Research status of the fractured reservoir in China

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Abstract:- As the degree of global oil and gas exploration and development to continuously improve, the oil-gas reserves of the porosity of the convention is dwindling, and the difficulty of development is growing too, so studying the fractured reservoir is becoming more and more important. That predicting and evaluating fracture zone accurately plays a very important role in comprehending the fractured oil and gas reservoirs. Based on a large number of literature survey, this paper studied the research status of china and other countries, analysised some methods of prediction and identification of the fractured reservoir now, and maked a summary,gived some suggestions also.

Keywords:- oil-gas exploration   the fractured reservoir   prediction and identification

I. INTRODUCTION

As the degree of global oil and gas exploration and development to continuously improve, the conventional oil-gas reserves couldn't meet the need of economic development now, so some exploration and development of unconventional oil-gas reserves is very significant,among them, the fractured oil-gas reservoir has been a important and new exploration field[1]. The key of exploration and empoldering of the fractured oil-gas reservoir is to distinguish, describe and forecast the crack. The crack in reservoir not only is reservoir space, but also is the channel of carriage, so in the process of oil and gas exploration and development, it plays a very important role[2].

II. RESEARCH SITUATION IN CHINA

The research to crack was started early in china, and to crack of reservoir was also started from the middle of the last century[3], The methods be used in the leading level. 1) At first, the method of research to crack is to watch it directly, that is watching outcrop in open country or coring samples directly, through the results from watching, we can speculate and analysis, obviously, this method's limitation is relatively large, only drilling area can be watched. The fractured reservoir has characteristic of strong heterogeneity and is affected by many influence factors, different reservoir has different cause of formation, so it increase the difficulty of understanding and descripting the crack. 2) From the early 80's, experts and scholars of china havegreat progress in data processing, china ntroduce from elsewhere a lot of advanced equipment and instrument, on this basis we can forecast and distinguish the crack through using log and seismic methods[4]. But the log and seismic methods have multiple solutions, that are bad for quantitative characterization of the crack. 3) In geotectonic stress field we developed thenumerical simulation method of quantitative predicting the crack's distribution law according to rock failure criterion, established rupture rate' and strain energy'volume density of crack' or fracture frequency'prediction model what is quantification, this can simplify the complex geologic problem, to quantitative forecast the crack's distribution using two dimensional numerical simulation,we can recognize that the crack what have business with deflection occurre in the place where the principal curvature or the inclination change rate of structural plane is maximum[5-7].

III.   BASIC RESEARCH

Now, with the development trend of international cooperation, China combine foreign advanced equipment and rich experience in China, we have a lot of evaluation method to distinguish the fractured reservoir. At present, the commonly used methods of prediction as follows:

A.   The conventional logging method.

The conventional logging method can provide abundant geological information for geological workers, who can pick up the development characteristics and development degree of from the crack logging information to a certain extent. But as a result of limitations of logging itself, and the crack's complexity of the characteristics of geometry, kinematics, it is difficult to distinguish the crack's characteristic fully, the geological workers only use comprehensive analysis of various curve.

B.   Imaging well logging

Imaging well logging, is to use the sensor array scanning or rotary scanning measuring under the shaft, acquisit lots of the stratum information of the longitudinal, circumferential or radial along the borehole, after transfering to the ground, wo can get two dimensional image of wall of a well or three dimensional image of a probing depth of the borehole. This method is more accurate, intuitive, convenient. Imaging well logging can identify crack basically through the resistivity difference between the place where there is crack and the surrounding rock. Imaging well logging's advantages are high precision and high resolution, but it can't be used for all the wells due to the higher cost, so we should make full use of rock and the imaging logging data, to calibrat the conventional logging data, so that we can distinguish accurately the crack of all the wells through the conventional logging data.

C.   The seismic inversion technology

The seismic inversion technology that people usually said is wave impedance inversion, through repairing of seismic horizon,density, velocity and synthetic ,we can make it match the seismic record as far as possible, so that get speed curve and density curve that is the inversion results, it can analysis the change of the geological body in the horizontal more objective.

D.   The tectonic stress field method

The tectonic stress field, that is reservoir tectonic fractures's three dimensional finite element numerical simulation, that is system consists of mathematics, mechanics and earth Science. The whole process is process that is controlled by geological model, mechanical model and mathematical mode each other[8]. In theory, There is a positive correlation between the degree of fracture development and fracture's porosity and rock's deformation degree after tectonic forces, the geological structure model was built by Qirong Qin and Peidong Su and so on[9], to donumerical simulation on the paleo tectonic stress, and to do regression analysis between fracture's porosity data from field test of well point and the failure approach index coefficient(η) from the same point, and to establish the function relation between fracture's porosity and the failure approach index coefficient, so that people can get values of fracture's porosity of each point, after that, people can evaluation fracture's porosity characteristics through drawing fracture porosity contour map.

E.   The curvature analysis method

The curvature analysis method is to forecast the degree of development of the crack according to the degree of crook of the layered rock. Shangru Sun[10] have studied a certain area where the degree of tectonic deformation is relatively gentle using principal curvature and the Gauss curvature method, there is larger

deviation when using principal curvature to predict the tectonic fracture, while the Gauss curvature method's result accord with geological interpretation, drilling and logging data preferably. The application results show that the Gauss curvature method is a more effective method to predict and evaluat regularities of distribution of tectonic fracture in relatively flat areas, and it has good application prospect.

IV. OTHERS

In order to study and evaluat the fractured reservoir better, our country has made a lot of efforts,include building some laboratory, research center and some other authorities, which actively involved in the study of the fractured reservoir. China also strongly support the research of the crack, some project have been project, 973,863 research projects and innovative projects both have crack project. A lot of research Specialist Staff of research company consists of enterprises, colleges and Universities are making efforts to study the crack.

V. CRACK RESEARCH PROSPECTS

1) Many dynamic data, such as the drill hole information, the fracturing construction information, the cementing quality information and the production test information, also can reflect the characteristics of the crack, in addition to using the above methods. The dynamic data can reflect the validity of fracture from the dynamic point of view, especially can reflect Various roles that the crack play in oil-gas reservoir development.

2) The crack's evaluation criteria is mainly reflected in the Porosity and permeability characteristic of the crack.

3) The main influence factors of the crack formation is the tectonic stress field, so through studying the tectonic stress field to forecast the crack, it may be a more

effective method.

VI. CONCLUSION

Although there are many methods to forecast and distinguish the crack, all have their limitations, owing to the complexity of the crack's formation and distribution law. The study to the fractured reservoir is still in the exploratory stage, the quantitative characterization of the crack is still a frontier subjectin petroleum geology. We should focus on doing targeted research, doing repeated practice, continuing to correct the model using the method of multi disciplinary, multi domain, multi method combination, and only in this way, can we get satisfactory results.

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