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Research status of shale gas evaluation methods

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***Abstract*:** - Shale gas occurs mainly in the dark shale or high carbon shale and sandy silt, which clip rocks. Origin, occurrence, distribution and other characteristics of the geology. of gas in the shale have diversity. Shale gas has "three high and two low" phenomenon in the logging curves, could be a better indicator of shale gas. Using logging curve combination method, acoustic wave and resistivity cross-plot method is the main method for evaluation of shale gas and convenient way. But the study of shale gas in our country has still many problems, the researchers should speed up the development process of logging instrument, and study the advanced logging method.

***Keywords: s**hale gas; geological characteristics; logging response characteristics; logging method; cross-plot*

I. INTRODUCTION

Shale gas is subject to adsorbed or free state exists in the high carbon mudstone, mudstone and shale and silty rocks[1]. From the view of the world, the resources of shale gas has the huge potential, mainly distributed in North America, Central Asia and China, Latin America, the Middle East and North Africa and the former Soviet union. Shale gas resource of China is rich, at present, the lack of China's oil and gas resources make Chinese accelerate shale gas exploration process[2].

II. SHALE GAS RESERVOIR GEOLOGICAL CHARACTERISTICS

Shale lithology is mostly asphaltene or rich organic matter in dark shale and high carbon shale, during which there are a layer of mud sandwiched between the development of silty mudstone, muddy silty sand, silty sand, etc.. The adsorption gas and free gas mainly occur in the shale formation, and the adsorption gas content accounts for 20%-85%. Shale gas exists in the natural crack and the effective large pore with the free state; and in the surface of the organic matter or mineral solid particles with the adsorbed state. The characteristics of shale gas has the characteristics of spontaneous self storage or short distance migration, and the development position of gas source indicates the spatial development of the gas reservoir.

III. SHALE RESERVOIR LOGGING RESPONSE CHARACTERISTICS

The theory that using logging data to evaluate shale is based on the shale contains large amounts of organic matter, causing that the shale has physical characteristics different from other rocks. In general, the physical difference of shale with higher organic carbon contents of the physical features are more obvious, and the abnormal reflects in the logging curve are greater[4-6].

A. Dual laterolog resistivity logging of shale gas shows a low value. Because the shale contains rich hydrocarbon with less conductive, abnormal characteristics is slightly higher than that in mudstone resistivity curve.

B. Acoustic time curve shows a high value. Shale is tighter and has less porosity than mudstone, its acoustic time is between sandstone and mudstone. When there are cracks and rich organic matter, their acoustic time

values are larger.

C. The density logging curve shows a low value. The value of shale density is between coal and sandstone, but much higher than coal. When there are cracks and rich organic matter, it will get smaller.

D. Natural gamma logging curve shows high anomaly. This meets that the fine clastic rocks with high abundance of organic matter is often accompanied by increased levels of radioactive elements.

E. Neutron porosity shows a high value. The shale contains a large amount of clay shale, high irreducible water saturation, rich kerogen and natural gas.

IV. LOGGING IDENTIFICATION METHOD OF SHALE GAS RESERVOIR

In the process of the logging evaluation of shale gas reservoir, lithology identification is the first problem to be solved. Through the relevant logging technology and method, the shale layer can be recognized. This section introduces to identify shale with logging combination method and plot method, achieving better results[7-9].

A Logging combination method

The conventional logging combination can be used to divide the lithology. Well logging curves commonly contain natural gamma, density, neutron, acoustic and resistivity logging etc.

B Cross-plot method

Using acoustic logging (DT) and resistivity (logarithmic) to determine the boundary of shale can distinguish lithology, determine the organic rich shale region. Bowman studied on the Mississippi Fort Worth Barnett basin shale group. Get shale boundary can be get by crossing DT and logR, DT=105-25logR, which can determine formation lithology.

V. THE EXISTING PROBLEMS AND THE DEVELOPMENT DIRECTION OF SHALE GAS RESEARCH

Shale gas exploration, development and research work are in the initial state, analysis technology of rock physical experiment on shale gas and key technology of logging evaluation belongs to the blank. Shale gas logging series which has Chinese characteristics is not clear, lack of interpretation method and software. This severely restricts geophysical logging evaluation of shale gas in china. To solve the above problems, we must speed up the logging instrument for shale gas development process, and introduce advanced logging method to service the exploration and development of shale gas in China [10].

VI. CONCLUSION

The shortage of China's oil and gas resources prompted China to speed up the process of shale gas exploration. The geological characteristics of shale gas reservoir are complicated. Shale gas has a good show in the logging data, thus can be evaluated shale with logging technology. At present, there are still many problems about the shale gas exploration in China, and we need to accelerate the development process of the logging instrument, and study the advanced logging method.

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