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ALIPHATIC STRAIGHT CHAIN HYDROCARBONS FROM NATURAL SOURCE AS KEY ROLE FACTOR IN DAILY LIFE

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ABSTRACT
Bottled gas is a term used for substances which are gaseous at standard temperature and pressure (STP) and have been compressed and stored in carbon steel, stainless steel, aluminium, or composite containers known as gas cylinders. CNG (compressed natural gas) is methane and LPG is propane and/or butane. CNG (compressed natural gas) is stored as a gas and LPG is stored as a liquid. CNG (compressed natural gas) is compressed natural gas storage – methane. LPG is liquefied petroleum gas – propane. The class of gases that are termed compressed gases are non-liquefied gases. This means that they do not become liquid at normal temperatures, even at high pressure. They are either: A gas or mixture of gases in a container having an absolute pressure exceeding 40 pounds per square inch (psi) at 70°F (21°C).

KEYWORDS: Methane, ethane, propane, butane, CNG, LPG, Bio-CNG, LMG, LNG, Octane Number.

INTRODUCTION

Compressed Natural Gas (CNG) is a cleaner, eco-friendly, and cost-effective alternative to petrol and diesel, primarily composed of methane (CH_4). It is used in specialized or modified vehicles, compressed to 200–250 bar to reduce volume for storage. It reduces harmful emissions, is lighter than air (disperses quickly), and offers a safe, economical fuel option for transportation and industrial applications. The biggest difference between Bio CNG and CNG lies in where they come from. CNG is extracted from underground fossil reserves and processed for use. Bio CNG is produced from organic waste like agricultural residue, food waste, animal dung, and municipal waste. This makes Bio CNG completely renewable. Bio-CNG, or Compressed Biogas, is a renewable and eco-friendly alternative to traditional fossil fuels. It is a purified form of biogas, with a methane content of over 90%, making it comparable to natural gas in terms of energy potential. Bio-CNG is the purified form of Biogas. Biogas is processed to get 95% pure methane gas. Bio CNG is exactly similar to the commercially available natural gas (CV: ~52000 KJ/Kg) in its composition and energy potential. The process residue is a high quality concentrated liquid fertilizer. As we all know Bio-CNG is purified. The main constituents are methane, carbon dioxide, and traces of gases like water vapour, oxygen, hydrocarbons, ammonia, etc. It is a highly combustible gaseous fuel that releases heat and energy.

Key Aspects of CNG Composition: Primarily methane (CH_4), with smaller amounts of ethane, propane, and butane.

Safety: CNG is safer than other fuels due to its high ignition temperature, narrow range of flammability, and storage in high-strength, certified cylinders.

Environmental Impact: It is considered a "green fuel" that is lead and sulphur-free, producing fewer emissions compared to conventional fuels.

Applications: Primarily used in automobiles (cars, buses, auto-rickshaws) and also for industrial applications like agricultural, power generation, and heating.

Cost Efficiency: While the initial cost of CNG vehicles can be higher, the lower cost of fuel generally provides better economic returns over time.

Figure 1: CNG.

Mechanism: It acts as a substitute for petrol or diesel in internal combustion engines, requiring a dedicated or bi-fuel system. CNG is compressed at stations to less than 1% of its volume at standard atmospheric pressure. As of early 2026, prices for CNG in some Indian cities, such as Mumbai, hover around ₹80–90 per kg due to adjustments in gas supply costs. CNG stands for Compressed Natural Gas, a cleaner, more economical alternative fuel made by compressing natural gas (mostly methane) to a fraction of its original volume, allowing it to be stored in high-pressure tanks for vehicles like cars, buses, and auto-rickshaws, offering lower operating costs and reduced emissions compared to petrol or diesel.

Key aspects of CNG

Composition: Primarily methane (CH_4). Process: Natural gas is purified and compressed to about 1% of its standard volume for vehicle use, typically stored at 200-250 bar (2,900-3,600 psi).

Usage: Used in modified internal combustion engines or specific CNG vehicles as a replacement for gasoline or diesel.

