Current Status and Prospect of Development and Utilization of Coal Mine Methane in China

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Abstract:

China has abundant coal and coalbed methane reserves. However, there is a long way for us to go in development and utilization of coalbed methane in the world. The paper describes coalbed methane reserves, development and utilization situations. It also presents a clear vision of the prospect of future utilization.

Keywords: China; coalbed methane; development and utilization

1. Introduction

Coalbed methane (CBM), also called coalbed gas, contains methane (above 85%) and is formed in the conditions of high pressure and anaerobic along with the formation of coal. It is adsorbed on the coalbeds and becomes CBM. In coal mining process, because of pressure relief of coal, the adsorption of equilibrium condition is damaged, and lots of coalbed methane (CBM) will be released.

CBM is always regarded as arch criminal of causing coal mine safety accidents. However, in recent years, along with the situation of the world energy remained tight, we have realized that CBM as a clean and economy energy can effectively relieve the world energy crisis. The thoughtway to treat the CBM is gradually changed from "pumping" to "use". Since 1970s, some major coal-producing countries are involved in this field, a lot of research and experimental work have been done on the exploration and development theory, mining application technique and achieve outstanding achievements, which make this industry develop rapidly.

China is abundant with coal and CBM resources. With the development of industry and improvement of people's living standard, an increasing number of mining companies and energy producers have attached importance to the extraction and utilization of CBM in order to reduce greenhouse gas emissions,

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increase clean energy. CBM, an independent and new energy mineral, belongs to unconventional natural gas resources and has a wide range of applications and high rate of commercial value. From the consideration of energy strategic, CBM is an important energy to replace conventional gas energy in China[1-2]. Especially against the backdrop of our country strongly advocated the development of green economy and low carbon economy, the exploitation and utilization of CBM have a great significant in economic, social and environmental.

2. CBM Resource

2.1. CBM resource in the world

According to the international energy agency statistics and Chinese CBM resource evaluation result, global CBM resource could be more than 260×10^{12} m^{3} and 90% of the distribution is in 12 major coal-producing kingdom and Russia, Canada, China, America and Australia's CBM resource exceed 10×10^{12} m^{3} (table1).

<table>
<thead>
<tr>
<th>Countries</th>
<th>The coal resources (×10^{12} t)</th>
<th>CBM resource (×10^{12} m^{3})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russia</td>
<td>8.5</td>
<td>17~113</td>
</tr>
<tr>
<td>Canada</td>
<td>7</td>
<td>17.9~76</td>
</tr>
<tr>
<td>China</td>
<td>5.95</td>
<td>36.8</td>
</tr>
<tr>
<td>America</td>
<td>3.97</td>
<td>21.2</td>
</tr>
<tr>
<td>Australia</td>
<td>1.7</td>
<td>8~14</td>
</tr>
</tbody>
</table>

2.2. CBM resource in China

All tables should be numbered with Arabic numerals. Headings should be placed above tables, left justified. Leave one line space between the heading and the table. Only horizontal lines should be used within a table, to distinguish the column headings from the body of the table, and immediately above and below the table. Tables must be embedded into the text and not supplied separately. Below is an example which authors may find useful.

On the tectonic evolution stages of our country, there are several phases of coal-accumulating processes and produced numerous coal-bearing basin and coal deposits which creat good conditions for the formation and reservoir of CBM [3].

2.2.1 CBM resource

Shallow buried (above 2000m) of CBM resources in our country is 36.8×10^{12} m^{3}, more or less alike the natural gas of our country. According to the calculation, 1000m^{3} of CBM is equivalent to a ton of standard coal and its calorific value is above 8000Cal/m^{3}. According to this estimation, the CBM reserve of our country is equivalent to 350×10^{8} ton of standard coal or 240×10^{8} ton of oil.

2.2.2 The distribution of CBM

Over a large area, Chinese CBM resource is mainly distributed in the eastern, central, western and southern. Geology resource is 11.3,10.5,10.4 and 4.7 trillion cubic meters, respectively, occupies 31%,28%,28% and 13% of our country. The region of Qing Hai-XiZang has 44.3 billion cubic meters, occupies 0.01%. Recoverable resource is 4.3,2.0,2.9 and 1.7 trillion cubic meters, respectively, occupies 40%,18%,26% and 16% of our country.
3. The Current Situation of CBM Exploration and Utilization

3.1. The technology of coal gas extraction

In recent years, our country has made great progress in gas drainage theory and engineering practice, and has formed a complete system of borehole extraction technologies, suitable for all kinds of geological condition of CBM extraction. Which is commonly used in underground extraction technologies including roadway level extraction, adjacent layer extraction, goaf extraction and comprehensive extraction.

