

Outlook for China's Coal Mine Methane Reduction Mitigation

**Fan Weitang Academician
Chairman China National Coal Association**

The concentration of greenhouse gas in the global atmosphere is increased by the production activities of human society and it becomes the main reason of global climate change. Coalbed methane (with main composition of methane) discharged to the atmosphere in the process of coal mining is a major emission source.

China is one of the developing countries that has rich coal resources. The proven recoverable coal reserve in China is 114.5 billion tons that is equivalent to 17 times of the cumulative total proven oil and natural gas reserves calculated by the heat value. Coal production in China last year was 1.394 billion tons and it's expected to reach 1.6 billion tons this year. The discharged coalbed methane will be simultaneously increased along with the increase of coal production.

In the past 50 years, the method of pre-drainage practiced widely in China's coal mines with high gas concentration for the purpose of preventing gas explosion accident. Meanwhile, coalbed methane is a usable clean energy. The development and utilization of China's coal mine methane in recent years has progressed rapidly which has significant importance to the reduction of green house gas emission, to the improvement of energy structure as well as the improvement of coal mine safety.

1. Favorable foundations for the reduction of green house gas emission in China's coal mines

Since 1980's, the issue of global environment has aroused concerns of all the nations in the world and the reduction of green house gas emission has become an important environment topic. According to related research reports by United Nations Development Programme (UNDP) and U. S. Environmental Protection Agency (US EPA), the annual methane emission in China's coal mines is as high as 12 billion m³.

Gas explosion is the main disaster in coal mines. For the purposes of coal mine safety and the control of gas emission accidents, it started to practice coalbed methane underground drainage from 1950's in China. Tremendous progresses had been achieved since then and coalbed methane drainage amount has been increased year by year. In 2002, there were 193 coal mines of 53 enterprises developed methane drainage with total drainage amount of 1.146 billion m³, which was increased 16.9% of the total in 2001. (Shown in Fig. 1 Coalbed Methane Drainage Amount in China by years)

By decades of underground drainage practices, we have obtained rich experiences on the drainage and the drainage technologies are fairly matured. Generally, it includes the drainage technologies as follows: by the target zone of drainage, it includes drainage in production zone, in adjacent zone, in gob areas and in surrounding rocks; by drainage methods, it includes the method of borehole extraction, roadway extraction, combined extraction method and surface vertical well extraction; by the relations between coal mining and drainage, it includes pre-drainage prior to the mining, mining while drainage, production while drainage and post-drainage. (Shown in Fig. 2 The Schematic Diagram of Drainage Methods)

In some of the coal mines in China, fairly perfect gas utilization systems have been set up. The underground gas drainage system has been combined with its surface utilization system to supply the extracted gas as residential use for the families in the mining areas, so as to reduce methane emission to the atmosphere and realize the multi-benefits of methane utilization at the maximum extend. It is convenient to use coalbed methane as residential fuel and it can obtain better economic benefits. Therefore, the

preferential selection of coalbed methane utilization is for household use and is followed by power generation and chemical feedstock. The aforementioned utilization methods have been well practiced in China. For example, Fushun Mining Group Corp. Ltd. can supply gas to residents in Shenyang and Fushun for a long term; coalbed methane fired power plant of Jincheng Anthracite Coal Group Corp generates power by gas turbine using methane underground extracted and has achieved favorable economic benefits. It's planned to construct a methane fired power plant with the capacity of 120MW and the power capacity will be the largest one in the world. All these projects have been playing a positive role in the reduction of greenhouse emission and will lay a sound and solid foundation for future development.

In recent years, China has conducted a series of international cooperation projects in the field of coalbed methane development and utilization. Through the exchanges and cooperation with foreign companies and international organizations, it has increased the international technology transfer and has achieved favorable results in the fields of environmental protection and economic promotion.

In 1991, United Nations Development Programme decided to provide China with an assistant project of "The Improvement of Coal Utilization Efficiency and Environment". The sub-project of China Coalbed Methane Resources Development under the assistant project was transferred to the project of Global Environment Facility (GEF) in 1992 and was funded US\$10 million by Global Environment Facility. The project consisted of three coalbed methane development demonstration projects by Songzao Mining Administration, Kailuan Mining Administration and Tiefa Mining Administration as well as the project of China's Coalbed Methane Resources Evaluation by China National Coal Research Institute, Xi'an Branch. The implementation of the project has laid a foundation for the realization of coalbed methane commercialization in China.