Benefits: Lower fuel costs, reduced pollution (cleaner burning), and higher octane rating than petrol. Safety: Odourless in its natural state, but a sulphur-based odorant is added for leak detection. Compressed Natural Gas (CNG) is primarily composed of methane [CH_4] typically accounting for 85–98% of the mixture. It is a cleaner-burning alternative to gasoline and diesel, consisting of smaller amounts of ethane [C_2H_6], propane [C_3H_8], butane [C_4H_{10}], and minor non-combustible gases like nitrogen [N_2] and carbon dioxide [CO_2].

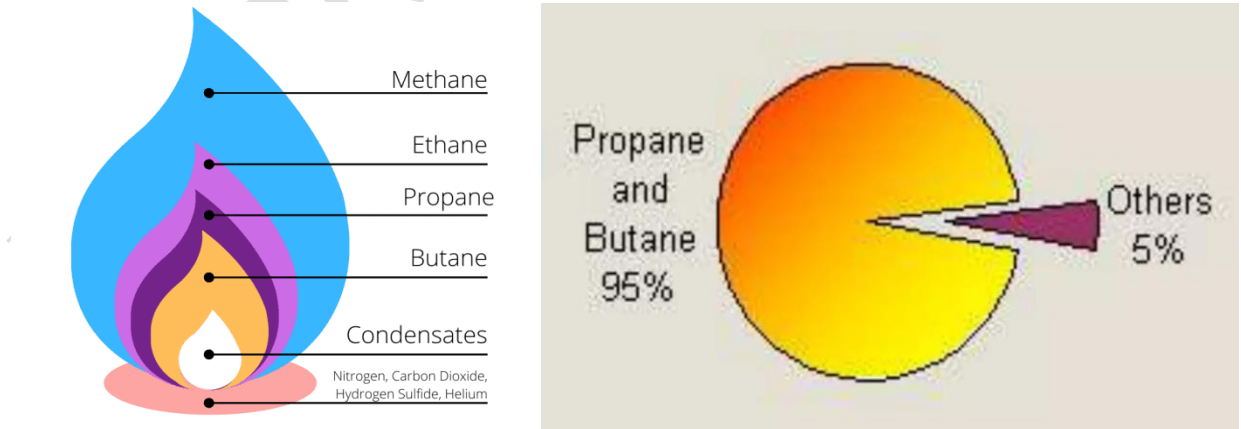


Figure 2: CNG & LPG components.

Key Components and Properties

Methane: 85% - 98%

Other Hydrocarbons: Ethane, Propane, Butane

Impurities: Small amounts of nitrogen, carbon dioxide and water vapour

Octane Number: Over 120, which resists engine knocking

Storage: Compressed to 200–250 bar (2,900–3,600 psi)

Figure-3: CNG, PNG, LPG, LNG gas station.

Key Differences from Other Fuels

CNG vs. LPG: CNG is mostly methane, while LPG is a mixture of propane and butane.

Bio-CNG: Contains roughly 92-98% methane with 2-8% carbon dioxide.

CNG is derived from natural gas wells, coal bed methane wells, and oil wells. Its high methane content ensures efficient combustion and lower emissions, making it an ideal fuel for vehicles and power generation. CNG is mainly used for vehicles (cars/autos) due to better mileage.

LPG stands for Liquefied Petroleum Gas, a flammable mixture of hydrocarbon gases, primarily propane and butane, used as a clean and efficient fuel for cooking, heating, and vehicles, stored as a liquid under pressure in cylinders.

Key Characteristics

Composition: Mainly propane (C_3H_8) and butane (C_4H_{10}).

State: A gas at normal temperatures, but liquefied under moderate pressure for easy storage and transport.

Odour: Naturally colourless and odourless, but an odorant (like ethyl mercaptan) is added to give it a distinct smell for leak detection.

Uses: Popular for domestic cooking (cooking gas), water heating, industrial applications, and as an automotive fuel (Autogas).

CNG (Compressed Natural Gas) and LPG (Liquefied Petroleum Gas) differ primarily in composition, state, and safety. CNG is 80-90% methane stored as gas under high pressure, making it safer, cleaner, and preferred for vehicles. LPG is a mixture of propane/butane stored as liquid under lower pressure, primarily used for domestic cooking and heating.

