

Enrichment and accumulation law of oil and gas in the middle of west slope of Shulusag

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Abstract: The Shulu slope is located in the southern part of the Central Hebeiprovince. According to the result of the third resource evaluation, the amount of resource in Shulu west slope is up to 51.2Millionton(mt),the provedreserveofthisareacanbereachedto14.6308mt,and the remainingresource is to36.56mt,resource convertingrate is merely28.58%.The amount of residual resources is very large. It has certain exploring prospect.In this paper,the distribution characteristics of the reservoir have been summarized, and combined with the previous research results and the understanding of the formation factors, the formation pattern and the formation mechanism of the reservoir.Many fault occurred in the early stage of the forming of Shulu Sag and the later construct active stage.The fault occurrence consists of consequent fault and antithetic fault. The different combination types and the variation of fault throw control the distribution of reservoir, the influence of different types fault combination and fault throw on the reservoir are summarized. In the slope, theantithetic fault combination is favor of the forming of reservoir and the consequent fault is difficult to forming reservoir under the small fault throw with plenty sand body. The hydrocarbon will be accumulation in the upper trap.

Key words: Shulu slope, consequent fault;antithetic fault;oil and gas plane law; fault throw

I. INTRODUCTION

Shulu sag lies in the southern part of Bohai Bay Basin. The exploration area is about 700square kilometers. It is developed in the Palaeozoicbasement, it's a half graben sag which is stated in the north east direction. The eastern part of it is boundary with the New River fault. It's the whole Shulu slope's steep belt. The south is Small liu village fault, the northern Hengshui fault as a boundary, and is connected with the Shen village sunken.



Fig.1 Tectonic area location map of Shulu slope

Oil and gas enrichment have hierarchical characteristics, and the corresponding control factors of hydrocarbon

accumulation also have order. When discussing the enrichment mechanism and control factors of oil and gas, the writer stresses the order on macro to micro, analyses oil and gas accumulation law and its controlling factors in regional to oil reservoir.

II. HEADINGS

2.1 Analysis of oil gas planar enrichment rule and control factors.

From the macroscopic view of oil and gas's horizontal distribution feature, Shulu slope deposited PaleogeneKongdian group on the basis of Paleozoic rigid Paleogene, Shahejie group four segment (Es4), Shahejie group three segment (Es3), Shahejie group second segment (ES2), Shahejie group first segment (Es1), Dongying group (ED) and the Tertiary system. After effected by large scale fault block activity during the Yanshan period, the sunken formed a south-north trough, east-west zoning. The two zones are the west slope belt and the eastern part of the step-fault zone. Drilling confirmed that the hollow two sets of hydrocarbon source rocks in the Shahejie group three segment and Shahejie group one segment, and a combination of a series of reservoir and seal. The Shulu west slope is a sedimentary slope which leans east and raises west. The Tertiary system layer overlaps Paleozoic slope.

A large number of different levels and sequence of faults are developed in Shulu west slope. The scale of each block is different, sometimes appears as a sequence of block group. Fault is the main factor to complex fault block oil field. Each fault block is often controlled by a number of faults. Every fault is different from formation time, characteristics, cause of formation, The difference of the sealing ability is big, some works sealing, some works destructing, others works transporting.

Geological background of Shulu slope decides that it develops delta front sand body and many favorable traps, this forms oil and gas enrichment, therefore structural factors are the main controlling factors of the formation of the oil and gas reservoirs in the slope zone.

2.2 Analysis of oil gas vertical enrichment rule and control factors.

The hydrocarbon source rock of Shulu slope belt usually is not growth or thin, it mainly distributed in the centre of the trough. Consequently, the collocation way of source rocks' position-transport system-trap restricts the oil and gas accumulation. In general, the oil and gas accumulation has the characteristics of short distance transport, oil and gas can not only come from the mature oil and gas which are generated from the centre of deep zone, but also can come from the slope belt. The migration distance of the slope inner zone is short since the zone is near to the sag which produces oil and gas. Purposely, oil and gas at first enrich between the nasal structural belt or fault block of the slope belt and trough belt, the most favorable sites for oil gas accumulation are the nasal structural belt and fault block which are close to the oil generation sag, paleohigh background is more conducive to the accumulation of oil and gas. And it is a good example of the formation of the structural lithologic composite oil gas reservoir, such as the Xicaogu and the Taijiazhuang nasal structural reservoir, which is formed by the combination of the characteristics of the large thickness and the connectivity of the gravel in the slope.

Since Shulu slope grows in the geological background where the reservoir forms, distributes widely, the west is shallow and the east is deep. The east deep concave area generates oil and gas, and then they are migrated to the west. The nasal structures and the mutual cutting of multiple sets of faults are favorable for the accumulation. It is considered that the large scale migration of oil and gas is in the period of the formation time of the fault.

