

Current situation of domestic and foreign development of coal-bed gas

Wang Fei, Wang Yanbo, Huang Chong, Zou Pengcheng, Liu Shouhui, Cao Chenglong, Liu Yanyan

Liaoning Shihua University, Fushun, Liaoning, China 113001

Abstract:- Coal bed methane (CBM) in the coal seam is the hydrocarbon gas that mainly component methane and adsorbed on coal surface. Some Coal bed methane (CBM) free in the coal pore or dissolved in water. Coal bed methane (CBM) was emerging in nearly one hundred and twenty years of high quality clean energy. This paper is mainly introduce the characteristic of coal seam and it's differences between home and abroad ,and the current development of Coal bed methane (CBM) as well as it's exploration technology, and the method of enhancing Coal bed methane(CBM) production. This paper also compared the differences between rapid developing countries and China from the point of view of economic benefit and prospect on the development of Coal bed methane (CBM) industry in our country in the future.

Keywords:- Coal bed methane (CBM), energy, coal

I. INTRODUCTION

Today in the world about 25% of the energy was taken by natural gas and natural gas demand is still rising at a rate of about 23% a year. In my opinion, the pattern of CBM instead of natural gas as the energy is gradually revealed, coal bed methane reserves can up to 260 trillion cubic meters in the world, so countries are racing to develop coal bed methane industry. [1]Our country point out coal bed methane exploitation and utilization present situation analyses and the situation coal bed methane exploitation in the“coal bed methane development and utilization of the 11th five-year plan”. According to the plan we should make sure coal mine production safety, build a resource-conserving and friendly to the environment and general requirements of the socialist harmonious society. The plan has been clear about the principles and guiding ideology, development target, and described the future five years of exploitation and utilization of China's coal bed methane (coal gas) blueprint, and also put forward the development layout and the main task. The plan also assessed the impact to the environment, and the bases of guarantee measures. “Coal bed methane exploitation and utilization of the 12th five-year plan” analysed coal bed methane exploitation and utilization of the status and the situation, putting forward in the next five years China's coal bed methane (coal gas) development and utilization of the guiding ideology, basic principles, development goals, major tasks and safeguard measures. Due to the government's emphasis on the development and utilization of coal bed methane resources in our country, the implementation of favourable policies to make the pace of commercialization of coal bed methane industry in China is gradually accelerated.

II. BACKGROUND INTRODUCTION

The coal rake in our country has characteristics including low pressure, low permeability, low saturation, poor air permeability, soft coal seam and so on, which increases the drainage difficulty .While the coal rack abroad has easy structure ,is single layer, and is suitable for the development of coal bed gas.

country	Coal seam gas reserves ($10^{12}m^3$)	country	Coal seam gas reserves ($10^{12}m^3$)
Russia	17-113	Poland	3
Canada	6-76	England	2
China	31.46	Ukraine	2
America	11-19	Kazakhstan	1.1

Australia	8-14	India	0.8
Germany	3	South Africa	0.8

Data sources: [http //zhidao.baidu.com/question/12519374.html](http://zhidao.baidu.com/question/12519374.html)

III. EXPLORATION TECHNOLOGY

A Seismic exploration technology

Seismic exploration technology is with high resolution characteristics, at present, most cases of seismic exploration technology is mainly applied the conventional 2D seismic to the exploration of seam gas, first using the large network of 2D seismic selecting favourable targets, then encrypt at the favourable target areas to control survey network. [2]We can understand the geological structure in a certain area by using seismic exploration technique and ensure the coal-bed gas depth range and content of coal in this area. Mastering this technique can determine the well drilling and drilling location advantageous, coal-bed methane mining better. In twentieth Century 70, 80 years the United States has begun exploration of coal bed methane being based on this technology, and achieved good results.

B Basic geological technology

There is a direct relationship between production horizon and the exploitation of coal-bed gas content of coal bed gas, therefore, we need to combine data and information, the thickness of coal seam, for a certain range of coal quality, coal seam *depth, as well as the content of coal seam gas, in order to facilitate the determination of mining location.*

C Geochemical exploration technology

Geochemical exploration technique is based on the physical absorber and top air as the main method, using acidolysis hydrocarbon, heat released mercury as the auxiliary method, using geochemical small mobile laboratory field exploration on the fast physical absorber and analysis and test of top air method, a fast and reliable and applicable to the exploration of coal gasification the field analysis method. Geochemical samples 2870 acquisition in the project more than a year of study, physical sample 1162, test methods in the field testing of 1052 samples.

IV. DEVELOP OF TECHNOLOGY

A It generally used ground drilling method in not mining areas

This method refers to after do some pre-processing on coal seams in not mined coal, extract CBM by drilling.[3] So that the exploitation of CBM can be independent of outside coal mining operations.

