

STUDY ON CNG AS A FUEL IN TWO WHEELER

Abhisheak Gangwar¹, Ashutosh Tiwari², Vinay Keshari³

^{1,2,3}Department of Mechanical Engineering , RRSIMT Amethi , Uttar Pradesh, India

ABSTRACT: In today's century the two wheelers play a very important role because, In India middle class people has average income so they use bikes for as transportation. Utilization of motorcycle in India is on the top. Lots of them have two stroke and four stroke engines and they use petrol and diesel as a fuel. The use of petrol and diesel is totally responsible for global warming because the quality of fuel is very low. CNG uses as alternate fuel in four wheelers so with some modifications CNG can use a fuel in two wheelers. Natural gas has many special properties and some specification. High rating of octane has ability to rapid burn and this increase the engine performance and more efficient. India has massive source of CNG. CNG is very light in weight and easily filled from the existing CNG pump. In the introduction some results and parameters are shows why CNG should be used in two wheelers as a fuel. And results also force industry to use this technology in their bikes.

KEYWORDS: CNG, two wheeler, fuel, Natural gas.

INTRODUCTION:

In India many people dies from the pollution so there is much needed of eco-friendly environment. In this type of bike the basic concept is used that is that the pressure is reduced from 210 bar to 6-9 bar which will be possible by the vaporizer. Now in days most of vehicles are designed for CNG. This technology is to much simple that it can also be installed in the normal bikes. Now most of the four wheelers are works on CNG so it will be available in stations easily. This technology is much better in comparison LPG system because it is very light and easily dissipated in the environment. This technology will also increase the life of engine and vehicle because it is dry in nature.

CNG: (COMPRESSED NATURAL GAS)

In Compressed natural gas methane is stored at very high pressure because of its property it is uses in the place of gasoline. CNG is tasteless, odorless and colorless. Methane is in highest percentage in the mixture of CNG. CNG is safer in comparison to other fuels because it is lighter than the air and easily disperse. CNG can be found by waste water treatment plants. It is also called biogas. The cost of CNG is 55% less than in comparison to gasoline and LPG. CNG is mixture of gases which has compressible nature which is less than 1% of its atmospheric pressure. Basically it stored in spherical and cylindrical shapes containers. The vehicle which is driving by Natural gases mostly used in Iran, Pakistan, Delhi, Ahmadabad, Mumbai, Kolkata, Chennai ,Luck now and Kanpur because of rising prices of gasoline. In above cities the pollution is also in control because of CNG.

In Malaysia, natural gas is drilled from, Sabah, Sarawak and offshore Terengganu while for gas utilization it transfers in Peninsular Malaysia and then it transfers to many other plants for proper utilization. In this paper a experiment is taken from the industry where the CNG is used in two wheelers and also get some results and it was found that the result which comes from the experiment is very efficient in comparison to gasoline. This experiment was conduct in Malaysia on MODENAS and KRISS 110 bike's engine. In this paper result only shows a example of the CNG bases bikes and forced industry to make a such type of system for two wheelers. In this experiment the composition of natural gas which is used in this bike also be showing. In this table the specification is also describe which shows the accuracy of result.

Table: SPECIFICATION OF ENGINE AND COMPOSITION OF NATURAL GASES

| | | |
|---------------------------------|--------------------|--------------------------------|
| Type | Unit | 4 st, 1 cyl, SOHC |
| Bore x stroke | (mm) | 53.0 x 50.6 |
| Displacement | (cm ³) | 111 |
| Compression ratio | | 9.3 |
| Carburetor Type | | KEIHIN PB18 X 1 |
| Diameter of throttle valve | Mm | 18 |
| Diameter of venturi | Mm | 18 |
| Type of choke valve | | Butterfly |
| Lubrication system | | Forced lub. Wet |
| Engine oil Rating | | SF OR SG |
| Viscosity | SAE Grade | 20W-40 |
| Capacity | (L) | 1.1 |
| Cooling system : Cooling method | | Air cooled |
| Ignition system | | Magneto to CDI |
| Ignition timing : Angle | (°/rpm) | 6.5 BTDC /1200 ~27 BTDC / 4000 |
| Spark plug : Type | | NGK C6HAS |
| Gap | Mm | 0.7 |
| Regularity | | C |
| Air cleaner Type | | Wet element air filter |
| Number (qty) | | 1 |

