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Favorable block research in Lishu fault depression

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Abstract: - With the deep development of multi fault depression in Songliao Basin in Lishu fault depression a lot of drilling cores and well logging data and seismic facies of the comprehensive study of pear of sedimentary facies and its evolution of Lishu fault depression formed at the beginning of the substrate is a group of syngenetic fault cutting, the development of small fault depression, Lishu faulted oil and gas resources are abundant and diverse, the northwest to the southeast three SW - NE trending fault zone controlled the oil and gas distribution and accumulation, and oil and gas reservoir types from the southwest depression to the northeast slope can be divided into pure gas, oil and gas zone and pure oil zone 3 is nearly NW trending distribution of oil and gas distribution. Lishu fault depression development two sets of main source rocks are Shahezi Formation and Yingcheng Formation, the type of organic matter abundance, relatively good. Oil source correlation shows that the Lishu fault depression of crude oil in addition to correspond to two kinds of different genesis of hydrocarbon source rock types of crude oil and to both mixed source and wide distribution of crude oil. The analysis of geological and geochemical indexes shows that the oil and gas migration from the deep depression to the slope along the slope and fault. The above analysis is helpful to the study of Lishu fault depression favorable areas in more detail.

Keywords: - *Pear fault depression; Oil and gas distribution; Oil source fault set*

I. REGIONAL GEOLOGICAL SURVEY

Pear sag is located in the southeast uplift area, songliao basin is a composite basin superimposed fault depression, east of tanlu fault zone, pear, gongzhuling across two city, covers an area of about 2300 km2, mining area resources 360 million tons of oil equivalent, 205 opening of exploratory well, the whole sag found nine oil and gas fields, proven oil reserves of 44.3585 million tons, proven degree is 20.6%; Proven gas geological reserves of 19.341 billion square, the proven degree is 13.5%. Is divided into four secondary structural belt, the Northern Slope zone, steep slope zone, the central structural belt, west slope area in the east. Its overall assumes the north north east to distribution, for the west boundary mulberry big fracture controlled by west fault ne "basket" of the early cretaceous fault depression, western formation sedimentary thickness is big, east side of the boundary faults development, stratigraphic overlap upwards, thickness thinning, even pointed out. Pear fault is a composite basin fault depression of composite, average thickness of more than 5 km; Upper depression structural layer is thin, generally is about 2 km, from quantou formation (K1q), qingshankou formation (K1qn) and nenjiang group (K1n), lack of the quartet group one MingShui group. Bottom-up found lower cretaceous shahe subgroups, city group and denglouku group and quantou group five oil and gas formation[1].

In view of the pear tree fault depression, the 1986-1996, at the exploration stage, the family, after four or five subsidiary of oil and gas fields, five eight house gas field; In 1996-2000, evaluate zone, found a warlock gas field, Qin Gutun, TaiPingZhuang oilfield, town gas bearing structure; During the period of 2001-2006, the target exploration, finds that the home field, etc.; And 2007, so far, has been the subtle reservoir exploration, found that 10 house, seven tree oil field, eight house gas field and Su Gutun reservoirs, jinshan, etc. After nearly 30 years, the exploration at present, the region has made gravity, aeromagnetic, seismic, drilling and geochemical and a series of research, is now in the stage of exploration and detailed survey. Due to The Times of tectonic movements in the region, more characteristics of the complex, strong reformation in its later stage and hydrocarbon accumulation is unclear, oil and gas exploration progress and found that the effect is not significant, these factors has a great influence on the oil and gas exploration and development in the region. After years of exploration in the study area, northeast of sinopec oil and gas branch has invested a lot of physical work in pear area, has carried on the thorough research, and has made important breakthroughs. There are 2 d seismic 7441.2 km, 3 d seismic 1233 km2, basically a complete coverage of 3 d. Fracture is the main performance of the basin tectonic changes in form, for oil and gas generation, migration and accumulation has important influence, provide channels and paths for hydrocarbon migration, structural trap provide favorable places for oil-gas accumulation, tectonic action with the whole process of reservoir formation. Qin Gutun fault zone for the inside of a pear tree fault one of the three main fault zone, directly controls the formation and distribution of Qin Gutun oilfield, studies the characteristics of tectonic evolution, the pear tree rift tectonic evolution and hydrocarbon accumulation regularity and oil and gas exploration.