U.S. Environmental Protection Agency (USEPA) has been actively supporting the recovery and utilization of China's coalbed mine methane, supporting the establishment of China Coalbed Methane Clearinghouse under China Coal Information Institute, helping the investigation on China's coal mine methane emission, collecting and disseminating related coalbed methane data and information, conducting project feasibility study and economic evaluation, recommending some prospective coal mine methane projects, publishing the magazine of China Coalbed Methane as well as organizing international workshops and technical trainings that have promoted the international cooperation for coalbed methane development and utilization.

In 1996, Asian and Pacific Economic Cooperation (APEC) selected Tiefa Mining Administration as the location for the establishment of China's coalbed methane utilization demonstration project. The project was transferred to Japan "Green Aid Project"(GAP) in 1997. The project was completed in 2002 including underground coalbed methane drainage, utilization, and transportation and distribution systems.

The aforementioned international cooperation projects have brought internationally advanced technologies, equipments and experiences for China's coalbed methane utilization and development and have improved the organic union of coalbed methane reduction mitigation and its recovery and utilization.

2. Existing preferential policies for the development and utilization of China's coal mine methane resources

The Chinese government has formulated a series of policies to support coalbed methane development . First of all, the development and utilization of China's coal mine methane resources is in line with the strategies for the reduction of green house gas emission by the Chinese government. The Chinese government has actively participated in international green house mitigation actions. China National Coordinating Committee on Climate Change Policy was established in 1998 that is the inter-section coordinating organization on the issues of climate change policies; Premier Zhu Rongji announced in the

Global Sustainable Conference the agreement and approval of Kyoto Protocol by the Chinese government on September 3, 2002. The project of “The Construction of China’s Implementation of CDM Mechanism” that was organized by Climate Change Office of China State Development and Reform Commission has determined three preferential fields which included renewable energy, energy efficiency and coalbed methane.

Secondly, the development and utilization of coal mine methane is the requirement of coal mine safety production. In order to improve the level of China’s coal mine safety production, China National Coal Association and China State Administration of Coal Mine Safety Supervising have jointly held the site meetings in Tiefa coal mine and Jincheng coal mine to specifically straighten out and improve coal mine safety in two consecutive years. In the site meeting in Tiefa coal mine in 2002, it summarized and forwarded the strategy of “pre-drainage prior to the production, supervising and control, determining production by ventilation”. It once again emphasized the important position of coal mine methane drainage in coal mine safety production and popularized the advanced experience of underground methane drainage by Tiefa Mining Administration, Jincheng Mining Administration and Yangquan Mining Administration and some other mining areas. In order to improve the current status of China’s coal mine safety thoroughly, the Chinese government input RMB ¥2 billion state bonds in 2003 and plans to input RMB ¥2.2 billion capital in 2004 for coal mine safety production and the majorities of the input will be used to improve underground coalbed methane drainage system in coal mines. The measure has provided powerful guarantee for coal mine methane projects.

Thirdly, the development and utilization of coal mine methane can enjoy a series of preferential policies. The recovery and utilization of coal mine methane is included in the projects to be supported and encouraged by the state that is clearly incorporated in the documents of Catalogue of Resources Comprehensive Utilization, Catalogue of Industries, Products and Technologies Encouraged by the State and Guidance Book for Industries with Foreign Investment and it can enjoy lots of favorable policies in the aspects of investment, construction permission and taxation. For example, the project of underground coalbed methane utilization in coal mines in China is included in the comprehensive utilization of waste gas that can enjoy favorable policy on income tax and the maximum favorable will be the exemption of income tax in 5 years after the project is put into production. The income tax for surface coalbed methane development project will be exempted in the first two years and then 50% will be imposed in the following three years after the project is put into production, and import duty and import related duty are exempted. All the preferential policies have created a favorable external environment for the reduction of coalbed methane emission.