Safety: CNG is lighter than air, so it disperses quickly if leaked, reducing fire risk. LPG is heavier than air and can accumulate on the ground, increasing explosion hazards.

Primary Usage: Energy Content: LPG has a higher calorific value per unit volume, providing more energy per litre than CNG.

Environmental Impact: Both are cleaner than petrol/diesel, but CNG emits fewer greenhouse gases and is generally considered more eco-friendly.

Figure 4: LPG storage.

Summary Table

Feature	CNG (Compressed Natural Gas)	LPG (Liquefied Petroleum Gas)
Main Component	Main Component CH_4	Propane C_3H_8 & Butane C_4H_{10}
Storage State	Gas (High Pressure)	Liquid (Low Pressure)
Density	Lighter than air	Heavier than air
Main Use	Vehicles, City Fuel	Cooking, Industrial
Safety	Safer (disperses quickly)	Risky (settles on ground)
Efficiency	Higher mileage	Higher energy per volume

Which to Choose?

For Vehicles: CNG is generally preferred for better mileage, lower cost per km, and cleaner emissions.

For Cooking/Heating: LPG is preferred for its high energy output.

Liquefied natural gas (LNG) is natural gas (predominantly methane, CH_4, with some mixture of ethane, C_2H_6) that has been cooled to liquid form for ease and safety of non-pressurized storage or transport. It takes up about 1/600th the volume of natural gas in the gaseous state at standard temperature and pressure. LNG is odourless, colourless, non-toxic, and non-corrosive. Hazards include flammability after vaporization into a gaseous state, freezing and asphyxia. The liquefaction process involves removal of certain components, such as dust, acid gases, helium, water, and heavy hydrocarbons, which could cause difficulty downstream. The natural gas is then condensed into a liquid at close to atmospheric pressure by cooling it to approximately −162°C (−260°F); maximum transport pressure is set at around 127 kPa (18 psi) (gauge pressure), which is about 1.25 times atmospheric pressure at sea level. Clear, odourless and colourless, LNG is typically 85-95% methane, which contains less carbon than other forms of fossil fuels. It can contain low amounts of ethane, propane, butane and nitrogen; the exact composition varying depending on its source and processing.

Figure 5: LNG.

The gas extracted from underground hydrocarbon deposits contains a varying mix of hydrocarbon components, which usually includes mostly methane (CH_4), along with ethane (C_2H_6), propane (C_3H_8) and butane (C_4H_{10}). Other gases also occur in natural gas, notably CO_2. These gases have wide-ranging boiling points and also different heating values, allowing different routes to commercialization and also different uses. The acidic components, such as hydrogen sulphide (H_2S) and carbon dioxide (CO_2), together with oil, mud, water, and mercury, are removed from the gas to deliver a clean sweetened stream of gas. Failure to remove much or all of such acidic molecules, mercury, and other impurities could result in damage to equipment. Corrosion of steel pipes and amalgamization of mercury to aluminium within cryogenic heat exchangers could cause expensive damage.

Figure 6: PNG.

Piped Natural Gas (PNG) is natural gas - mainly Methane and supplied through mild steel (MS) and polyethylene (PE) pipes to cater to the natural gas demand of customers in various segments like Domestic / Commercial & Non - Commercial / Industrial. PNG is mainly methane – CH_4 with a very small percentage of other higher hydrocarbons like ethane, propane, butane and pentane. The ratio of carbon to hydrogen is least in methane and hence it burns upto 95% making it the cleanest burning fuel.

Liquefied Petroleum Gas (LPG) It is extracted from crude oil and natural gas. LPG is composed hydrocarbons containing three or four carbon atoms. The normal components of LPG thus, are propane (C_3H_8) and butane (C_4H_{10}). Small concentrations of other hydrocarbons may also be present.

