



## Adapting with Coal

### What is the issue?

\n\n

\n

- Despite the loosing sheen for coal as a power source, it is unavoidable at least for few decades.

\n

- Given this, the new methodology of power generation with coal gains significance in environmental perspective.

\n

\n\n

### How is coal's importance at present?

\n\n

\n

- Coal, as a source of energy, is firmly becoming out of favour.

\n

- The climate change considerations have contributed to this change.

\n

- Most countries have plans to phase out coal in the next few decades.

\n

- India has officially announced that it would not set up any new coal-fired power plants after 2022.

\n

\n\n

### Why is coal unavoidable now?

\n\n

\n

- There is rapid increase in power generation from renewable sources like wind and solar.

\n

- But still, over 60% of India's electricity is generated in thermal power plants.  
\n
- It is estimated that coal would continue to be the mainstay of India's energy mix for at least three more decades.  
\n

\n\n

### **How should it be dealt with?**

\n\n

- \n
- Efforts are on to ensure that pollution emanating from coal is at least reduced a bit in these intervening years.  
\n
- A variety of "clean coal technologies" is being deployed or experimented with.  
\n
- The modern "super-critical" power plants also emit lesser pollutants.  
\n

\n\n

### **How do thermal power plants work?**

\n\n

- \n
- Most thermal power plants burn coal to generate heat.  
\n
- The heat is used to convert water into steam.  
\n
- The pressure of the steam is then used to move turbines that produce electricity.  
\n
- The quality of coal is an important factor in deciding the efficiency of the plant.  
\n
- It refers to the amount of electricity generated per unit of coal burnt.  
\n
- It also takes into account the waste that is released.  
\n
- Typically, coal power plants release a lot of carbon dioxide (CO<sub>2</sub>), a dangerous greenhouse gas.  
\n

\n\n

## What is the complexity?

\n\n

- \n
  - Coal is cheaply available in India in very large quantity.
- \n
  - But it is not preferred due to the high ash and low energy content.
- \n
  - Burning coal in the conventional pulverised mode results in the release of a lot of fly ash.
- \n
  - This is a major contributor to air pollution and a health hazard too.
- \n
  - Several techniques in place to capture fly ash, after it is produced, are not very efficient.
- \n
  - Alternatively, coal is passed through an extensive “pre-processing” process called “washing”.
- \n
  - The aim is to remove some of the ash content before it is burnt.
- \n
  - This has also not been very effective.
- \n

\n\n

## What is the new finding?

\n\n

- \n
  - A new, more effective way of managing the problem ensures that the ash is removed as chunks from the reactor bed itself.
- \n
  - Also, the procedure reduces the formation of CO<sub>2</sub>.
- \n
  - It instead generates synthetic gas (syngas).
- \n
  - This is a mixture of clean fuel gases like carbon monoxide and hydrogen, as by-products.
- \n
  - These can then be put to a variety of uses.
- \n

\n\n

## How does it work?

\n\n

\n

- A well-known coal gasification technique is used.
- \n
- Here, coal is only partially burnt with a very limited supply of oxygen.
- \n
- It is done in the 'bubbling fluidized bed gasification reactor'.
- \n
- At about 100°C, all moisture from the coal is drained out.
- \n
- At higher temperatures (300°C - 400°C), gaseous fuels trapped inside coal are released.
- \n
- These include gases like nitrogen, methane and a mixture of many other hydrocarbons.
- \n
- At temperatures 800-900°C, the carbon in the coal starts reacting with oxygen in the air.
- \n
- It also reacts with the steam supplied along with air.
- \n
- It then forms carbon monoxide (CO), hydrogen and carbon dioxide (CO<sub>2</sub>).
- \n

\n\n

### How does it help?

\n\n

\n

- Controlling the amount of air and steam ensures that significant amounts of carbon monoxide (CO) and hydrogen (H<sub>2</sub>) are formed.
- \n
- By this way, production of CO<sub>2</sub>, which is a greenhouse gas, can be minimized.
- \n
- Careful systematic studies have been conducted to arrive at the regime of operation, air to coal and steam to coal ratios.
- \n
- It has been found that the addition of steam becomes **favourable in the case of high-ash Indian coals**.
- \n
- In fact, this technique can be extended to produce syngas of high calorific value.
- \n

- This can be done by enhancing the oxygen content in the oxidizer.  
\n
- Besides, adding biomass, like rice husk along with Indian coal imparts catalytic effect.  
\n
- It improves the gasification performance significantly.  
\n

\n\n

### **What is the way forward?**

\n\n

- \n
- The process would improve the attractiveness of Indian coal for use in power plants.  
\n
- It could help significantly in the transition period to renewables.  
\n
- Existing power plants will have to replace their traditional reactors with gasification reactors for this.  
\n
- In Indian coal mine mouths, such gasification reactors can be established to take care of rural power needs.  
\n

\n\n

\n\n

**Source: Indian Express**

\n



**IAS PARLIAMENT**  
*Information is Empowering*  
A Shankar IAS Academy Initiative