3. Broad Prospect for China’s coal mine methane reduction mitigation

Oil and gas resources in China are in short supply but coal resources is abundant in the country. The proved reserves of oil and natural gas account for only 7.6% of the total proved fossil energy reserve but coal accounts for 92%. It’s preliminarily estimated that coalbed methane resources in China is approximately 31 trillion m³. The Chinese government attaches great importance to the development of coalbed methane industry and selects it as the backup resources for China’s oil and natural gas resources. “The preferential selections of China’s coalbed methane favorable regions and the study on key technology for exploration and development” has been listed as the sub-subject of “Study on key technology for China’s oil and gas resources development” under the scientific research program in China’s 10th “Five-Year Plan”. Coalbed methane underground drainage in the production mines and the development and utilization of coalbed methane resources in abandoned coal mines are the important contents to be studied.

In view of the market of utilization, it's predicated that gasification rate in main urban cities in China will reach 85-90% in 2020 which shows huge market potential. Reform in power industry in China is underway. In order to keep a certain growth rate of the national economy, it's necessary to maintain 5% growth in power industry. Thus, the investment for power market is numerous. At present, both residential use and power generation projects by underground extracted coalbed methane have brought fairly good economic benefits.

In a long time, the economic benefit for China's coal enterprises is relatively poor. But in recent years, with the favorable turn of coal market, its economic benefit is getting better and better. The development and utilization of coalbed methane resources has obvious social benefit and the input of environmental fund has brought new opportunities for the development and utilization of coalbed methane resources.

Currently, total underground drainage amount of coal mine methane reaches 1.145 billion m³. However, the average drainage rate is approximately only 23% in all the coal mines implementing drainage activities that exists a certain distance with those in foreign countries. It needs to strengthen research and increase the input in the aspects of improving drainage technology and upgrading the drainage equipment to improve drainage efficiency, to increase utilization amount and to reduce coalbed methane emission in coal mines.

The concentration of ventilation air gas in coal mines is pretty low but the total capacity is huge. Research and practice in the field is still a blank space in China. According to a study by U.S. Environmental Protection Agency, the amount of ventilation air gas in China in 2000 was 12 billion m³. The annual ventilation air gas is equivalent to 92.30 million tons of CO₂. Thus, it has huge potential for the utilization and mitigation of coal mine ventilation air gas.

China Coal Information Institute and U.S. Environmental Protection Agency have jointly made complete and detailed investigations on coalbed methane resources in all mines in China, and the current status of coalbed methane drainage and utilization, coalbed methane market as well as the proposed coalbed methane projects. On the basis of the investigations, it forwarded eight most preferential areas for coalbed methane development as follows: Jincheng Mining Administration, Fushun Mining Administration, Panjiang Mining Administration, Jiaozuo Mining Administration, Pingdingshan Mining Administration, Yanquan Mining Administration, Huainan Mining Administration and Huaibei Mining Administration. (Shown in Fig. 3 The distribution of eight preferential coal mines). The projects of coalbed methane development and utilization in the eight mining areas have promising future. Decades of foreign companies have talked potential cooperation over with the eight mining administrations and progresses have been achieved respectively.

In conclusions, the reduction of green-house gas emission is of vital importance to the human being. To reduce green-house gas emission caused by human activities will benefit international society now and forever. The development and utilization of coal mine methane will reduce green-house gas emission, improve coal mine safety production and increase clean energy. We sincerely welcome all foreign companies, international institutions and organizations to cooperate with China's coal mines for the development of coal mine methane projects, for the promotion of coal mine methane reduction mitigation and to make due contributions to the protection of our beautiful homeland – the earth.