(Source: Modenas KRIS 110 Operating Manual)

Table 2. Natural Gas Composition

| Component | Mol % |
|---------------------|---------------------------|
| C ₁ | 93.07 |
| C ₂ | 3.70 |
| C ₃ | 0.90 |
| iC ₄ | 0.29 |
| nC ₄ | 0.13 |
| iC ₅ | 0.07 |
| C ₆₊ | 0.07 |
| CO ₂ | 1.10 |
| N ₂ | 0.68 |
| Compressibility | 0.9977 |
| Density | 0.7404 kg/sm ³ |
| Relative Density | 0.6042 |
| Molecular Weight | 17.4663 |
| Gross Calorie Value | 39.20 MJ/sm ³ |

Table 3: Petrol Specification

| Description | Value |
|-----------------------------------|--------------------------------|
| Density @ 15 ⁰ C, kg/l | 0.733 |
| Research Octane Number (RON), g/l | 97.0 |
| Lead Content, kPa | 0.008 |
| Reid Vapour Pressure, %wt | 62 |
| Total Sulphur | Trace |
| Distillation | 50% evaporated, ⁰ C |
| | 90% evaporated, ⁰ C |
| Colour | Yellow |

In this system a new bike was designed to perform the experiment. In Malaysia a prototype was also fabricated in Teknologi University and complete setup of the system was capable to run on the road. This bike was developed for future assignment. And in the last when test was performed on this bike and it was found that 50% pollution can be reduced by this system and use for making Eco-friendly atmosphere.

IMPORTANT TERM TO MAKE A SETUP:

CYLINDER OR CONTAINER:

The most important property about the CNG cylinder that it should manufactured to handle all type of pressure (physical and chemical). There should be high strength of CNG cylinder that it can wear all type stress and designed as no puncture can make in cylinder. CNG vehicle cylinder works at very high pressure because CNG is highly compressible in nature. Before using the cylinder in CNG vehicle it should measure by gasoline-gallon equivalents because CNG gas does not change its state when it compressed.



Fig: Some CNG cylinder which can be used in bikes

Gas regulator or ON/OFF valve:

Generally these type of valve made of brass, aluminum, plastic and stainless steel. These are also called ON/OFF valve. Basically these are operated on electromechanical principle. This type of valve is controlled by electric current. Main functions of this type of valve are release the natural gas, shut off or on the system, disturb or mix the gases. This is one of the safe switch and fast action valve. If this type of valve will be operates between two ports then outflow also control only two heads. They have long service life but compact design. They can easily setup on the cylinder to control and maintain the pressure easily.

CNG is economical beneficial in two wheelers:

The CNG used bike has better potential economic in future of India. For the exact value a operation is performed on the project and it shows that when the engine is operated from the fuel then it runs 1km on 4 rupees and when the engine is operated from the CNG then it runs 1km on 1 rupees. Other advantage of the CNG system bike that other tax is 25% reduced in India.

There are some advantages of CNG system:

1. It will Reduced the fuel cost in comparison to gasoline.
2. It is Domestic produced abundant fuel.
3. Well established and growing infrastructure in India.
4. Eco-friendly system.
5. It will Reduced the maintenance cost.
6. It will also increase the performance of vehicle.
7. It provides many best Safety advantage.

COMPARISON OF FUEL AND GESOLINE ON SOME DIFFERENTS BASES:

CNG or Natural compressed gas is much better in comparison to petrol because it cheap, easily transport and low moisture content. This type of vehicles have lower maintenance cost in comparison to other gasoline vehicles. CNG mixed easily with other gases because of its gaseous form. The most important term is that it has auto ignition temperature up to 550 °C and also has a narrow flammability (4-13%). It has Less pollution and more efficient in comparison to other fuels.

