India’s Leapfrog to Methanol Economy

Table 1 Prelims Booster

A) Methanol Economy: means the replacement of fossil fuels with methanol as means of energy storage, transportation fuels and feedstocks of chemical products

B) Need for Methanol Economy in India:
- Energy security: India is the 6th highest consumer of petrol and diesel in the world
- Environmental concern: India is third highest energy related CO2 emitter country in the world.
- Current Account Deficit: India’s crude import bill stands at almost 6 lakh crores
- Inflation: The price of fuel has multiplier effect

C) Applications of Methanol in various sectors of Indian Economy:
1) Transportation: Methanol blended with gasoline and diesel or complete substitution + railway engines can run on methanol/DME blends + methanol and DME powered ships → cost cutting and efficiency increase
2) Energy: India → Huge Coal reserves; Biomass generated; Stranded & Flared gases → alternate feedstock and fuels → India’s 10% reduction in import dependence of oil and gas by 2022.
3) Manufacturing: methanol compatible engines under Make in India → FDI investments → employment
4) Marine sector: liquid form → no SOx or NOx; cheaper and cleaner than LNG and Bunker / Heavy Oil. → meeting the stringent emission regulations by the IMO → reduce the costs.
5) Electricity power generation: as a turbine fuel
6) Agriculture: Biomass like rice straw or Bamboo in North East → feedstock → additional income to the farmers
7) Telecom Towers: 2% of diesel consumption → can be replaced
8) Chemicals sector: Methanol → producing various chemicals like formaldehyde, acetic acid and olefins → can be exported
9) Clean cooking fuels: Ujjwala Yojana (PMUY) → LPG connections → Methanol or DME blending with LPG or the complete substitution of latter through former can gradually displace LPG imports
10) Swachh Bharat: opportunity for India to use its landfills to convert it into methanol and avoid problems such as toxins leaching into the soil and release of GHG emissions etc

D) Global Developments
- Methanol is being actively pursued by China, Italy, Sweden, Israel, US, Australia, Japan and many other European countries.
- 10% of fuel in China in transport Sector is Methanol. China alone produces 65% of world Methanol and it uses its coal to produce Methanol.
- The Technology has acquired commercial maturity and countries like Iceland are producing in meaningful quantities already.
- The United States ran several methanol programs, especially in California from 1980 to 1990 for the conversion of gasoline run cars to methanol blended fuels
- Israel, Italy have adopted the Methanol 15% blending program with Petrol.
- Methanol is seen by the world as the “Enduring Energy Solution known to Mankind”
D) Status of Methanol in India:
- Presently at a nascent stage in production and usage but huge potential in both
- Methanol imports is meeting 90% of India’s methanol requirement because cheaper for India to import vs domestic production
- India imports 99% of its methanol from Iran and Saudi Arabia who produce it from natural gas
- India does not have a commercial coal to methanol plant despite having large coal reserves
- India is producing all of its methanol from imported natural gas
- The Government is likely to go ahead with a target of 15% blending by methanol/DME in gasoline/diesel by 2022
- Recently, Coal India Limited (CIL) planned to set up a coal based methanol plant in West Bengal
- The Namrup-based Assam Petrochemicals Limited (APL) rolled out the country’s first methanol- based cooking fuel project-
  - ‘Green and Clean Fuel Pilot Project on Methanol Cooking Stove’. The project has been promoted by NITI Aayog.

E) NITI Aayog’s Plan for Methanol Production in India:
- India is producing all of its methanol from imported natural gas since domestic production is not economically viable at present. → it must use abundant domestic high ash coal to make it economically viable → Commercial coal to methanol plants need to be set up wherever necessary.
- It is estimated that a 1600 tons per day of methanol plant will require a capital expenditure of ~INR 1200 Cr which would be able to produce methanol at INR 17-19 per liter which is comparable with the cost of imported methanol. Whereas, presently, the per liter cost of methanol production in India is INR 25-27 or even more depending on the volatility in the price of imported natural gas.
- Biomass/municipal solid waste and flared natural gas can also be used for methanol production, but the continuous availability of latter would be a challenge.

F) Challenges:
- Water Intensive → 20 cubic meters freshwater for 1 ton coal-based methanol → wastewater.
- leakage and explosion → loss of life and property.
- Vehicle’s damage → rubber or plastic components + corroding metals such as aluminum, magnesium, zinc
- During the process of making methanol from coal, a large amount of CO2 is emitted.
- Technology to co-generate power in methanol plants requires further refinement
- For blending more than 15% of methanol, internal combustion engines changes in the engine design are required.

G) Way Forward:
1. Create an innovation fund → support the R&D activities → a demonstration coal to methanol production plant
2. Have sufficient domestic methanol production capacity so that user industries are assured of supply
3. Simultaneous programs for the development of
   - flexi-fuel vehicles to run on methanol/DME fuel blends
   - Methanol/DME cookstoves
   - Converting diesel powered railway locomotives to methanol/DME based engines.
4. Explore possibility of setting up a manufacturing facility for methanol/DME in Iran or Qatar as these countries can provide the natural gas at very low prices
5. Import Methanol/DME for its direct application or for further conversion to chemicals like olefins as it is likely to be economically advantageous rather than importing crude
6. Set up a mega coal based complex for production of power, methanol and fertilizer in an integrated manner
7. Methanol Blending Program with all possible fossil fuels can be implemented on an early basis

MAINS QUESTION:
With growing energy needs should India work on exploring methanol production and application? Discuss the facts and fears associated with Methanol economy in India(250 Words, 15 Marks)