1.1 Tectonic characteristics

Pear sag is located in the southeast uplift area of songliao basin, rift area of 2300 km2, basal maximum buried depth is over, to develop since early cretaceous fault depression of the composite basin superimposed type, is carried on by west controlled by boundary faults arc fault depression. Fault current profile form can be divided into upper and lower double deck structure, mulberry set fracture as the main control of pear trees downfaulted basin of depression of faults, controls with fault sequence of the formation and distribution and west east super loop shape of fault pattern. Occurrence in gentle, thickness and distribution of relatively stable depression sequence coverage on fault sequence and base layer[2].

Pear sag is located in the songliao basin, and its basic evolutionary stages:

(1) early crustal uplift and the fault early stage volcanic eruption (T3 ~ J1-2)

Early in the basin evolution stage, because of the heat convection, resulting in widespread uplift of the earth's crust thinning, and with the intense magma eruption and large-scale acid magmatic rock intrusion. From Triassic to early and middle Jurassic, moho arch in the deep part of songliao basin, produce the mantle pads, show wide slow fornix shape crust uplift in the long-term by denudation state. Continents tumbled at the same time, the formation of NNE to fracture, and strong magmatic activity along the fracture occurs, until the late Jurassic began to form isolated dispersed group of middle and small faulted basin.

(2) the fault phase (J3 ~ K1d)

Early chasmic activity (J3) is characterized by fault activity and volcanic eruptions, the embryonic form fault basin. Crack in early to mid is given priority to with extending action, forming a series of small fault, sedimentary stone mountain group of the fire. , in the middle of the lacunae of the sag west east tilted movement function, mulberry fault traction machine, rapid subsidence in the west and the east, north and south uplift and formation in north north east to the distribution of the new fault basin. Late chasmic sag to atrophy, stretching rate is smaller, tectonic subsidence rate is reduced, the peripheral began to uplift, end chasmic stage. Namely denglouku sedimentary period, fault activities began to abate, denglouku sedimentary overlap in the fault basin gradually or protuberance, form unified depression, began to large depression basin. This period of transitional tectonic denglouku period show is broken, depression, the broken on the characteristics of the super.

(3) the depression stage (K2q ~ K2n)

Large depression stage in late cretaceous quantou stage - late cretaceous nenjiang stage. The qingshankou formation to nenjiang formation sedimentary period is the acme of lake basin development. From the fault depression to depression mechanism is that the mantle stop on the arch, heat convection is abate, crustal deformation and fracture activity[3]. In under the influence of sediment load balancing role, make whole subsidence basin.

Quantou stage characterized by shallow depression. Mainly for a brown, red sand and shale, reservoir development. Qingshankou formation and nenjiang period characterized by large depression. Especially in the central depression of songliao basin formation of large-area deep lake, is one of the important source rock depression stage. But the southeast uplift area pear rift zone due to the stretch chasmic stage crust thinning is relatively small, balanced subsidence caused by amplitude is relatively small, sedimentary thickness is much less than in the central depression area.

(4) stage basin uplifting atrophy (K2m ~ Q)

Nenjiang movement after late cretaceous basin of deep structure tends gradually adjust equalization, intense tectonic inversion basin comprehensive rise, lake basin scale contraction, and accompanied by folding, pear area missing four stations and sedimentary MingShui groups. Tertiary and quaternary system is on the basis of erosion was leveled Shi Jianzao deposited a set of grinding, activity is very weak, the basin gradually tend to die.

1.2 Formation characteristics

The tectonic framework and evolution of the basin is controlled by the whole structural movement of songliao basin and the stress field, faulted structural layer and double layer structure of depression the structural characteristics of main sedimentary fault depression of the structural fire stone mountain, shahe subgroups, city group and denglouku group stratum, gradually developed alluvial fan, braided river delta, fan delta deposits, such as depression structural main development of quantou formation, qingshankou formation, yaojia formation and nenjiang group, restricted by fault basin, dominant in river deposits[4].

