



# प्रयास

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## EDITORIAL

### Harnessing the Value of Dung

#### Background

- The 'BioCNG' outlet in Dama village of Deesa taluka, belonging to the Banaskantha District Co-operative Milk Producers' Union, sells 550-600 kg of gas per day generated from 40 tonnes of dung at an adjoining four-acre plant.
- It is India's first and only gas-filling station based on dung from cattle and buffaloes.
- 'Bio-CNG' is purified form of bio-Gas whose composition & energy potential is similar to that of fossil based natural gas and is produced from agricultural residues, animal dung, food waste, Municipal Solid Waste (MSW) and Sewage water.

#### Key Points of the Article

- A biogas plant requires fresh dung, which contains methane along with water. The methane is produced by bovines inside their rumen (first of four stomach compartments), where the plant material they eat gets fermented or broken down by microorganisms before further digestion.
- Carbohydrate fermentation leads to production of carbon-dioxide (CO<sub>2</sub>) and hydrogen. These are used by archaea (bacteria-like microbes in the rumen) to produce methane, which the animal expels either as gas or in the dung.
- Anaerobic digestion is a process by which the complex organic matter in dung is broken down in the absence of oxygen to produce biogas. The digestion, taking place in a 3,000 cubic-meter sealed vessel reactor, involves four successive stages: hydrolysis (break-down of organic matter into simple molecules), acidogenesis (their conversion into volatile fatty acids), acetogenesis (production of acetic acid, CO<sub>2</sub> and hydrogen) and methanogenesis (biogas generation).
- The raw gas is purified for removing CO<sub>2</sub> (through vacuum pressure swing adsorption or VPSA process), H<sub>2</sub>S (using activated carbon filter) and moisture (with air dryer separator). The end-product, purified (to 96-97% methane, 2-3% CO<sub>2</sub> and below 0.1% H<sub>2</sub>S and moisture) and compressed, is stored in cascades.
- This compressed biogas (CBG), conveyed through pipelines to the dispensers at the fuel station, is what's being sold as BioCNG at Rs 72/kg.
- The separated solid (6,000-8,000 kg) is decomposed in aerobic condition (presence of oxygen) for sale as PROM (phosphate-rich organic manure, incorporating rock phosphate and phosphate solubilising bacteria) or compost (after adding neem and castor cake, sugarcane press mud and microbial consortia).
- Out of the liquid part, 30,000-35,000 litres is re-used for mixing in the digester and the balance sold as liquid fermented organic manure.

Source: Indian Express

#### Significance of Bio-CNG

- Bio-CNG, or bio-compressed natural gas, holds significant importance for several reasons:
  - Reduced Greenhouse Gas Emissions: When compared to traditional fossil fuels like diesel or gasoline, bio-CNG emits significantly lower levels of greenhouse gases, including carbon dioxide and methane. By utilizing bio-CNG, countries can reduce their carbon footprint and combat climate change.



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- **Waste Management Solution :** Bio-CNG production relies on organic waste materials, providing an incentive for proper waste management practices. It encourages the recycling of waste materials that would otherwise contribute to environmental pollution and health hazards.
- **Energy Security :** Since Bio-CNG can be produced domestically from locally available organic waste, it reduces dependence on imported fossil fuels, enhancing energy security for countries. This is particularly beneficial in regions with limited access to conventional natural gas reserves.
- **Economic Benefits :** The production of Bio-CNG creates economic opportunities in rural areas, where organic waste materials are abundant. It generates employment through the operation and maintenance of biogas plants and related infrastructure, contributing to local economic development.
- **Diversification of Energy Mix :** Incorporating bio-CNG into the energy mix diversifies the sources of energy production, reducing reliance on a single energy source. This diversification enhances energy resilience and mitigates risks associated with fluctuations in global energy markets.
- **Improvement of Air Quality :** Bio-CNG burns cleaner than conventional fuels, producing fewer pollutants such as sulfur dioxide, particulate matter, and nitrogen oxides. Its use in vehicles and industrial processes can help improve air quality and reduce respiratory health issues in urban areas.

### Challenges of Bio CNG

- **Bio-CNG, or biogas compressed natural gas, has several challenges associated with its production, distribution, and utilization :-**
  - **Feedstock Availability:** The primary challenge lies in ensuring a consistent and reliable supply of organic waste or biomass as feedstock for biogas production. Dependence on agricultural residues, municipal waste, or livestock manure can be unpredictable due to seasonal variations and logistical constraints.
  - **Biogas Production Efficiency:** Achieving optimal biogas production efficiency requires careful management of the anaerobic digestion process. Factors such as temperature control, substrate composition, and microbial activity influence gas yield and quality.
  - **Technological Constraints:** The technology for converting biogas into compressed natural gas (CNG) must be efficient and cost-effective. Challenges include developing reliable purification and compression systems, as well as ensuring compatibility with existing CNG infrastructure.
  - **Economic Viability:** The economic viability of Bio-CNG depends on various factors, including feedstock costs, energy prices, and government incentives. Fluctuations in these variables can impact the profitability of biogas projects and deter investment.
  - **Market Acceptance:** Overcoming consumer skepticism and building market acceptance for Bio-CNG as a viable alternative to fossil fuels may require public awareness campaigns and demonstration projects showcasing its benefits in terms of environmental sustainability and energy security.
- Addressing these challenges will require collaboration among policymakers, industry stakeholders, researchers, and communities to promote innovation, investment, and regulatory support for the Bio-CNG sector.
- Overall, bio-CNG represents a sustainable and environmentally friendly alternative to conventional fossil fuels, offering numerous benefits across environmental, social, and economic dimensions.