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Development status of tight reservoir fluid identification method

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Abstract: Through a lot of research literature, summed up the preliminary understanding of the tight layer of oil and gas and the status of technical development of low porosity and low permeability reservoir identification, tight reservoirs as an important reservoir of unconventional oil and gas resources, the demand for crude oil in the country is very important. For the tight pore structure complex, low porosity and permeability of the reservoir, heterogeneity obvious characteristics of the reservoir fluid identification difficult. In this paper, the use of conventional logging identification methods and unconventional logging identification method identificates integrated oil and gas reservoirs in tight layer synthetically.

Keywords: *tight reservoir fluid identification low porosity and permeability*

I. INTRODUCTION

Because today's tight oil and gas resources, human demand for oil and gas resources can not rely only on conventional oil and gas resources, the demand for unconventional oil and gas is particularly valued. It must be the study of the oil and gas exploration from conventional oil and gas exploration to the unconventional oil and gas exploration. Since the formation mechanism of conventional oil and gas and unconventional oil and gas, geological characteristics are very different focuses on conventional oil and gas traps if there are oil and gas, rather than the conventional oil and gas reservoirs in the study was valid position of the reservoir, so we focused on unconventional oil and gas development, we must a new approach for the development of unconventional oil and gas exploration formation.

Following the shale gas, tight oil and gas has become a hot topic of global unconventional oil and gas exploration and development, aiming at Daqing Changyuan tight oil reservoirs in the southern region of Fuyu have complex lithology, porosity and permeability, in the Logging Interpretation facing the reservoir parameter calculation, fluid feature identification, reservoir evaluation of the effectiveness and capacity problems must be research key technologies, while the composition of the rocks in the region are complicated, while having a strong heterogeneity of reservoir pore structure is very complex features. This paper gives some insight on these issues and reviewed [1].

II. DEFINITION OF TIGHT OIL

Specific definition of tight oil and gas so far, have not reached a standard of interpretation, Zhao Zheng zhang[2] believes tight oil refers to the folder in or adjacent to high quality raw tight clastic reservoir system or carbonate reservoirs, has not been large-scale and long-distance migration and the formation of oil and gas accumulation, generally have no natural capacity, through large-scale fracturing technique to form industrial capacity. Air permeability of tight reservoir properties limit is generally identified as the ground is less than 1mD, underground overburden pressure permeability less than about 0.1mD. At the same time, many experts believe that in mudstone, shale source rocks inside the powder - fine sandstone, carbonate, etc., or a

hydrocarbon source rock itself is also the presence of hydrocarbons in tight reservoirs, its reservoir permeability is generally less than 1mD, both specific content is basically the same [3].

III. FACTORS OF FLUID IDENTIFICATION

A Complex pore structure and physical properties of reservoir fluid identification impact

Poor reservoir property and complex pore structure leading to lower oil and gas well logging sensitivity, oil and oil-water layer identification difficult. Reservoir and pore structure has not only changed the reservoir capacity and flow characteristics, but also the impact of reservoir electrical characteristics to a well in Daqing, for example, production layer average porosity of 11.3%, a low porosity and low permeability reservoir, because of complex pore structure of such reservoirs, pore connectivity is poor, often flooding accumulation process is not adequate, the general form of low saturation reservoir. In addition, low porosity and low permeability reservoir space is small, the contribution of small logging information from the fluid, resulting in logging low sensitivity to oil and gas; And the complexity of reservoir lithology and pore structure as well as the intrusion of the drilling fluid further conceal or blur effect resistivity logging capabilities reflect characteristics of oil and gas. This type of reservoir, usually oil and water layers in the resistivity curve resistivity approaching, according to the size of the resistivity log value is difficult to separate directly their area, so that the reservoir fluid identification work more complicate.

B Formation water salinity to the influence of fluid identification

Influence of formation water salinity to fluid identification is mainly reflected in the effects on the resistivity curve, the same oil-bearing reservoir and reservoir conditions, the formation water salinity is higher, lower resistivity response. On the contrary, the lower formation water salinity, resistivity reservoir response is higher. Low water salinity blocks fluid identification, reservoir resistivity anomaly, the presence of water layer or the same layer is misjudgment of the situation reservoir[4].

