

2. NGT Directs CPCB to study Pyrolysis Plants

Prelims level: Environment – Conservation.

Mains level: GS-III Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment.

Why in News?

- The NGT has directed the CPCB to carry out a study within four months to ascertain whether advance batch automated pyrolysis plants can address pollution caused due to burning of waste tyres in pyrolysis industries.

About Pyrolysis:

- The word is coined from the Greek-derived elements pyro "fire" and lysis "separating".
- Pyrolysis is the thermal decomposition of materials at elevated temperatures in an inert atmosphere.
- Pyrolysis is most commonly used in the treatment of organic materials. It involves a change of chemical composition and is irreversible.
- It involves decomposition of organic materials in the absence of oxygen and thus distinct from combustion.
- It is an endothermic reaction and the rate of pyrolysis increases with rise in temperature.
- In general, pyrolysis of organic substances produces volatile products and leaves a solid residue enriched in carbon, char.

There are two types of Pyrolysis:

- **Fast Pyrolysis** optimizes bio-oil Production by increasing the rate of pyrolysis temperature to 1000°C / second. This process yields approximately 60-70% bio-oil, 15-25% bio-char, and 10-15% syngas.
- **Slow pyrolysis** uses slower heating rates and bio-char is the major end product. This type of pyrolysis doesn't yield bio-oil. In the both process, the system is self-sustaining by harnessing the syngas to drive the reaction.
- Extreme pyrolysis, which leaves mostly carbon as the residue, is called carbonization.

Resultants of Pyrolysis:

- Pyrolysis of biomass produces three products – a liquid, a gas and a solid:
 1. **Bio Oil:** Comes from the combustible gases of the process, which are condensed, into a liquid. Bio-oil can be used as a low grade Diesel Oil.

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2. **Bio-Char:** is the solid material that is created in the process. Biochar is being promoted for its potential to improve soil properties and fertility as well as sequester carbon.
 3. **Syngas:** are the permanent gases (CO_2 , CO , H_2 , light Hydrocarbons) that remain after the pyrolysis process is complete. Syngas can be used in place of Natural gas or converted with Catalysts to ethanol.
 - Thermal decomposition leads to the formation of new Molecules. This allows to receive products with a different, often more superior character than original residue. Thanks to this feature, Pyrolysis becomes increasingly important process for today industry-as it allows to bring far greater value to common materials and waste.

Application:

- The process is used heavily in the chemical industry, for example, to produce ethylene, many forms of carbon, and other chemicals from petroleum, coal, and even wood, to produce coke from coal.
- Aspirational applications of pyrolysis would convert biomass into syngas and biochar, waste plastics back into usable oil, or waste into Safely Disposable Substances.

