



## Coal Gasification

**For Prelims:** Coal Gasification, Syngas, Hydrogen Economy

**For Mains:** Coal Gasification, Hydrogen Economy, Concerns Associated with Coal Gasification Plants

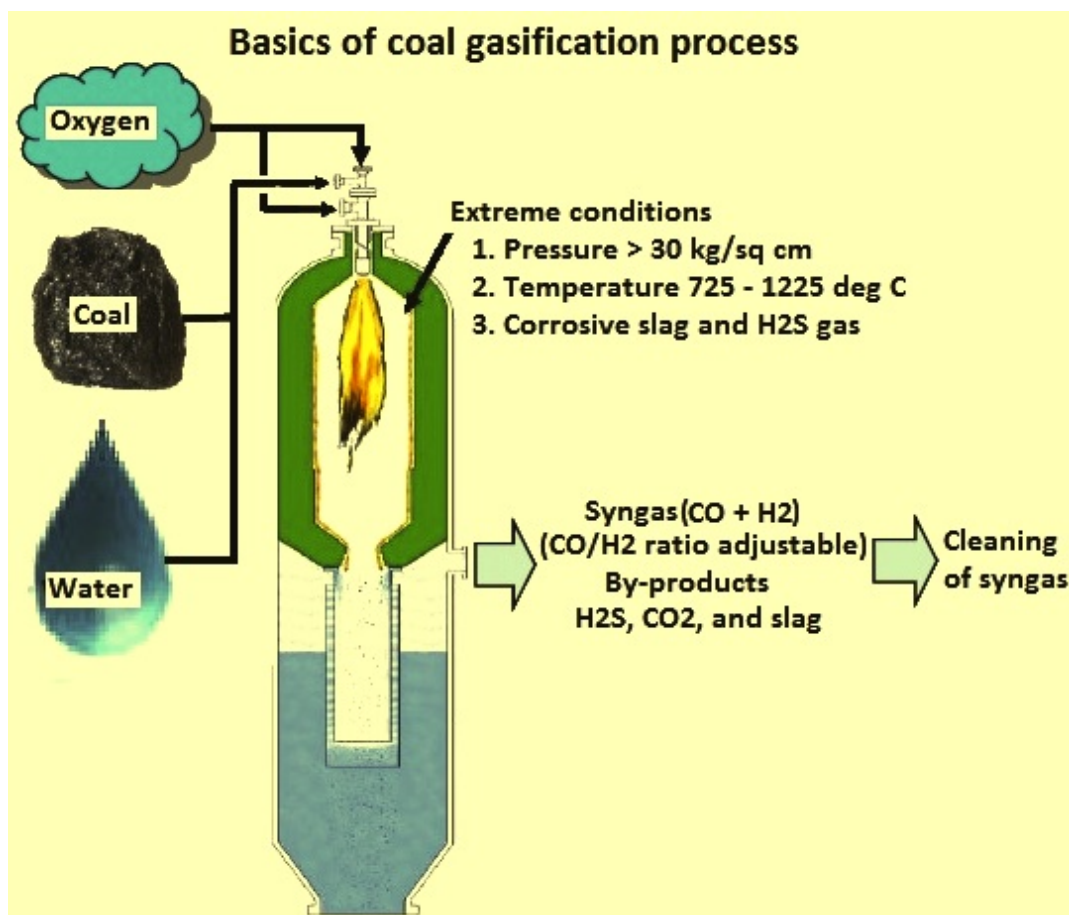
### Why in News?

The Ministry of Coal has prepared a **National Mission document to achieve 100 MT (Million Tonnes) Coal Gasification by 2030.**

### What is Coal Gasification?

- **Process:** Coal gasification is a process in which **coal is partially oxidised with air, oxygen, steam or carbon dioxide to form a fuel gas.**
  - This gas is then used instead of piped natural gas, methane and others for deriving energy.
  - **In-situ gasification of coal - or Underground Coal Gasification (UCG) - is the technique of converting coal into gas** while it is still in the seam and then extracting it through wells.
- **Production of Syngas:** It produces Syngas which is a **mixture consisting primarily of methane (CH<sub>4</sub>), carbon monoxide (CO), hydrogen (H<sub>2</sub>), carbon dioxide (CO<sub>2</sub>) and water vapour (H<sub>2</sub>O).**
  - Syngas can be used to **produce a wide range of fertilizers, fuels, solvent and synthetic materials.**

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## What is the Significance of Coal Gasification?

- Steel companies typically use coking coal in their manufacturing process. Most of the coking coal is imported and is expensive. To **cut costs, plants can use syngas**, which comes from coal gasification plants in the place of coking coal.
- It is primarily **used for electricity generation**, to produce chemical feedstocks.
- The **hydrogen obtained from coal gasification can be used for various purposes** such as making ammonia, powering a [Hydrogen Economy](#).
- India's hydrogen demand is likely to increase to **11.7 million tonnes by 2030 from 6.7 million tonnes per year as of now**. Refineries and fertiliser plants are the largest consumers of hydrogen now, which is being produced from natural gas. It can be produced through coal in the processes during coal gasification.

## What are the Concerns associated with Coal Gasification Plants?

- **Environmental Perspective:** Coal gasification **actually produces more carbon dioxide than a conventional** coal-powered thermal power plant.
  - According to CSE estimates, one unit of electricity generated by burning gasified coal generates 2.5 times more carbon dioxide than what would result when burning the coal directly.
- **Efficiency Perspective:** The syngas process converts a relatively high-quality energy source (coal) to a lower quality state (gas) and consumes a lot of energy in doing so.
  - Thus, the efficiency of conversion is also low.

## What is the Hydrogen Economy?

- It is an economy that relies on hydrogen as the commercial fuel that would deliver a substantial fraction of a nation's energy and services.
- Hydrogen is a zero-carbon fuel and is considered an alternative to fuel and a key source of clean

energy.

- It can be produced from renewable sources of energy such as solar and wind.
- It is an envisioned future where hydrogen is used as fuel for vehicles, energy storage and long-distance transport of energy.
- The different pathways to use hydrogen economy includes hydrogen production, storage, transport and utilization.
  - In 1970, the term 'Hydrogen Economy' was coined by John Bockris.
  - He mentioned that a hydrogen economy can replace the current hydrocarbon-based economy, leading to a cleaner environment.

## Way Forward

- Companies need to adopt new technologies and build digital infrastructure to support the current and future requirements.
- There is a need to ensure **optimal use of technology** in the sector.

**Source: PIB**

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