

A Technical Review on CNG: Alternative Fuel for Two Wheeler

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Abstract- In recent times due to effects of pollution and global warming this is a need for eco-friendly fuel for two wheeler. An increasing number of vehicles worldwide are being designed to run on CNG. CNG's can also be very easily refueled from any of the existing gas stations. CNG bike are said to be safer than LPG bike also because LPG is very highly combustible whereas CNG is very light in property and dissipates easily into the air. The life of the engine of the bike is also enhanced by CNG due to the fact that this gas is dry and does not leave behind any residue when engaged in the combustion process to propel the bike. Today, the heavy vehicles are run on the basically petrol & diesel, which producing a large amount of harmful gases like CO₂, SO₂ etc. which act as the major source for global warming. The Cost and pollution with petrol & diesel vehicles is very high manufacturers to develop vehicles fuelled by alternative energies. Due to the unique and environmental friendly properties like CNG for storing energy is a method that is not only efficient and clean, but also economical. So the air is considered as one of the future fuels which will run the vehicles. And assure that the CNG is the alternative fuel for the vehicles.

Index Terms- CNG, Bike, Alternate source of energy, clean and highly efficient, Non-polluting.

1. INTRODUCTION

Compressed natural gas (CNG) (Methane stored at high pressure) can be used in place of gasoline (petrol), Diesel fuel and propane/LPG. CNG combustion produces fewer undesirable gases than the fuels mentioned above. It is safer than other fuels in the event of a spill, because natural gas is lighter than air and disperses quickly when released. CNG may be found above oil deposits, or may be collected from landfills or wastewater treatment plants where it is known as biogas. CNG is made by compressing natural gas (which is mainly composed of methane, CH₄), to less than 1 percent of the volume it occupies at standard atmospheric pressure. Natural gas can be compressed, so it can store and used as compressed natural gas (CNG). CNG requires a much larger volume to store the same mass of natural gas and the use of very high pressure on about 200 bars or 2,900 psi. Natural gas is safer than gasoline in many respects. The ignition temperature of natural gas is higher than gasoline and diesel fuel. Additionally, natural gas is lighter than air and will dissipate upward rapidly if a rupture occurs. Gasoline and diesel will pool on the ground, increasing the danger of fire. Compressed natural gas is non-toxic and will not contaminate groundwater if spilled. Advanced compressed natural gas engines guarantee considerable advantages over conventional gasoline and diesel engines. Compressed natural gas is a largely available form of fossil energy and therefore

non-renewable. However, CNG has some advantages compared to gasoline and diesel from an environmental perspective. It is a cleaner fuel than either gasoline or diesel as far as emissions are concerned. Compressed natural gas is considered to be an environmentally clean alternative to those fuels.

2. NATURAL GAS AS AN ALTERNATIVE FUEL FOR IC ENGINE

Natural gas is produced from gas wells or tied in with crude oil production. Natural gas is a mixture of hydrocarbons in gaseous form, consists of approximately 85 to 95 per cent of methane as main component but frequently contains trace amounts of ethane, propane, butane, pentane, hexane, nitrogen and carbon dioxide, Table No.1 gives the composition of CNG in percentages of volume. However, Natural composition varies considerably over time and from location to location.

Few natural gas vehicles (NGV) are operating on LNG at present. Research and developments are being carried out so that vehicles will be able to refuel their cryogenic storage tanks from LNG depots at a cost that is competitive with CNG and more extensive use will be made of this form of storage. Until such time most vehicles using natural gas will store it in compressed form.

Table.1 Natural Gas composition

Compositi on	Formu la	Volume fraction (%)			
		Ref. 1	Ref.2	Ref. 3	Ref. 4
Methane	CH ₄	94.0	92.0	94.3	91.8
Ethane	C ₂ H ₆	0	7	9	2
Propane	C ₃ H ₈	3.30	4.66	3.29	2.91
Iso- butane	i- C ₄ H ₁₀	1.00	1.13	0.57	-
N-butane	n- C ₄ H ₁₀	0.15	0.21	0.11	-
Iso- pentane	i- C ₄ H ₁₀	0.02	0.10	0.05	-
N-pentane	C ₅ H ₁₂	0.02	0.08	0.06	-
Nitrogen	n- C ₅ H ₁₂	1.00	1.02	0.96	4.46
Carbon dioxide	N ₂	0.30	0.26	0.28	0.81
Hexane	C ₅ H ₁₂	0.01	0.17	0.13	-
Oxygen	N ₂	-	0.01	<0.0	-
Carbon monoxide	CO ₂	-	<0.0	1	-
	C ₆ + C ₆ H ₁₄	1	<0.0	1	-
	O ₂ CO				
Total		100. 00	100. 00	100. 00	100. 00



Type 1: All Steel



Type 2: Hoop wrapped composite



Type 3: Fully Wrapped Composite



Type 4: Fully Wrapped and Non-Metallic Liner

3. CNG ACCESSORIES

3.1 CNG Cylinder

CNG cylinders are available in four types. Type 1 cylinders are the heaviest and least expensive, and Type 4 tanks are the lightest and most expensive – Cylinders are available in a large range of sizes and configurations. It is also possible to install multiple tanks within one vehicle. CNG is stored on board vehicles in high working pressure rated at either 3,000psi or 3,600psi pounds per square inch. CNG cylinders meet very rigorous safety standards. Cylinders are made of high strength materials that are designed to withstand impact and puncture. If these cylinders are exposed to fire, thermally activated pressure relief devices (PRDs) provide a controlled venting of the gas rather than letting the pressure buildup in the cylinder. CNG cylinder capacity is measured in gasoline-gallon equivalents (GGE).

