_{17} and Ph/nC_{18} correlation diagram of the South Songzhan crude oil and Sanzhao depression source rock, K_1qn^1、K_1qn^{23} and K_1q_4 source rock have the same depositional environment and maturity with South Songzhan parent material. The relationship between South Songzhan crude oil and K_1qn^1 source rock is more closer than the other layers (Fig.7).It can be seen from the hydrocarbon source rock evaluation that, the main source rock are $K_1qn^1$and K_1qn^{23} source rock in Sanzhao area.The sterane C_{29}-20S/(20S + 20R) and C_{29}-ββ/(αα+ββ) of K_1qn^1 Source rock has the similar maturity with oil sample, except for the other source rock(Fig.8). South Songzhan crude oil may come from K_1qn source rock.

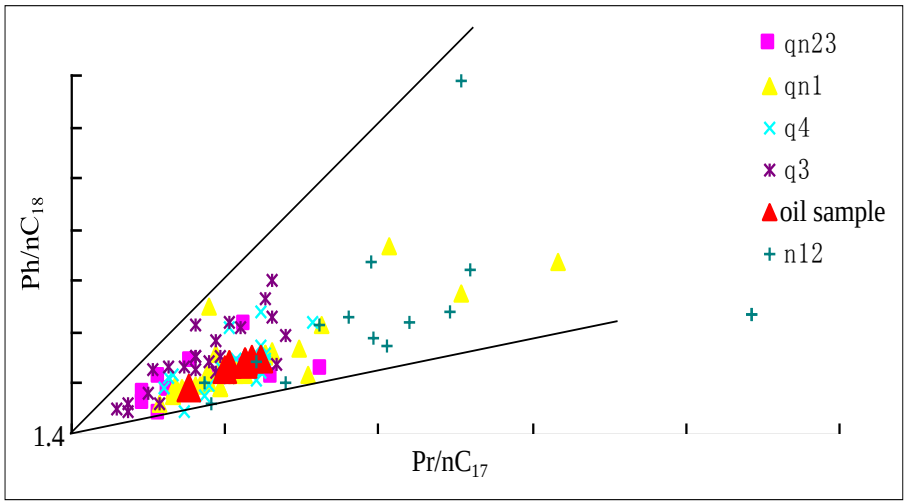

Fig 7 The relationship between Pr/nC_{17}、Ph/nC_{18} and depth of Sanzhao source rock and oil sample in South Songzhan

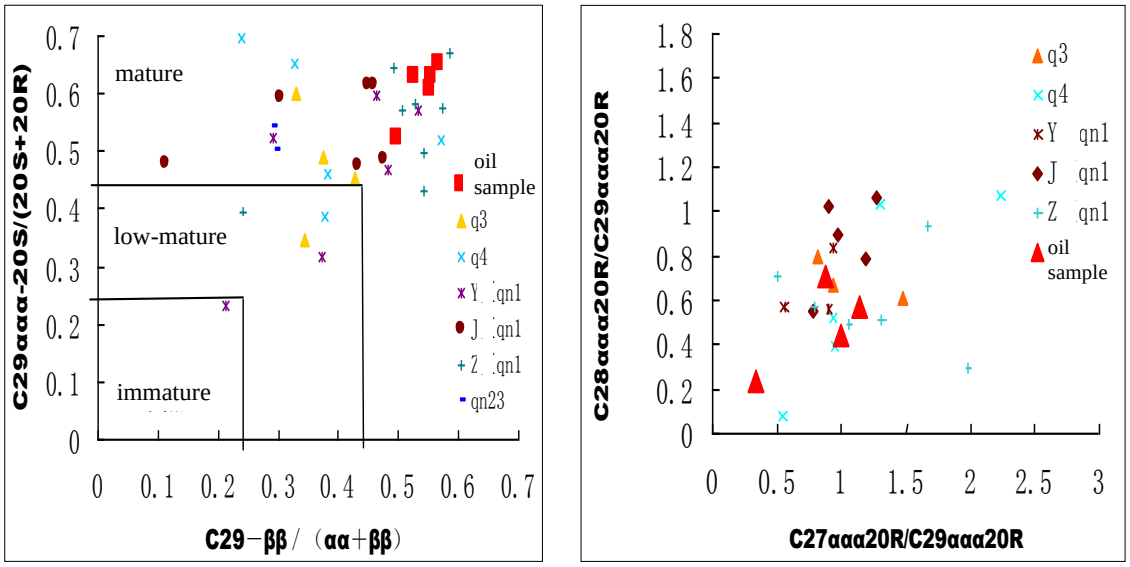

Fig 8 The sterane maturity of crude oil in Sanzhao source rock and South Songzhan region

IV. CONCLUSION

Through the oil source correlation study: South Songzhan crude oil is mature oil. F,Y crude oil are both from the same oil source-K_1qn^1 source rocks in Sanzhao depression, secondly is K_1qn^{23} source rock.

REFERENCES

[1] Fu Guang, Wang Yougong. Migration horizons downward of oil from K_1qn source rock of F,Y oil layer in Sanzhao depression and its significance[J]. Acta Sedimentologica Sinica, 2008, 26(2):355-360.

[2] Wang Xue. Oil sources of Fuyang oil formation in Qijia Sag and Daqing Placanticline, Songliao Basin[J]. Petroleum Exploration and Development, 2006, 33(03):294-298.

[3] Wang Yachun, Zhao Jintao, Wang Meiyan. Mechanism of oil migration and accumulation in F,Y oil layers of South Songzhan region,Songliao Basin [J]. Acta Sedimentologica Sinica, 2009, 27(4):752-759.

[4] Hunt JM. Generation and migration of petroleum from abnormal pressured fluid compartment [J]. AAPG Bulletin, 1990, 74(1):1-12.