2.3 Effect of fault structure style combination on oil reservoir.

The influence of different structural styles on the enrichment of oil and gas is different, thus controlling

the distribution of oil and gas. The study shows that the oil source of Shulu sunkenShahejiesection 2is mainly derived from the source rocks of the Shahejie section 3. After guided by oil source fault, oil and gas accumulate. According to the characteristics of extensional basin, lateral seal of fault is decided by different lithology docking.The characteristics of accumulation are different from fault distance and fault combination under the slope background.According to its characteristics, the faults can be divided into several types, such as table 1 shows, consequent fault -reverse fault combination; reverse fault-reverse fault combination; reverse fault-consequent fault combination; consequent fault -consequent fault combination.

1) consequent fault -antithetic fault combination

It’s the best combination for oil and gas accumulation. Under the condition of large fault distance, the oil pool can be formed in where the structural high point of the consequent fault or antithetic faultis developed, and the oil layer is deep, the oil-bearing area is large. When the fault distance is small, only the antithetic fault can accumulate the oil, the consequent fault can transform oil and gas on the updip direction to the slope through sand body, under this condition,the oil layer is thick, the oil-bearing area is small.

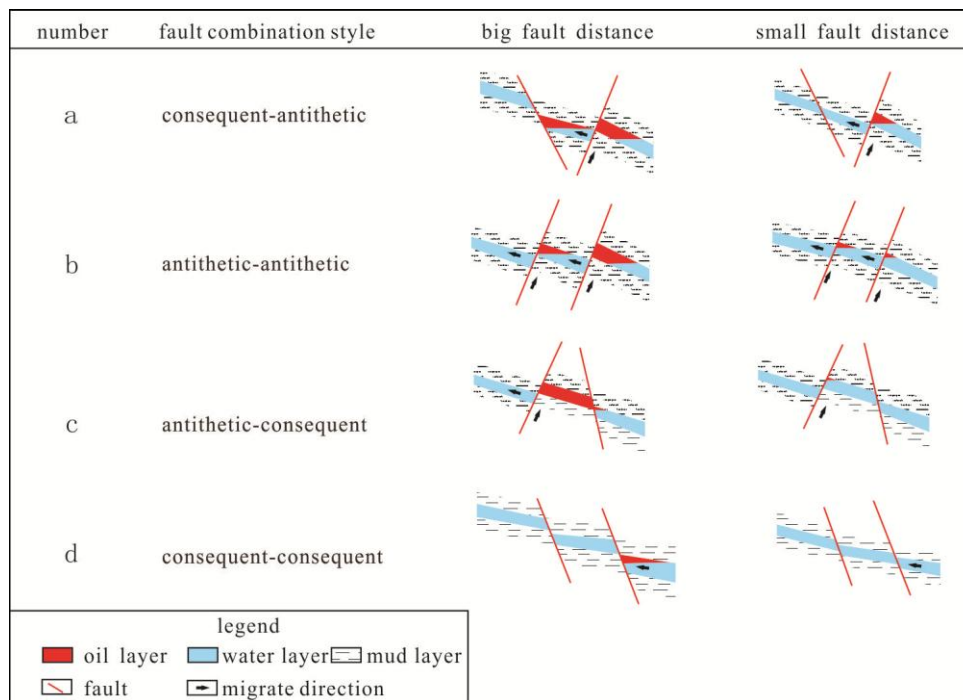


Fig.2 Relationship between fault combination style and oil gas

2) antithetic fault- antithetic fault combination

Antithetic fault- antithetic fault combination is easy to accumulate when the fault distance is big, at the same time, oil column height and oil-bearing area are small .It’s easy to appear oil and water layer andoil bearing stratum in the downward direction of the small distance fault.

3) antithetic fault-consequent fault combination

When the fault distance is big, the downdip direction of the antithetic fault orconsequent fault is benefit for migrating, but the oil column height of the reverse fault is far greater than the normal fault. Meanwhile the oil-bearing area is so large that the migration even can throughout the whole block. While the fault distance is small, only the consequent fault can form the oil migration which is small, the normal fault is hard to migrate.

4) consequent fault-consequent fault combination

This situation is very simple. Such combination is able to migrate oil and gas

III. CONCLUSION

According to the analysis of oil gas accumulation in the area of Shulu slope, the relationship between the fault tectonic style, the fault distance and the oil gas accumulation zone is as follows: (1) The reverse fault is easy to form oil accumulation; (2) when the reservoir is deep, the fault distance whose is small can't form oil accumulation either, the reverse fault can accumulate oil and gas, but the scale is small; (3) under the big fault distance condition, normal-reverse, reverse-reverse, reverse-normal combination is apt to form oil accumulation, but the possibility of a normal-normal fault combination reservoir is small, which is heavily depend on the lateral source of oil and gas migration.

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