CONCLUSION

Currently, environmental protection has been significantly interested, traditional fuels such as coal, gasoline, and diesel are gradually being replaced with cleaner, more environmentally friendly, commonly known as Liquefied Petroleum Gas (LPG), Compressed Natural Gas (CNG) vs Liquefied Natural Gas (LNG). So, what are the differences between CNG, LNG, and LPG? The following information will help you understand and distinguish between CNG, LNG, and LPG. What is compress natural gas? Natural gas is a fossil fuel composed primarily of methane (CH_4), along with other hydrocarbons such as ethane, propane, butane, and traces of other gases. It is a naturally occurring gas that is often found in association with oil deposits underground. It can also be found in coal beds and as methane hydrate deposits on the ocean floor. CNG (Compressed Natural Gas) is natural gas extracted from natural gas fields or associated gas produced during oil extraction. It is transported through pipelines to gas processing plants to remove impurities and then sent to compression stations, where it is compressed to high pressures (200-250 bar) and stored in specialized tanks.

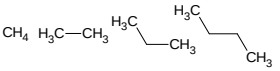
LNG (Liquefied Natural Gas) is natural gas that has been liquefied through deep cooling to approximately -162^{O}C (-260^{O}F) after being processed to remove impurities. The main component of LNG is methane (CH_4), which accounts for about 95% of its composition, remaining are ethane, propane, and other substances. LNG is colourless and odourless.

Figure 7: Logo.

The volume of natural gas in its liquid state is about 600 times smaller than its volume in its gaseous state, making it very convenient for long-distance storage and transportation to the point of consumption.

LPG (Liquefied Petroleum Gas) is a liquefied mixture of light hydrocarbons, with propane and butane as its main components. It is liquefied for convenient storage and transportation. LPG is produced from natural gas streams extracted from oil wells or through crude oil refining processes. LPG is colourless and odourless.

The difference between compress natural gas vs liquefied natural gas and liquefied petroleum gas

Ordinal Numbers	Characteristic	LNG	CNG	LPG
1	Main component	Methane	Methane	Propane & Butane
2	Density	0.41-0.5 kg/L	0.75-0.83 kg/Sm^3	0.51-0.56 kg/L
3	Heating value	55	53	50
4	Safety	LNG is lighter than air, and it disperses easily when there is a leak.	CNG is lighter than air, and it disperses easily when there is a leak.	LPG is heavier than air, and it tends to accumulate on the ground when there is a leak, making it highly flammable and displacing oxygen.
5	Storage and transportation conditions	LNG is liquefied at a temperature of -162^{O}C and atmospheric pressure, reducing its volume by 600 times compared to its gaseous state at Standard temperature and pressure (STP)	CNG is compressed to a pressure of 200-250 bar, resulting in a volume reduction of approximately 200-250 times compared to its ambient temperature and pressure state.	LPG (Liquefied Petroleum Gas) is liquefied at low pressure, depending on the propane/butane ratio and temperature. At 38^{O}C, LPG liquefies at a vapour pressure of approximately 12 bar. The volume of LPG in its liquid state decreases by around 250-270 times compared to its gaseous state.
6	Storage material	LNG is stored in multi-layered steel tanks, with an insulation layer to maintain the low temperature required to keep it in its liquefied state. These tanks are designed to withstand pressures of approximately 12 bar.	CNG is typically stored in specialized high-strength composite or steel cylinders designed to withstand pressures higher than 250 bar.	LPG is stored in steel tanks or cylinders designed to withstand pressures up to approximately 25 bar.
7	Role	LNG is used as fuel for power generation, industrial production, transportation, shipping, and as raw materials for chemical production.	CNG is used as fuel for industrial production, transportation, and vehicles.	LPG is used as fuel for residential, industrial production, transportation, and vehicles.  Methane, Ethane, Propane, Butane

The benefits of using CNG, LNG, and LPG over conventional fuels include that they are cleaner and more effective, which makes them suited for industrial use. Due to ease of storage and long-distance transportation, LNG and LPG are two of them that are often traded. CNG and LNG are safer and more environmentally friendly than LPG. Liquefied natural gas (LNG) and propane are not the same, although they are both forms of natural gas. LNG is primarily composed of methane, which is cooled to a very low temperature to convert it into a liquid state. Propane, on the other hand, is a hydrocarbon gas that is the main component of Liquefied petroleum gas (LPG). With the capability to simultaneously supply LNG, CNG, and LPG fuels using an open fuelling method, Gas South believes it can ensure a flexible gas supply, stable quantity, competitive pricing, and optimally meet the needs of customers. Customers have the flexibility to choose from various options, including investing in equipment, transportation, and operations.

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