1.3 Sedimentary characteristics

Predecessors' research results and exploration practice indicates that pear tree rift has experienced the city group of the end of the camp, the denglouku group and the end of the late tectonic uplift movement of the nenjiang formation, strata denudation several times[5]. The tectonic framework and evolution of basin development and the influence of the ancient climate, fault structural overall has experienced from the shore and shallow lake, lake basin half deep lake and deep lake basin, the shallow lake - half deep lake basin, the last to

shallow water depositional filling process. And fault depression period characterized by near provenance, coarse clastic sediments rapid sedimentary characteristics, thus formed the alluvial fan, fan delta, turbidite fan and deep-water lake lake "fan -" in the composition of sedimentary combination[6].

Pear trees in the early development of fault basin is given priority to with volcanic eruption facies, lacustrine facies and alluvial fan facies, develop a set of basic and acid volcanic rocks, pyroclastic rocks, colored sand of coarse clastic carbonaceous mudstone and coal, conglomerate; Of late, because of lake basin expansion, large-scale invasion and half deep lake of shallow lake, lake - deep lake facies is given priority to, accompanied by underwater fan, fan delta, delta, turbidite facies, lithology is given priority to with film of mudstone and silty sand rock, sandstone, conglomerate, carbonaceous mudstone and coal seam[7]. Basin generally experienced from dry lake basin to damp lake basin, from shore shallow lake basin, shallow lake - half deep lake basin, deep water basin, the shallow lake - half deep lake basin, finally the evolution process of the packing for the shallow lake.

II. THE SYSTEM STRATA AND THE OIL SOURCE FAULT SET

Pear is a single fault type basket shape sag, four second-order tectonic units. Mulberry platform fracture is its of basin-controlling boundary faults, an arc of basin of faults, the slope in north and southeast as background; City group of the late tectonic movement under the background of regional sinistral strike-slip, regional stress field by the tension gradually transformed into extrusion, local uplift accept erosion, forming the central structural belt, the denglouku late tectonic movement for QuanOuXing sinistral strike-slip movement, affected by the tectonic movement, the pear tree sag formed a little wide, Qin Dong, leather home three strike-slip faults and associated with the nearly ns-trending fault. Due to differences of basin-controlling fault activities, things sag faulting differences in nature, have different performance in the role of hydrocarbon accumulation.

2. 1 Fracture formation evolution and fracture systems

Fracture of the progressive deformation is not invariable, the strength of the different sedimentary stages of its activities are different. Due to tectonic deformation determines the formation and development of the fracture, and stratigraphic unconformity contact relation is one of the symptoms of an active structure, so the unconformity surface reflects the tectonic deformation occurred, which corresponds to the fracture formation period. Through the study on the structure, stratigraphic sequence analysis, combined with the structure of the balance profile for geometry can clear fracture the formation of the evolution process and its characteristics[8]. Research suggests that the study area the formation of the fracture evolution has experienced a fire stone mountain city group to camp (early) fault depression period, denglouku ~ (middle) of the nenjiang formation of depression period, the quartet ~ quaternary (late) of three big stages of tectonic inversion, different evolutionary stages deformation characteristics of the fracture, the fracture formation reflects the evolution of the differences of different regional stress field.

2.1.1 fracture system

Because many pear trees rift vertical oil-bearing series in the hydrocarbon expulsion of hydrocarbon source rock evolution history research, on the basis of combination of each oil gas composition of fracture system, can in order to determine each oil gas provides the basis for the fault type of the oil source. And the flower like fracture zone development style.(Fig.1).

1) the development of fracture system type in the study area

Deformation characteristics on the basis of fracture formation period, (stretching, twisting and strike-slip) and the formation mechanism and evolution of the fracture system in the study area can be divided into six types: the early strike-slip stretching fracture (Ⅰ type), medium-term transtensional fault (Ⅱ type), the late pressure torsion fracture (Ⅲ type), strike-slip stretching early - mid transtensional fault (Ⅳ type), transtensional