B In the area of coal has been mined you can use the following methods

①Dig a well in gob: Prior to mining wells from the ground to about 4 meters above the coal seam position, use of coal generated when drilling work promote for the formation of cracks in the goaf, make CBM through the cracks into the mined-out area to achieve the purpose of exploitation. ②Horizontal borehole: Horizontal drilling is taken in the underground not mining area or CBM drilling in to be mined area, the length of 122 ~ 244m. There is also a level of development technology similar to horizontal borehole, it use directional drilling technique in underground coal to not mining area fight over 304.8m drilling. This method is called the long horizontal hole. ③Drainage and gas law: By extracting aquifer water to the coal seam gas has more space, Due to space gradually increased so that the pressure decreases, thus the CBM dissociation from void of coal.[3]

V. THE METHOD OF IMPROVING THE YIELD

A Hydraulic fracturing

Hydraulic fracturing techniques yield significantly, this technique is an early start in the United States, currently the most mature development, by fracturing can produce more coal longer cracks so that the CBM to adopt out more, after this technique CBM production could reach 5 to 20 times before, Canada, Australia and other countries fracturing technique are used to mine and produce a good yield, this technique is also preferred for the production of technical in china.

B The injection of carbon dioxide and recovery of CBM

Han Dexin [4]think that when multiply gas is adsorbing, competing adsorption, in coal influence each other, can make the strong adsorption ability of the gas in the gas phase concentration decrease, the weak adsorption ability of gas in gas phase concentration increase, reaching a dynamic balance. The ability of carbon dioxide adsorption are better than coal methane, so when adopted the method of gas injection before gas extraction after a period of time of adsorbing carbon dioxide and methane to get more methane from coal seam gaps. It make Coal bed methane yield that reach eighty per cent to ninety per cent and increase the production.

C The injection of nitrogen and recovery of CBM

Guo Yongyi[5], Liu Chenglun[6] conclude that coal for a variety of gas adsorption rate and adsorption capacity of how fast this order: $CO_2 > CH_4 > N_2 > H_2$, through the study of the critical temperature and the boiling point of these gases. Due to filling the nitrogen reduces the effective partial pressure of methane in coal reservoirs, can make the methane desorption from the coal seam. It makes the CBM recovery efficiency can reach above eighty five per cent.

VI. COMPARED DOMESTIC CBM ECONOMIC BENEFIT TO FOREIGN COUNTRIES

The table of methane production and social economic benefits

N.J.	Coal bed gas production (108m3)	Economic benefits (107 美元)	furnishes employment
Alabama	32	10.3	700
Pennsylvania	0.11	<0.1	<10
Virginia	9.7	1.7	200
West Virginia	0.2	<0.1	<10

Data sources: EPA, 1994

The industries of CBM succeed in the US in the 1950s. The first CBM production tested wells go into operation in 1953 in the San Juan basin of the United States. In 1980, the world's first commercial coal bed were completed and put into operation in the United States ,the production has reached 383 x 108 m3 in twenty years. In our country in 1996 issued a "CBM development of the eleventh five-year plan" and established the China United CBM Co. LTD, was awarded the CBM exploration, development and production of franchise. This marks the development of coal bed methane in our country has entered a new stage [7].

VII. CONCLUSION AND PROSPECT

We should know the geology of that region before the CBM exploration and then select the best method. Pay attention to whether the Coal Mine Area was developed or not so that we should use the best and safety ways to develop. The technique of hydraulic fracturing has been developed rapidly and became the most popular methods in enhanced oil recovery. At the same time it is also the most popular ways in china. The coal bed methane (CBM) reserves in china ranked the third in the world. Because of the special geological structure and the seam feature, the yield of each gas reservoir can't achieve the expected value. Nowadays we need more and more resources, as the new energy the development of CBM industry become more and more important.

Government has realized and make important instructions in the CBM eleventh Five-Year Plan and CBM twelfth Five-Year Plan. It creates a good environment for the development of CBM industry in China. We should use the successful experience of foreign CBM industry and advanced technology, the CBM industry would become a bright spot in the economic development of China.

REFERENCES

- [1]. You ran, Global coal seam gas have so rapid development [J] Chinese oil companies,2012,(03),pp.54-55.
- [2]. Li jingming, Chao haiyan, Nie zhihong, a compendium of developing CBM—a case study from developing CBM in Ordos Basin [J]. gas industries,2011,(12),pp.79-84+141.
- [3]. Zhao guangyu, Study on improvement of CBM reserves [J].shanxi coal,2004,(03),pp.20-22.
- [4]. Han dixin ,Tang shuhuan, the adsorption/desorption of multicomponent gas by coal[J]. Technology of coal, 2002,30(1):58-60.
- [5]. Xu longjun, Liu chenglun, Injection production method to improve the recovery of coalbed methane[J]. Journal of Chongqing University,2000,23(6):42-44.
- [6]. Guo yongyi, Wu shiyue. Discussion on the development of coalbed methane gas injection mechanism [J]. Journal of Taiyuan University of Technology,2000.31(4):361-363.
- [7]. Ma zhengyan, Yang changing, Successful experience and Enlightenment of the United States of America CBM industrialization:[J]. China's economic resources, 2007,(04),pp.31-33+50.