

COAL BED METHANE

E-Content
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Sem - IV
MGELEC-I (Fuel)
Elective Paper

What is CBM ?

- *CBM is simply Methane (CH₄) found in coal seams found during Coalification process.*
- *CBM is a gas for which Coal acts both as a SOURCE and as a RESERVOIR ROCK ,*
- **Formation of coals (decomposition of plant debris in swampy areas, coalification) => results in by products like Methane + Water**
- Due to **high pressure** of the overlying sediments over the coal seam, the coal gas is **adsorbed in the solid matrix of coals (ca. 90 % of CBM is adsorbed)**
- The storage capacity of CBM is generally affected by **the Temp, Pressure, Coal rank, Moisture, Porosity, Permeability, & Depth of occurrence.**
- CBM is present as **semi-liquid in the joints of coals (CLEATS)**
- It contains **lighter HC like Propane & Butane, some CO₂ (called SWEET GAS because it has no Hydrogen Sulphide, H₂S)**
- The Concentration of **CBM increases with increase in rank of coal (maturity)**

Extraction of CBM

- Gas is held within the coals due to **Hydrostatic Pressure**.
- **Pumping out of water lowers the Hydrostatic Pressure** and gas **Desorbs from the coal** in cleats and Fractures to flow to the surface.
- Methane (CBM) can be extracted from the coal seams by the process of **Desorption**, according to which the **Initial Reservoir Pressure** is reduced, by **Dewatering**, to the **Critical Desorption Pressure**.
- As the **pressure gets reduced**, the Coal Seam releases the CH₄ gas.
- The **Abandonment Pressure** is the lowest pressure at which no more CBM (Methane) can be produced.

- ***Before an exercise for the extraction of CBM is undertaken, an estimate of the reserves of CBM Gas is made.***
- ***As the CBM gas is found at shallower depths, drilling is cost effective.***
- ***Normally, **Directional Wells** are favoured for **CBM reservoir** as it can lead to the production of large amounts of Gas economically.***

