UCG and Power Generation
BHEL's Role

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Overview of Indian Coals
ORGANIC ASPECTS

- Sedimentation and Drift Origin
- Formations during 3 Eras viz Karharbari, Barakar& Raniganj
- Most of them Sub-Bituminous in Rank (78%)
- They do not swell on heating
- Only Raniganj coal is Bituminous(Swelling)
- Coals are generally very reactive
- High Composite Macerals(Highly Reactive,Reactive and Low reactive
- Both Thick and Thin seams are prevalent.

Overview of Indian Coals
INORGANIC ASPECTS

- Minerals homogenously mixed with coal
- Due to Sedimentation Deposition, Floor of coal Seam contains Sandstone, Shale & Carbonaceous Shale and Shaly coal
- Similarly there is transition from Prime coal to overburden layers
- Mineral Matter in core Coal Seam is much lesser (20 to 30%) M.Matter content goes up from Core towards Overburden and Floor(40 to 60%).

Lignites of India

- **Lignite's of Fresh Water Origin.**

  - Tamil Nadu, Pondicherry, J&K., Kerala

- **Lignite's of Marine Water Origin**

  - Gujarat :

  Lignite Reserves considered Equivalent to Total Indian Coal Reserves, but at a depth of 1000 meters & above(Mehsana – Ahmedabad Block & Tonsan Block -Patan – Tharad)

  - Rajasthan

  More locations less quantum of reserves(100-400 meters depth

Overview of UCG Technologies Required

- For Shallow depth seams

  - with and without Aquifier, Corrosive depositions, Saucer like deposits, etc.

- For Medium depth seams

  -with and without Aquifier, thin and thick seams, etc.

- For Deep seams

Coal Reserves & UCG Power Capacity

For capacity : 250/300MW

For Service Life : 30 to 35 Years

Reserve Required

With Coal : 30 to 40 Million Tons

With Lignite : 50 to 60 Million tons

Coal Bed Methane & UCG

- For Gas from UCG to be of consistent quality and quantity, it is necessary to link production of more number of cavities
- A ton of coal can give 4 to 14 m3 of Methane.

  (i.e. 35000 to 123000 Kcals/ton of coal)
- CBM can be useful to mix with UCG to maintain calorific value of gas

BHEL's Experience with Indian Coals

- Has utilised many types of Coals & Lignite
- Employed different Combustion Technologies
  - Pulverized coal, Fluid Bed & CFBC
- Employed Different Gasification Technologies
  - Atmospheric and Pressurized Moving Bed
  - Pressurized Fluid Bed (6.2MW CCDP)
- Characterized Organics & Inorganics from Combustion, Gasification & Emission View Points.

IGCC – 6.2MW Combined Cycle Demonstration Plant of BHEL

- **Unique Facility Configured to study, develop and optimize various aspects, concerning the design, operation, maintenance, scale up of Integrated Coal Gasification Combined Cycle Power Generation Technology**

Equipment Required for UCG

Upstream Equipment

- Compressors (Air & Nitrogen)
- High Pressure Water Pumps

Gasification Equipment

- Air & Steam Mixing Vessel
- Seamless Steel Tubes and Valves
- Ignitors

BHEL is capable of supplying the above equipment

Equipment Required for UCG

Downstream Equipment

- Dust Cyclones

  - Due to high ash content, dust loading in Fuel Gas could be High

- Gas Coolers (Forms part of Power Generation cycle)
- Scrubbers
- Electro De-tarrer

BHEL is capable of supplying the above equipment

Power Generation System

- Gas Turbine
  - BHEL makes 4 to 250 MW capacity
- HRSG to suit GT
- Steam Turbine to match HRSG

BHEL is capable of supplying the above equipment

Combined Cycle Plant of BHEL

Seamless Steel Tube

Factory of BHEL

Other Equipment required for UCG

- Steel Stacks
- Structures for Injection & Production Wells
- Piping Systems
- Motors etc.

BHEL is capable of supplying the above equipment

Summing Up….

- BHEL has very Good Experience in Engineering, Manufacturing & Operation of High Pressure Gasifiers and Combined Cycle Power Generation, most of which is akin and relevant for UCG & UCG Based Power Generation also
- BHEL is committed to participate & develop UCG Technology in India and in making available Necessary Equipment for Gasification & Gas Utilization for Power Generation.