Table.2 CNG Size chart

Nominal water Capacity	Gas capacity Cu.m.(Approx.)	Dia. mm	Length 'L' mm	Approx. Weight (Kg.)
20	5	232	650	25
22	5.4	232	700	28
25	6.3	232	780	32
28	5	232	860	34
30	7.5	232	910	37
50	12.5	232	1450	54
30	7.5	267	725	36

3.2 Fuel pressure regulator

A pressure regulator is a valve that automatically cuts off the flow of a liquid or gas at a certain pressure. Regulators are used to allow high-pressure fluid supply lines or tanks to be reduced to safe and usable pressures for various applications.



Fig.1 Fuel pressure regulator

Pressure regulator's primary function is to match the flow of gas through the regulator to the demand for gas placed upon the system. If the load flow decreases, then the regulator flow must decrease also. If the load flow increases, then the regulator flow must increase in order to keep the controlled pressure from decreasing due to a shortage of gas in the pressure system.

3.3 Solenoid Valve

On or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold. Solenoid valves are the most a solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design. The valve body must be compatible with the fluid; common materials are brass, stainless steel, aluminum, and plastic. The seals must be compatible with the fluid.

3.4 CNG supply hose

CNG supply Hose is long cylindrical tubes that supply fuel from one port to another port at High pressure these tubes are made to withstand high pressure intensity and also it suitable to all kind environment condition. It available in different shapes and size according to place of usage it will be varied. It consists of two ends which connect two ports. Materials of these tubes are different for different kind of application. Materials of these tubes are like steel, polyethylene, polyurethane.



Fig.2 Hose

4. Results and Discussion

There are several major problems needed to be solved when using lean burn natural gas engines. First, the set point for the best compromise between emissions and fuel economy is not clear, although wide range exhaust gas oxygen sensors have recently become available. Second, even if this set point is known for a given fuel and operating condition, the optimum air-fuel ratio changes with both operating conditions and fuel properties.

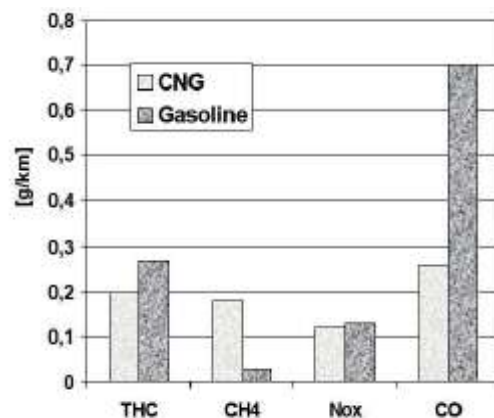


Fig.3 CNG engine emissions result

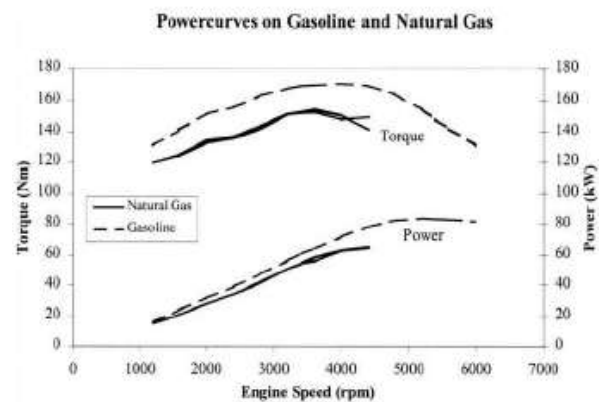


Fig.4 CNG and Gasoline power curves

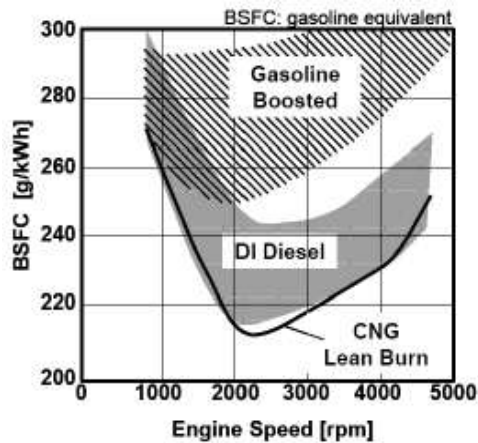


Fig.5 CNG lean burn fuel consumption

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5. CONCLUDING REMARKS

CNG or Compressed Natural Gas is the most viable alternate fuel for automobile companies in the near future. CNG is an alternated fuel which makes the use of compressed natural gas as a clean alternative to other fuels. Throughout the world there are 9.6 million vehicles running on CNG. CNG is viable or preferable because it has a host of advantages as against traditional fuels. CNG is environment friendly; economic, availability is in abundance and high in calorific value. CNG and LPG are slowly and steadily gaining ground in the automobile industry. They surely seem to be the fuel of the future. With the continuous rise in the price of petrol and diesel alternated fuels are becoming the preference of Indian consumers.

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