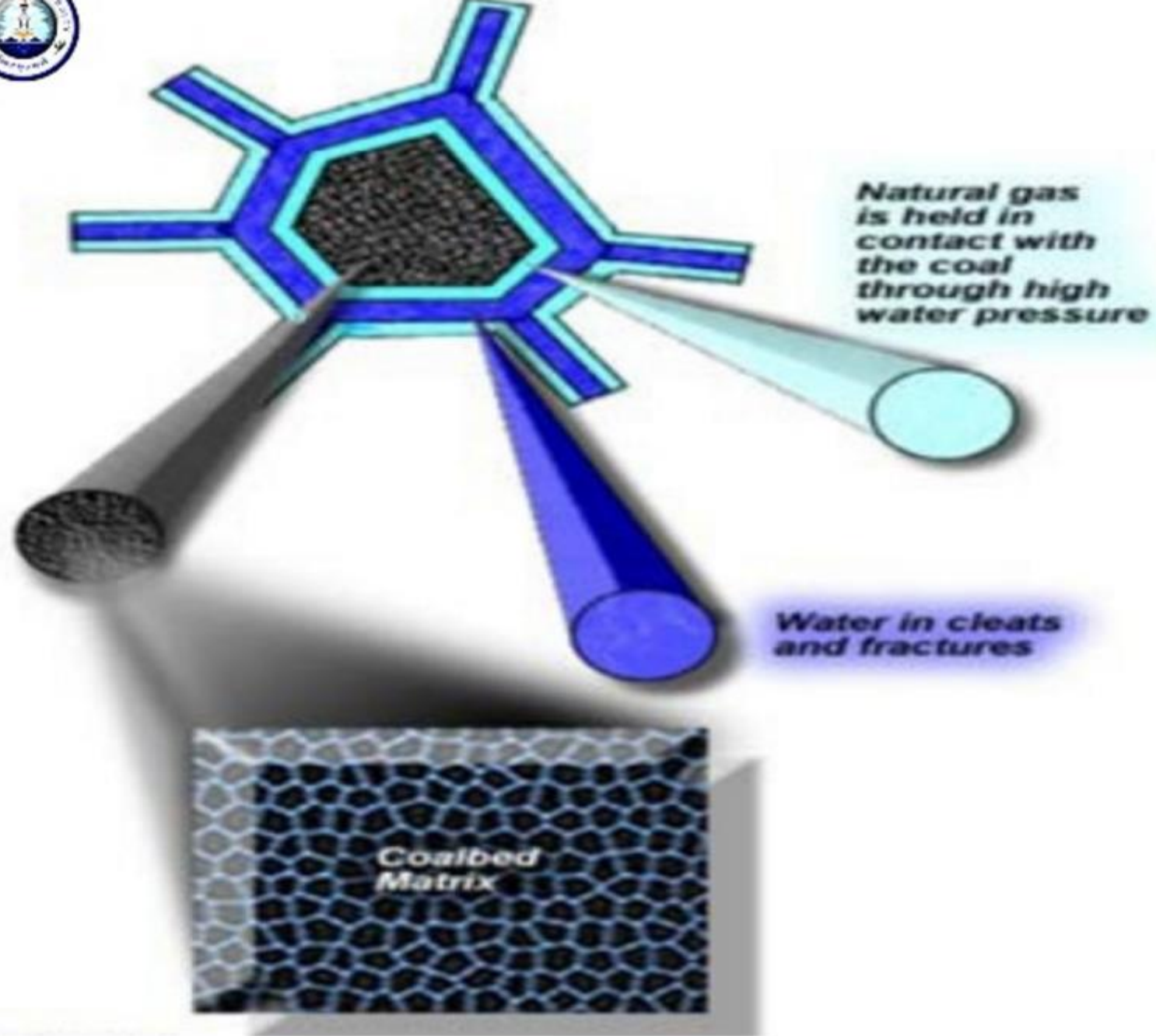


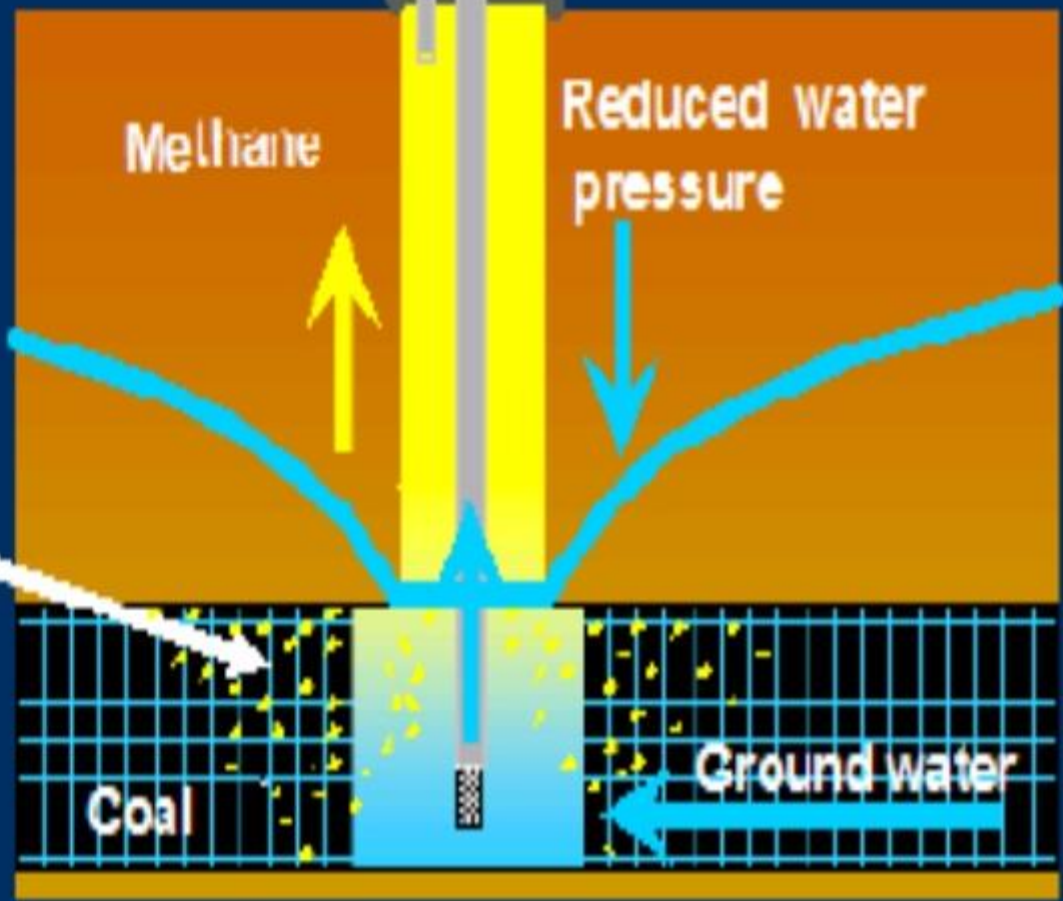
Figure :
Coal Bed Matrix illustrating gas surrounding the coal bound by water and rock