IV. FLUID IDENTIFICATION METHOD

A NMR identify gas-water layer

NMR studies showed that there are significant differences between the light hydrocarbon formation pore material (light oil and natural gas) and the longitudinal relaxation time of water, light hydrocarbons takes longer to fully polarized, a longer longitudinal relaxation time, Because the water is in contact with the rock pore surface, the relaxation time is greatly reduced. According to this principle, choose a certain echo spacing, wait times at short Tws mode, the longitudinal magnetization of water is completely restored, and a hydrocarbon partial recovery. Then select the same echo spacing, wait in a long time Twl observation mode, so longitudinal magnetization of water and hydrocarbons are fully restored. Then the long, low latency measured T2 spectral subtraction, water signals cancel each other out, and the signal of the hydrocarbons present in the difference spectra to identify oil[5][6][7].

B The time difference ratio of vertical and horizontal wave

When the rock gas is saturated, compressional slowness increases, the shear slowness unchanged, resulting in slowness aspect ratio increases, and therefore, the wave aspect completely saturated with water and measured by the difference than the difference between the aspect ratio slowness to just gas layer.

Fluid identification standards: obtain the time difference ratio of Vertical and horizontal wave of the rock when reservoir contain gas, using which and the time difference ratio of Vertical and horizontal wave in pure water layer to compare, when the former more then the latter, that the time difference ratio of Vertical and horizontal wave is less than the background values of water, it believes that the reservoir is gas reservoir[8].

C Making plate to identificate reservoir fluid

First, by using a double resistivity and sonic difference intersection method to produce gas-water identification plate, so it may be better to separate the oil-gas and water zone. Then gas reservoir identification plate uses the intersection of Three porosity log curves that are more sensitive to gas reservoir to make[9] . After applying the above identification plate to separate the oil-gas reservoir and water layer region, re-use gas reservoir identification plate to separate the oil and gas reservoir area[10].

D Time-lapse logging identify gas reservoir

Drilling process, under normal circumstances is that the mud column pressure is greater than or slightly greater than the formation pressure. So for the permeability of the formation, the well mud filtrate invading formation is a normal situation. With the change of the drilling time, the characteristics of invasive formation are constantly changing, so you can use the corresponding change in different time logging feature to identificate the oil-water layer.

1 Time-lapse resistivity logging When just open reservoirs by time lapse resistivity logging, mud invade relatively shallow, existing hydrocarbons in the vicinity around the well, so deep lateral resistivity log value is relatively high, close to the true formation resistivity, with the drilling time increased, mud filtrate into the formation, formation resistivity decreases, so the mud invading time increases, logging the measured resistivity of the formation reduced. As for the water layer, as is usually fresh water drilling mud, with mud invading time increases, logging the measured formation resistivity increases.

2 Compensated Neutron time-lapse logging

When just open reservoirs, mud invades relatively shallow, exists hydrocarbons in the vicinity around the well, due to the effect of gas reservoir excavation, neutron logging value is relatively small. With increasing drilling time, mud filtrate invades the formation, hydrocarbon is farther away from the well, leading to the neutron logging value is larger. When the reservoir is not present in natural gas, since it does not exist excavation effect of gas layer, this difference does not exist. So you can take advantage of this characteristic of neutron logging to identificate the gas layer[11].

V. CONCLUSIONSTRESS

With the oil and gas resources is shortage in the world, tight oil and gas is undoubtedly the new hope in the oil industry, the fluid identification is essential for tight reservoir.

Acoustic, density, neutron of three logging methods that reflect formations porosity are the basis of gas-bearing reservoir fluid identification. Under the complex reservoir conditions of tight sandstone, using a single method for fluid identification may have multiple solutions. According to the excavation effect of the gas reservoir, applicating acoustic, density and neutron three logs overlapping method, combined with the longitudinal resistivity comparison method can identificate fluid in gas reservoir qualitatively.

Because NMR logging signal coming from the fluid in formation porosity directly, not being by the skeleton composition of rock and mineral, and therefore can identify fluid properties of reservoir more accurately.

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