POTENTIAL USES OF COAL MINES METHANE OBTAINED FROM CBM DRAINAGE

One of the major decisions facing a mine owner, when considering the implementation of a CBM drainage program is the potential use for the gas. The gas is a clean energy resource. However, the location of the mine and the ability to convert the gas into a marketable product may severely test the mine planners' perseverance in finding an economic way of using the gas and producing the accompanying reduction in greenhouse gases. Here we would try to outline some possibilities for the gas whether it is a high-Btu, medium-Btu, or low-Btu product.

(1) High-Btu Gas (> 950 Btu/scf) – High-Btu gas is generally defined as having enough heat content to be used in a natural gas pipeline. Several potential uses exist for high-Btu gas. If the drainage system provides primarily CH4 and little in the way of inert gas, the product may be gathered, compressed, and marketed to a pipeline company. This is one of the most desirable options if natural gas pipelines are located near the mine. Thus, marketing of coal mines methane to a pipeline company would be a very desirable goal.

In case, pipelines are not readily available or the pipeline companies are not ready to buy coal mines methane, several other options are available for high-Btu gas. The first of these would be to use the gas as a feedstock to produce ammonia, methanol, or acetic acid. Currently, these chemicals are produced from natural gas, but coal-bed methane would be equally useful if it is available in sufficient quantities and if the chemical plants were in a favorable location. Another potential method of using CBM would be to compress or liquefy it for use in buses, trucks, and automobiles. This implementation has been successfully used in many of the CIS countries like Ukraine, Czech Republic etc.

(2) Medium-Btu Gas (300 to 950 Btu/scf) – There are many possible uses for medium-Btu gas. If the gas is at the high end of the heat content scale, enrichment by blending with a higher-quality gas or 'spiking' of the gas to produce a gas of pipeline quality is possible. Enrichment is the removal of gases like nitrogen, oxygen, and carbon dioxide to improve the heat content of the gas. 'Spiking' is the process of combining another fuel gas (like propane) with the methane to increase the heat content. Spiking will normally be economic only if the supplement gas is available cheaply in the area. A major and growing use of medium-Btu gas is as a substitute for other fuels in space heating and other applications where natural gas, fuel oil, or coal is normally used. For example, CBM can be used for heating mine facilities, heating mine intake air, heating greenhouses and institutional facilities, as a heat source in a thermal dryer and as a heat source for treating brine water.

Another use for medium-Btu methane is in electric power production. Using methane in coal-fired utility and industrial boilers and as a supplement to natural gas in blast furnaces is common where methane is extracted from coal mines.

(3) Low-Btu Gas (< 300 Btu/scf) – In most cases, these mines, where low-Btu gas is available, handle methane using ventilation alone and the gas is released into the atmosphere with the exhaust air of the mine. The concentration of methane is below 1%, making it impossible for use as a primary energy source. However, the option of using this waste energy is favorable under the right conditions and should be considered where the mine and a production facility can be located close to each other.

E. Environmental issues related to CBM drainage – The core environmental issues related to CBM drainage are listed below:

(1) Groundwater table draw down due to pumping large quantities of groundwater;

(2) Disposal of large volumes of produced water;

(3) Methane contamination of shallow groundwater;

(4) Noise pollution from compressors and other sources;

(5) Air pollution from compressor exhaust gases, methane leakage, and dust; and

(6) Surface disturbance from construction of roads, pipelines, and other facilities.

In CBM production, water is produced in large volumes and must be disposed of. Because waters produced from coal beds are often fresh and subsurface disposal is expensive, disposal to surface drainages, wherever possible, carries a strong economic incentive. Such disposal may erode soils and sediments, change microclimate, create unsustainable aquatic habitats, or salinize soils. Additionally,

the organic and inorganic chemistry of coal waters has not been studied comprehensively; dissolved contaminants in coal waters, such as phenols or arsenic, may damage the environment.

F. Summary and Conclusion - CBM is a potentially important energy resource in many of the major coal mining countries of the world. Significant volumes of CBM are exploited worldwide with most of the gas originating from operational deep coal mines, and lesser quantities recovered from abandoned mine workings. Many coal-producing countries are now looking at the potential for wider application of CBM technologies to maximise the exploitation of gas from coal seams. CBM is a clean fuel with similar properties to natural gas when not diluted by air or other non-combustible mine gases. CBM can be recovered from coal seams by:

- Drainage in working coal mines (CMM),

- Extraction from abandoned coal mines (AMM),

- Production from unmined (virgin) coal using surface boreholes (VCBM).

The characteristics of each of these CBM sources are different in terms of reservoir characteristics, production technology and gas composition. The principal constituent of CBM is methane (typically 80-95%), sometimes with lower proportions of ethane, propane, nitrogen and carbon dioxide (CO_2). The gas produced from coal mines consists of mixtures of methane and higher alkanes, water vapour, air, nitrogen (deoxygenated air) and CO_2.

CBM technologies are being developed in Australia and North America with emphasis on VCBM production and CMM utilisation options. Technologies for using methane in ventilation air are receiving attention in the USA and developments are being pursued in Australia, Canada and Sweden.

Summery of specific options for utilization of Coal-bed methane from mines:

a. Power Generation – CBM can be ideal fuel for co-generation Power plants to bring in higher efficiency and is preferred fuel for new thermal power plant on count of lower capital investment and higher operational efficiency.

b. Auto Fuel in form of Compressed Natural Gas (CNG) – CNG is already an established clean and environment friendly fuel. Depending upon the availability of CBM, this could be a good end use. Utilization of recovered CBM as fuel in form of CNG for mine dump truck is a good option.

c. Feed stock for Fertilizer – Many of the fertilizer plants in the vicinity of coal mines where coal-bed methane is drained, have started utilizing fuel oil as feedstock for its cracker complex.

d. Use of CBM at Steel Plants – Blast furnace operations use metallurgical coke to produce most of the energy required to melt the iron ore to iron. Since coke is becoming increasingly expensive, in the countries where CBM is available, the steel industry is seeking low-capital options that reduce coke consumption, increase productivity and reduce operating costs.

e. Fuel for Industrial Use – It may provide an economical fuel for a number of industries like cement plant, refractory, steel rolling mills etc.

f. CBM use in Methanol production – Methanol is a key component of many products. Methanol and gasoline blends are common in many countries for use in road vehicles. Formaldehyde resins and acetic acid are the major raw material in the chemical industry, manufactured from methanol.

g. Other uses – Besides above, option for linkages of coal-bed methane produced by coal mines, through cross country pipe lines may be considered.

Source : http://saferenvironment.wordpress.com/2008/10/15/coal-bed-methane-cbm-drainage-from-underground-coal-mines-%E2%80%93-safer-and-eco-friendly-option-of-green-energy/