CBM WELL CONSTRUCTION

METHANE
(to pipeline)

WATER
(discharged)



Methane Released from Coal at:
10% to 60% reduction in head or about 29 psi to 110 psi

Figure:
CBM Well Construction

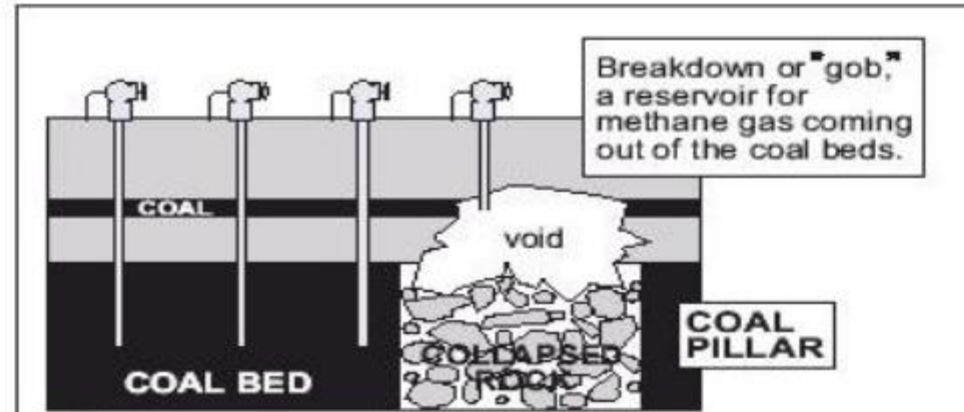
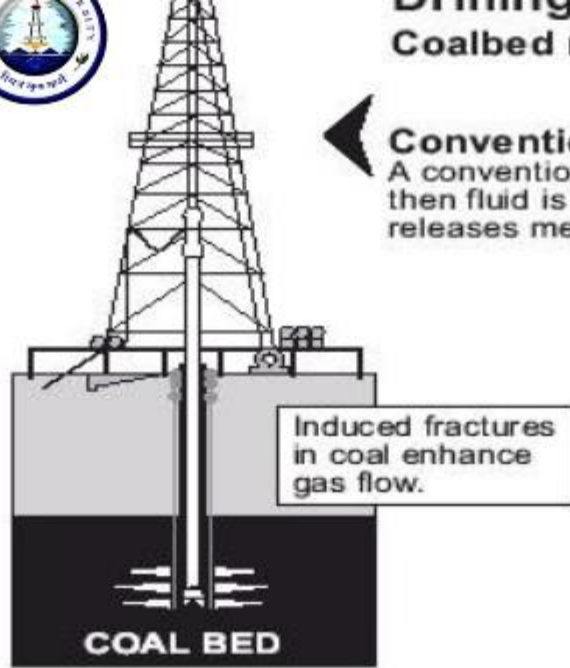


Drilling for methane gas in coal

Coalbed methane can be extracted from coal in several ways.

Conventional drilling

A conventional well like those used for natural gas is drilled, then fluid is forced down the well to fracture the coal, which releases methane gas.



Drilling before mining

Wells are drilled before mining, releasing some methane and reducing the risk of explosion. After a seam is mined, pillars are pulled, causing a collapse called a gob. The gob forms a reservoir for methane. Wells can also be drilled in the gobs of old mines.

Horizontal drilling

A motor behind the drill bit can be twisted to drill horizontally into a coal seam, which is fractured to produce methane.

