



Synthetic petrol (Synthetic liquid fuel)

Hydrogenation of coal

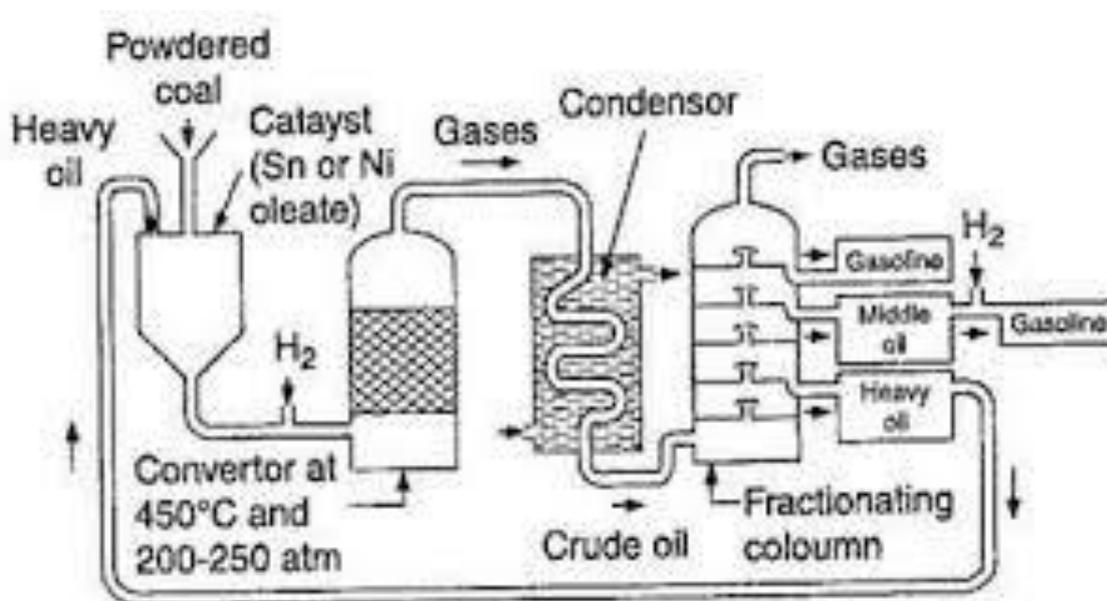
Coal is hydrogen deficient compound. If coal is heated with hydrogen at high temperature and high pressure, it is converted into gasoline. **This process of preparation of liquid fuel from solid coal** is called hydrogenation of coal.

Two methods are available for hydrogenation of coal. They are

- i) Bergius process (direct method)
- ii) Fischer –Tropsch Method (indirect method)

Bergius process

- In this process, the **finely powdered low ash coal, heavy oil, and catalyst powder (tin oleate or nickel oleate)** is mixed to form a **paste**.
- The paste is heated with hydrogen at a temperature of **400 - 450°C** and a pressure of **200 – 250 atmospheres** for about **1.5 hours** in a convertor.





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- During this process, hydrogen combines with coal to form **saturated higher hydrocarbons** which further decomposes to yield **low – boiling liquid hydrocarbons (crude oil) while passing through a condenser.**
- Crude oil obtained is subjected to fractional distillation to yield i) Gasoline ii) Middle oil iii) Heavy oil.
- The yield of gasoline is about 60% of coal used.
- The middle oil is further hydrogenated yield more gasoline.
- The heavy oil is recycled for making paste with fresh coal dust

Fischer Tropsch process

- Coal is first converted into coke.
- Then *water gas* ($\text{CO} + \text{H}_2$) is produced by passing steam over red hot coke at $1200\text{ }^\circ\text{C}$.
- Water gas is mixed with hydrogen and the mixture is compressed to 5-25 atmospheres.
- The compressed gases are then led through a converter which is maintained at a temperature of $200\text{-}300\text{ }^\circ\text{C}$.
- The converter is provided with a suitable catalyst consisting of a mixture of 100 parts cobalt, 5 parts thoria, 8 parts magnesia and 200 parts kieselguhr.
- A mixture of saturated and unsaturated hydrocarbons occurs as a result of polymerization.
- The reactions are strongly exothermic.
- Hence, the hot out coming gaseous mixture is led to a cooler where a liquid similar to crude oil is obtained.
- The crude oil thus obtained is then fractionated to yield gasoline and high boiling heavy oil.
- The heavy oil is used for cracking to get more gasoline