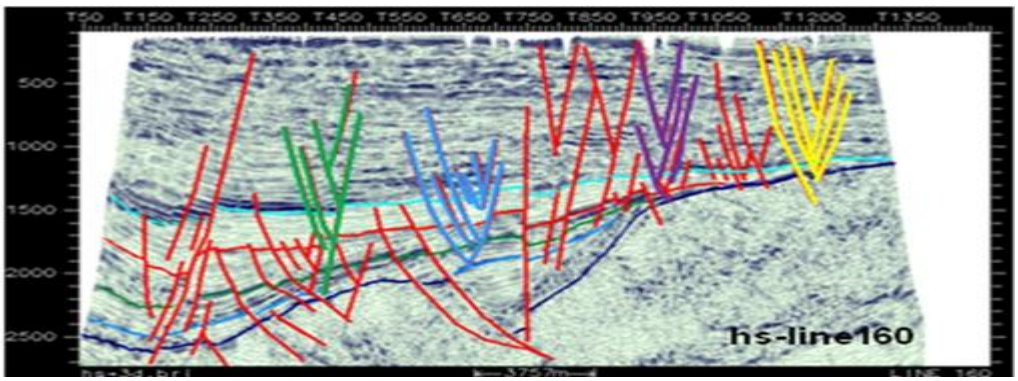

Fig.1 Flower like fault pattern of Lishu fault depression

mid pressure torsion fracture system (Ⅴ type), early strike-slip stretching - transtensional mid - late pressure torsion fracture system (Ⅵ type).

Ⅰ shaped fracture system is mainly in the rift period activity fault, early extension fracture in the study area in general is relatively few, breaking the east to the north of the main distribution is given priority to; Ⅱ shaped fracture system mainly is the rupture of fault depression period activity, only development in denglouku group to nenjiang formation inside; Ⅲ shaped fracture system is primarily a basin inversion phase formation fracture, as a result of the limitation of seismic data, the lack of new system and the structure of the strata above figure, but is simply the time pressure formed by the torsion fracture is very few, majority is put first fracture rupture twitched upward extend the results of the resurrection. Ⅳ shaped fracture system is mainly through the layer and fault depression of the fracture, after the first stretch strike-slip shear fracture, fracture system type is the most widely distribution in the study area; Ⅴ type layer and fracture system is mainly through fault depression basin inversion layer fracture, first transtensional activities after the torsional deformation of fracture pressure, this type of fracture is less; Ⅵ type and mainly through fault, fault depression basin inversion of the structural long-term active faults, transtensional strike-slip stretching after deformation of first activity of the fracture, which experienced three different deformation respectively.

2.2 Set of oil source faults and distribution

Activity different nature of fracture in different periods, different role in the oil and gas reservoirs. In a clear set of fracture system in petroleum system, on the basis of combination of hydrocarbon accumulation critical moment, fault activity times can be set oil source faults and their distribution. Oil source fault is refers to a crucial moment and connection of hydrocarbon source rock and reservoir fracture. From the horizon of the distribution of fracture system, the pear tree distribution difference of the slope east of oil source faults, are mainly distributed in small fracture and fracture around Qin Dong wide, the fracture makes the vertical migration of oil and gas accumulation period activity until the cause of oil and gas layers distribution, reservoir and accumulation period inactive fault in oil and gas accumulation process block oil and gas, hinder the role of migration.

III. CONCLUSION

Through the study of Lishu fault depression concludes：

(1) Pear sag has rich oil and gas resources, sag in hydrocarbon source rock, sedimentary thickness, high abundance of organic matter, organic matter type is given priority to with Ⅲ, Ⅱ type 2, high organic matter maturity and the resources potential is tremendous.

(2) hat the main hydrocarbon accumulation in the eastern slope of oil source faults, structure and fracture degree of the configuration of the relationship and the development of sandstone factors control.

(3) Qin Gutun anticline belt antiformal trap by Qin Dong fracture and its configuration control;

(4) can be vertical migration of oil and gas along the oil source faults, after entering the reservoir gathered at the updip direction trap;

(5) oil and gas migration along the small width of fracture of lateral control seven tree shahe subgroups of oil and gas gathering and faulted anticline and pinchout sandstone is the main trap types.

Hydrocarbon accumulation is birth, storage, cover, turn static elements and luck, work together, the dynamic process of gathering, the result of multi-factors coupling joint control, based on the principles of optimization of benefit, respectively from the oil source of oil and gas migration and advantages of broken circle of matching and the advantages of different configuration Angle fault - sand body single factor on the advantage of optimizing the accumulation area, when the good reservoir conditions is advantageous area, including the blank has not drilling drilling development blocks and blocks.

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