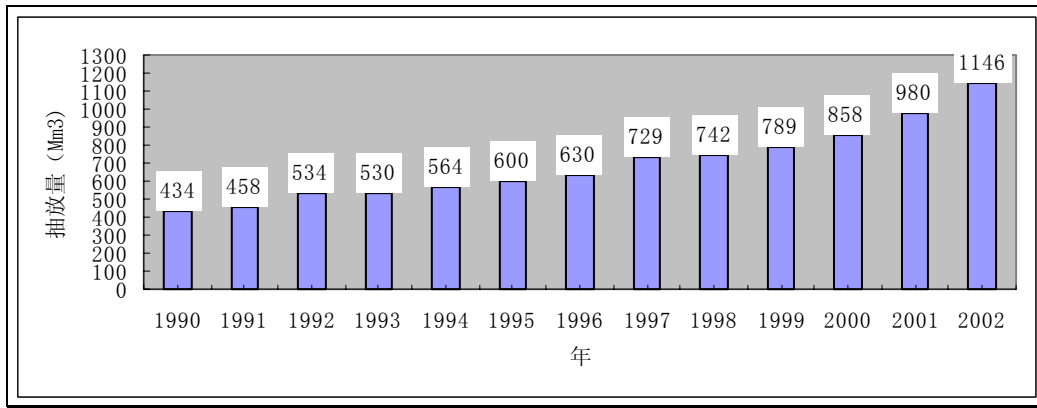


Fig 1. Coalbed Methane Drainage Amount in China by Years

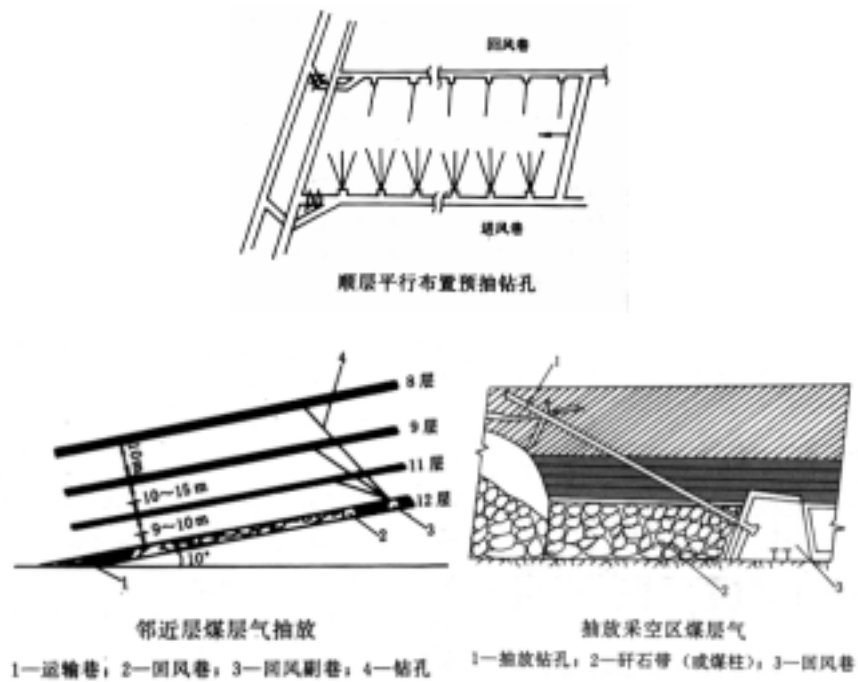


Fig.2 Schematic Diagram of Drainage Methods

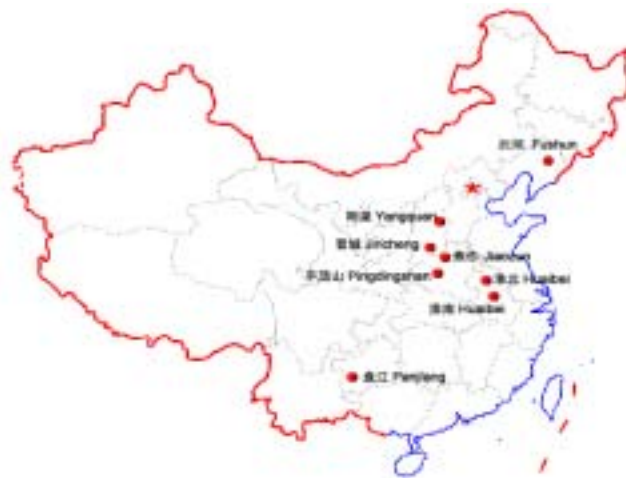


Fig.3 The Distribution of Eight Preferential Coal Mines