EVALUATION OF GAS CONTENT OF COALBED METHANE RESERVOIRS BASED ON SUPER-LOW-FREQUENCY ELECTROMAGNETIC EXPLORATION TECHNOLOGY

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1.Introduction

Coalbed gas content of coal reservoir is one of the most important parameters and must be fully evaluated to improve process design and performance of CBM recovery and/or $CO2$ sequestration. The traditional geophysical methods for determination of coalbed gas content are based on logging and seismic data. Although the seismic and logging technology can provide accurate data of coalbed methane gas, the cost is huge. As an important branch of geophysics, electromagnetic exploration technology draw much attention for its advantage of low cost. Therefore it is of great significance to develop an economical and practical evaluation approach for coalbed gas content by using electromagnetic method.

2．Methodology

Coal containing gas electromagnetic coupling theory insists that coal containing gas is a rheological medium. The electrokinetic effect, piezoelectric effect and SiJiePan's effect caused by the rheological medium are likely to make coal containing gas produce large amounts of electromagnetic radiation to its surrounding space, The frequency band of electromagnetic radiation produced by gas flowing is usually in low frequency.

Super-Low-Frequency (SLF) electromagnetic exploration technology is carried out on the ground using electromagnetic methods to measure physical properties of formations and fluids underground. These results are a series of curves plotted on a graph showing changes in the properties with depth.

In this paper, The SLF electromagnetic data are used to evaluate the coalbed gas content for the No. 3 coal seam in the southern Qinshui Basin (Hudi coal zones). Coalbed gas content of drilling core samples from coal seams was determined experimentally. The results, together with the SLF electromagnetic data obtained from SLF Electromagnetic exploration technology, have been analyzed by using BP neural network modeling.

3.Results

The relationships between coalbed gas content of coal reservoir and characteristics of SLF electromagnetic have been analyzed. The results showed that the signal curves collected by the SLF electromagnetic detector showed high amplitude anomalies in areas which are rich for coalbed methane, The higher the content of coalbed methane was, the more obvious amplitude anomalies of the curve showed. Besides, the depth of the high amplitude anomaly showed on the corresponding detection curve and the buried depth of coal seam were almost the same. According to geological statistics, the SLF electromagnetic data were analyzed to correlate the coalbed gas content of coal seams to the log responses. The correlation developed in this study has been applied to evaluation and prediction of coalbed gas content in the coal reservoirs of Hudi coalfields. The predicted gas contents of coal seams from representative boreholes in Hudi coalfield have been checked with well tests, showing reasonable agreements with experimental

measurements.

4.conclusion

The result developed in this study proved that the SLF electromagnetic exploration technology is effective in evaluation of the coalbed gas content.

Keyword： Evaluation Coalbed methane   electromagnetic exploration