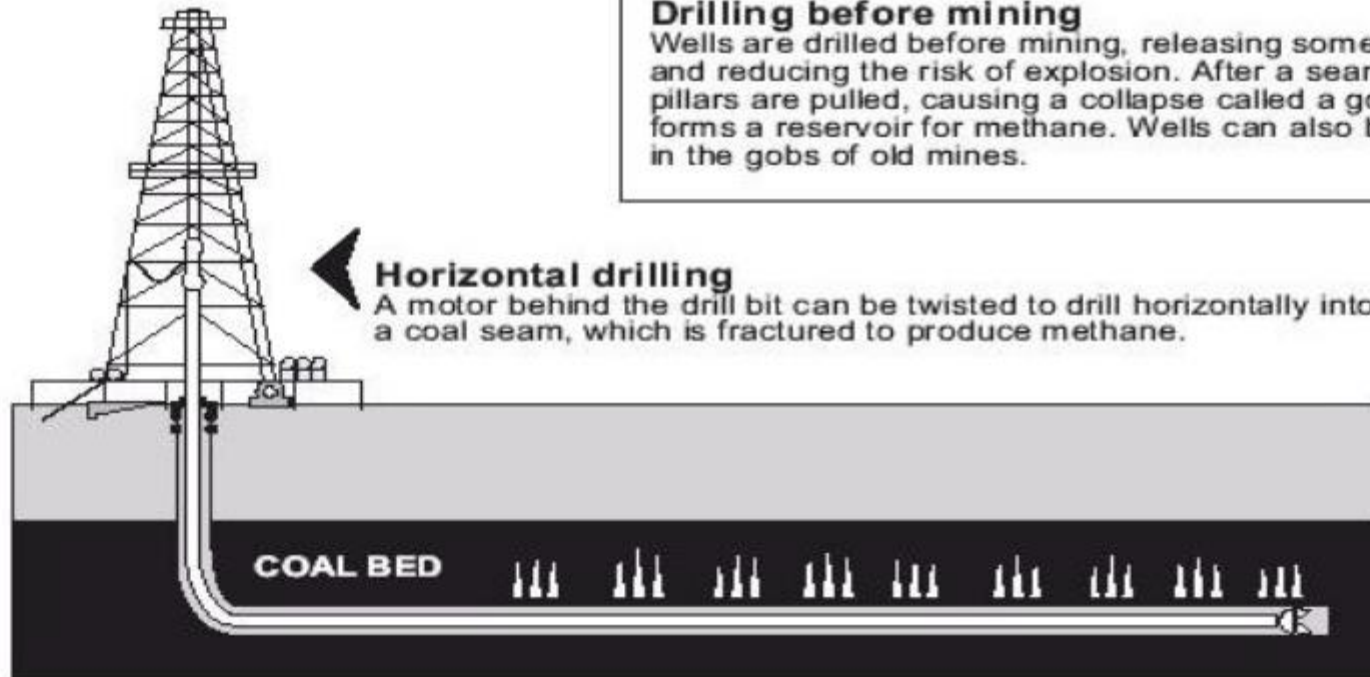


Figure:
Drilling for
methane
gas in coal

CBM Resources in India

- Govt. of India formulated a **CBM Policy in 1997**
- Offered **CBM acreages for CBM exploration & exploitation** through competitive global bidding.
- Coals abound in India in the **Tertiary, Mesozoic (Cret.) & Paleozoic (Permian) rocks**
- Some of the **Gondwana CF** like **Jharia, E.Bokaro, Raniganj, Karanpura and Sohagpur** are known for **quality coals have CBM prospects**.
- But, it is **only the Permian coals** that have large **intermediate rank coal reserves** at **suitable depth range in Barakar Formation** only which has large number of thick coal seams.
- Methane hydrate exploration in **Krishna-Godavari & Andaman-Nicobar** islands also has potential. (See Next Slide)
- **Data in Tertiary basins** are usually lacking on account of **greater depths of occurrence** and **lack of exploration for methane in the lignites**.
- Of the **total 253 BT coal resource** in the Indian Gondwana, only **about ¼ th lies ca. 600 m viable mineable depths (available for CBM exploration)**.

INDIAN RESERVES

Identified Blocks/Coalfields	Reserves (in BCM)	Reserves (in TCF)
Rajmal, Jharkhand	158	5.58
Birbhum W.B	50	1.77
Sohagpur	16.72	0.59
Singrauli Main Basin, MP	31	1.1
Tatapani-Ramkola, Chhattisgarh	53.78	1.9
Mand-Raigarh, Chhattisgarh	119	4.2
Southern Godavari Valley (Kothaguden) AP	87.2	2.2
Northern Godavari Valley AP	29.65	1.05
Barmer Basin, Rajasthan	120	4.24

Indian projects

- Raniganj(WB) -ONGC 90%
Coal India 10%
- Bokaro & Karanpura – ONGC 80%,
Indian Oil 20%
- Sohagpur (MP) - RIL
- Private sector operators – Dart Energy, GEECL,
Deep industries & a consortium by Jindal petroleum
- Satpura(MP) – Dart energy 80% ,
Tata power 20%
- Assam – Dart energy 60%
Oil India 40%

Advantages of CBM

1. CBM production **does not harm the coal mining work or schedule**
2. CBM production has **no adverse effects on the coal measures**
3. The **production of CBM**, on the contrary, **minimizes the usual mining hazard problems**
4. CBM production is **Eco-friendly**

Major challenges for commercial development of CBM assets

- Lack of technical expertise and experience in CBM related project development
- Lack of data/information on field characterization and hence technology selection toward reserve development
- Regulatory challenges in the form of clearances and pricing policies
- Poor quality of reserves in terms of CBM saturation level