ZHU Deyan, WANG Yong, ZHU Deshun and NING Fangxing, 2015. Study on shale cracks in Jiyang Depression. *Acta Geologica Sinica* (English Edition), 89(supp.): 143-144.

Sudy on Shale Cracks in Jiyang Depression

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1 Introduction

In early oil and gas exploration in jiyang depression stage, abnormal gas logging and oil and gas shows are frequently seen in the period of the shale. Most wells obtain commercial oil flow, such as Well Luo42, xinyishen9 in zhanhua sag and Well he88 in dongying sag, shows great potential for exploration of fractured shale oil. Once upon a time people in view of the current situation in the research on the reservoir, more focus on the fracture types and their origin (Yin Kemin, 2002; Yuan Jing, 2002; Liu Kuiyuan, 2004; Ci Xinghua, 2006), while the crack distribution of in-depth study is less. As a result of the existence of cracks of shale oil reservoir and production, fracture identification and forecast becomes the key to find shale oil dessert. therefore,it is important to clear shale fracture type system and carry out the identification of different types of cracks and forecasting,which help to select key target zone and shale oil well deployment, provide more objective basis for leadership decision-making.

2 Core and the Microscopic Characteristics of (micro) Mracks

According to the causes, cracks can be divided into two categories, diagenetic microfracture and structural microfracture, the former mainly includes interlayer microfracture and overpressure microfracture (by sparry).

2.1 Structural crack

Micro crack of tectonic movement mainly lies near the fault development and structure transition. The most common cracks are nearly perpendicular to the level of tension crack, which often cut through horizontal seam, help to connect bedding cracks, and vertical migration of oil and gas.

Open crack: core tend to give priority to with high Angle display, and the fracture development density is bigger, has a certain direction, trends and tectonic stress field in the study area are basically identical. filling crack: structure seam filling is the result of further evolution of open seam.

2.2 Interlayer crack

Interlayer crack is between the level of the shale pore seam, is formed by sedimentation. This kind of fracture is visible in cores and thin sections and scanning electron microscopy (sem). Interlayer crack develops between different components laminated, its width is narrower and all below 0.02 mm commanly.

2.3 Overpressure crack

Overpressure crack is given priority to with low Angle, irregular crack surface, not group in a direction, which has nothing to do with the big tectonic stress field. In addition, in the process of hydrocarbon charging evolution of hydrocarbon source rock, hydrocarbon source rocks of drainage and all kinds of cationic, often cause mineral dissolution and precipitation, performance oriented crystalline calcite crystals in filling pressurization process of bedding cack, recrystallization of crystal often develops intergranular pore crack.

3 Crack Identification

Many methods are used to of well logging, geology comprehensive identificate structural cracks, interlayer crack, overpressure crack,which ae associated with shale oil.

3.1 Structural crack

At present, the use of logging data to identify cracks are mainly conventional logging and imaging logging method.

Conventional logging identification of cack is considered to be a economic and effective method. Use of

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caliper, acoustic time, resistivity, density, neutron and gamma ray of 6 kinds of logging curve comprehensive identificate effective crack growth period, the logging response characteristics show the hole diameter and high AC, CNL, R2.5, low DEN, low GR values.

Imaging logging identification of crack is mainly on the basis of crack development in the difference between the resistivity and surrounding rock. FMI image (micro) crack appears to be a dark sine curve characteristics of the wavelength.

3.2 Interlayer crack

Using the measured data of the well,it is found that the rich organic matter grain layer argillaceous limestone interlayer crack is the most development. Based on lines of layered rock facies mainly develop in slope area of half deep lake facies ,we can predict interlayer crack with rich organic matter grain layer lithologic and stratigraphic dip.

3.3 Overpressure crack

Overpressure crack is higher in shale of organic carbon content. Therefore, we can make use of formation fracture pressure and characteristics of organic matter distribution to predict overpressure crack.

4 Crack Distribution

On the basis of crack identification, lower Es3 shale crack distribution of different types has been clear in dongying sag. Structural cacks are mainly distributed in Lijin -Shengbei fault belt, the central structural belt, Gao qing-Pingnan fault belt,Bamianhe fault belt; Interlayer cracks are mainly distributed in boxing sub-sag and the central structural belt; Overpressure crack are mainly distributed in boxing sub-sag and its northern areas. Using compositing different types cracks , shale oil enrichment cracks advantageous area can be determined, three types of cracks in the overlapping area are the first favorable area, two types of cracks in the overlapping area are the second favorable area.

5 Conclusion

1) Using seismic data to predict crack plane development zone, logging data to determine crack longitudinal development section, cores and thin section to identificate different types of micro cracks.

2) The first favorable crack areas of lower Es3 shale in dongying sag lie in the central structural belt, Gao qing-Pingnan fault belt.The second favourable crack areas lie in Lijin -Shengbei fault belt,niuzhuang sub-sag, boxing sub-sag and its northern areas.

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