Some chemical comparisons:

Carbon Monoxide (CO)

In the CNG system bikes the amount of carbon monoxide is 0.01-0.03% at the constant sped which is much less than gasoline fuel bikes. This above phenomena occurs due to complete combustion. The emission of CO after using the CNG system will decrease up to 98% which is much better than gasoline fuel

Unburned Hydrocarbon (UHC)

The amount of unburned hydrocarbon will decrease up to 78% by using CNG system in comparison to gasoline fuel. This will increase the performance of engine and helpful to Eco-friendly environment.

By some chemically and physically comparison it is clear that by using CNG system in two wheelers, the amount of CO₂,UHC, CO and NO_x will decrease which increase the life of engine, efficiency and performance.

SAFTEY FEATURES IN CNG SYSTEM:

1. CNG is nontoxic so in case of accident it does not react and no threat poses.
2. Methane is easily soluble in water.

3. It has a narrow flame.
4. It will minimize the ignition risk when compressed in compare to gasoline.
5. It has eco-friendly behavior.
6. If any case it leaks then it will easily dissipate because it is lighter than air.

CONCLUSION:

Natural gas large reserve base lends itself to opportunities for exploration of the resources not only to generate foreign exchange earnings through export of liquefied natural gas and piped gas but also fuel nations demand energy for industrialization and to spawn other ancillary and related industries, including the development of the natural gas vehicles especially for motorcycles. Since motorcycle is a second major source of pollutant in Malaysia and quite critical to environment and human health especially in city center like Kuala Lumpur, the initiation of natural gas powered motorcycle is the best solution to decrease air pollution in our country. Natural gas powered motorcycle totally eliminates nitrogen oxides and give a significant decreases on CO and HC emission. Therefore, natural gas motorcycle is the key of the next millennium with clean city transportations. In addition, these results would be useful as a guide to the motorcycle industries using natural gas as the fuel and also to the nation to achieve Vision 2020, which could account for the Malaysia's technology.

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.

REFERNCES:

- [1] ASCO, Engineering Information: Solenoid Valves,
- [2] NCER book S.Chand publication.
- [3] CNG wikipedeia.com
- [4] engines (HALO). Final scientific/ Technical report of the U.S Department of Energy. Malaysian NGV Taxi Prototype , 1996 Petronas.
- [5] Zulkifli Abd. Majid, Zulkefli Yaacob, Martin Philip King Ik Piau, "A Study on Exhaust Emission, Performance and Lubricating Oil Effects on Natural Gas Motorcycle", Jordan International Chemical Conference III, 27-29 September, 1999 Amman, Jordan.
- [6] Wong Siaw Foong, 1999, " A Conceptual Design on Storage Cylinder for Natural Gas Powered Motorcycle" University technology of Malaysia, Johor.
- [7] J.B. Heywood. 1988. Internal combustion engine fundamentals. McGraw-Hill Book Company.
- [8] G.A. Karim, I. Wierzba, Y. Al-Alousi. 1996. Methane-hydrogen mixtures as fuels. Int. J Hydrogen Energy. 21(7): 625-631.
- [9] S.O. Akansu, N. Kahraman, B. Ceper. 2007. Experimental study on spark ignition engine fuelled by methane-hydrogen mixtures. Int. J. Hydrogen Energy. 32: 4279-4284.
- [10] C. Smutzer. 2004. Application of hydrogen assisted lean operation to natural gas - fuelled reciprocating
- [11] www.rama cylinder.com

[12] Ong Hua Long, 1999, " Lubricating effect on natural gas powered motorcycle" University technology of Malaysia, Johor.

[13] Techlab Autogas pvt ltd. Manesa

[14] Alibaba.com for cng kit

BIOGRAPHIES



MR. ABHISHEAK GANGWAR is student of Mechanical final year from Rajarshi Rananjay Sinh Institute of Management and Technology, Amethi, U.P. He has already published 4 Technical Papers in International Journals.



MR. ASHUTOSH TIWARI is student of Mechanical final year from Rajarshi Rananjay Sinh Institute of Management and Technology, Amethi, U.P. He has good knowledge in Automobile field and works as Research Scholar.



MR. VINAY KESHARI is student of Mechanical final year from Rajarshi Rananjay Sinh Institute of Management and Technology, Amethi, U.P. He has good knowledge in Automobile field and works as Research Scholar.