3.2. Ground CBM exploration and development technology

After more than 20 years introduction, digestion, absorption, independent research and development, the ground CBM exploration in our country has made substantial progress in the geophysical exploration technique in CBM, coalbed methane drilling technique and CBM well completion technology, coalbed methane production technology, especially in the appropriate to the country’s high metamorphic anthracite CBM exploration techniques, etc.

3.3. The current situation of CBM exploration and utilization in China

3.3.1 The important significance of CBM exploration

Firstly, the development and utilization of CBM can improve safety production in coal mine, and increase economic efficiency. Coalbed methane can be produced in the process of coal mining which is called "gas". Gas accident is one of the biggest threats in coal mine safety production. CBM should be gathered before coal mining which can be helpful to prevent coal gas accidents from the root and improve safety conditions in the mines. At the same time, this can reduce mine construction fee (tunnel construction and ventilation cost reduce 1/4 or so), so as to improve the production efficiency and economic coal mine benefit and improve the social image.

Secondly, the development and utilization of coal bed methane can improve China’s energy structure and increase the clean gas energy to a certain extent.

Thirdly, the development and utilization of coalbed methane can be effectively reducing greenhouse gas emissions and improve the atmospheric environment. Coal bed methane (methane) is a greenhouse gas, which greenhouse effect is as 20 to 24 times as CO\textsubscript{2}.

Finally, the development and utilization of coalbed methane will also boost the development of related industries.

In summary, the development and utilization of coalbed methane can not only ease the contradiction between energy supply and demand, to some extent improve the energy structure, protect coal mine production safety and improve the global atmospheric environment. Meanwhile, the coalbed methane industry will become a new growth point of China’s national economy.

3.3.2 The relevant policies of China CBM development and utilization

For the development of coalbed methane and related industries, the state enacted many policies from different levels of development and perspectives. In 2005, the eight ministries jointly promulgated the "implementation opinions of control and utilization of coal mine gas", specifically mentioned "protect what we could, pump what should be exhausted, pump before mining, pump together with mining". June 15, 2006, "the State Council opinion on accelerating the use of CBM extraction" proposed properly address the problem of coal bed methane and coal resources cross-mining. April 17, 2007, the Ministry introduced the "notice about coal and CBM resources on strengthening the comprehensive survey and exploration management", which supports pumping together with mining. Along with the 12th Five-Year
Plan will soon introduce, increase investment in coalbed methane, mining technology improvements contribute to increasing exploitation and develop new technologies to use the previous venting gas.

4. Utilization of Coalbed Methane

Nineteen coal-producing provinces and cities in China coal mine gas drainage accumulated 6.45 billion cubic meters, the use of 1.93 billion cubic meters is far below the world average of 50% utilization in 2009. Build eighteen mining area in 2010, each CBM extraction is more than 1 million cubic meters. There are more than 2 million civilian users. CBM power generation capacity is more than 150 million kilowatts. However, utilization of coalbed methane gas is mainly for living, power generation and industrial gases, has not meet high-value use, such as chemical raw materials. Target is to build thirty six mining area of billion cubic drainage and utilization level till 2015.

5. Prospects

The natural gas industry will be the rapid development in the coming decades in China. Project of natural gas transmission from West to East China gives a golden historical opportunity to coal-bed methane industry. "West-East" pipeline need 1 trillion cubic meters of natural gas geological reserves as a guarantee. However, there is only about 700 billion cubic reserves of conventional natural gas, which needs additional gas source. CBM as unconventional natural gas, whoes composition is more than 95% methane, can be mixed with natural gas output and using. Besides, "West-East" pipeline through the region is also rich in CBM resources. For example, the Large-scale CBM Field Qin shui is priority to the exploitation of coal bed methane resources in the short term, which is the most realistic and feasible. Accordingly, China's CBM industry, once formed and developed, related industries will bring huge opportunities and economic benefits.

6. Conclusion

How to utilize coal-bed methane rationally and effectively is a serious issue in front of us. By analysis the utilization of coalbed methane of domestic and foreign, we can easily find, to vigorously promote the development of coal bed methane, we need to do the following means.

- Government need to formulate a scientific CBM development planning strategy, which can make CBM industry in a orderly, efficient and coordinated development.
- Government incentives to support, relevant laws and regulations to encourage and the formation of open and guide markets will help the development of China's CBM industry.
- Technology innovation is the key factor to the formation and development of coalbed methane industry. Pay close attention to the scientific and technological progress from the height of industrial development. Whether to identify suitable exploration and development of core technical to our geological conditions has an important influence on the success of CBM industry in China.
- Improve the relevant infrastructure, especially natural gas pipeline construction, which plays an essential role to the latter part of the sales and market of coal bed methane.

References