

Design and Modification of a 4 Stroke Bike Using Gobar Gas

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Abstract- Looking at the exponential growth of Pollution we can predict the future of the Earth. Diseases like asthma, lung cancer, skin cancer, etc., will be common. Observing at the current scenario of the petroleum and its rising price, ordinary person cannot afford to spend such a huge amount, unless it's a need and not leisure. This project gives an opportunity to crush all the problems. The cure to these problems is to use an alternate fuel which can be environment friendly, using green gas in essence, Gobar Gas. As Gobar gas emits very less pollutants so we can save the environment from air pollution. From the research we get to know that there are many sources of pollution, out of which transport has a drastic increase of 1301 tonnes of pollution which can make our environment more and more polluted. In this project we have aimed to modify the chosen bike so as it runs on an alternate fuel which is gobar gas. This bike is designed for rural region peoples. It is seen that gobar gas production is more in rural areas where there are more of cattle farms. Hence, it is easy to get fuel for this bike at very lower cost. The bike when fuelled with gobar gas produces enough torque to take up its dead load with a rider, thus making it possible to have a very low cost ride. This bike is made for convenient transportation of a person from one point to another.

Index Terms- Alternate fuel, Gobar gas, Low cost bike, Modification of bike, bike for rural region, biogas.

I. INTRODUCTION

This report contains project work based on designing and modifying a Bike which is operated by a Four Stroke Engine. This bike is designed and modified to such an extent that it may run on Gobar Gas.

As we know, there is a constant increase in consumption of non-renewable fuel (diesel and petrol). Hence, these sources of energy can be annihilated in future. Also high emission of harmful gases from the exhaust has a worst impact on environment which leads to global warming. And also everyone is aware of the continuous increase in cost of fuel.

These problems can be solved by using an alternate fuel like Gobar Gas. This gas is also called as green gas as it is generated naturally.

In this project we are attempting to use an alternate fuel for a Four Stroke engine bike. The fuel we use is gobar gas which is disintegrated from cow dung.

II. NEED FOR THE DEVELOPMENT

In today's world, competition for the super power is rising, ending up with making of technologies which are itself dangerous to the whole ecosystem. The everyday increase in pollution given out by industries and many other sources are making an imbalance situation to the blue planet Earth and making it into black planet.

There are many sources that give out harmful pollutants. But if we try to reduce these sources, we can help ourselves to live longer up to long generations.

If we see the internal combustion engines, mostly run on fuels like gasoline, diesel, kerosene, oil, etc., which gives out harmful gas like carbon monoxide, carbon dioxide, sulphur dioxide, NOx, etc. which when in contact with the oxygen and moisture in air becomes harmful acid like sulphuric acid, nitric acid which causes diseases like skin cancer, eye blindness, etc.

By using an alternate fuel for IC engine which is environment friendly, we can reduce the above mentioned problems.

III. PROBLEM STATEMENT

After looking to the increasing rate of air pollution in the world and annihilation of the non-renewable resource, to sustain life is getting much more difficult.

The day by day increase in rate of gasoline and diesel are striking the market. As we know the whole market is directly or indirectly affected by the fluctuating rates of petrol and diesel.

The harmful pollutant gasses emitted from the exhaust of IC engine also contribute a huge share into air pollution.

A common man cannot sustain in this world with all these problems he faces.

IV. OBJECTIVE OF STUDY

1. Modification of 4-stroke bike so as to replace petrol as a fuel with CH₄ (gobar gas).
2. Minimize the cost of overall bike.
3. To make bike more efficient with least pollutants as output.

V. PROPOSED METHODOLOGY

In order to overcome problems mentioned in previous chapters a brief study was carried out and observed the rise in pollution and increase in rate of fuel in India [4].

Table I: major pollutants and their source

Sr. No	Pollutant	Sources			
		Transport	Power	Industry	Domestic
1	Carbon monoxide (tonnes)	810	08	128	117
2	Sulphur dioxide (tonnes)	11	121	35	12
3	Particle matter nitrogen (tonnes)	157	143	20	03
4	Hydrocarbon (tonnes)	310	02	06	02
5	Suspended Particle (tonnes)	13	50	60	12

From the above table we can see the total pollutants from transport are **1301 Tonnes**. Hence, we can say transport causes more air pollution and thus we should find a better alternate fuel which will emit less amount of pollutants.

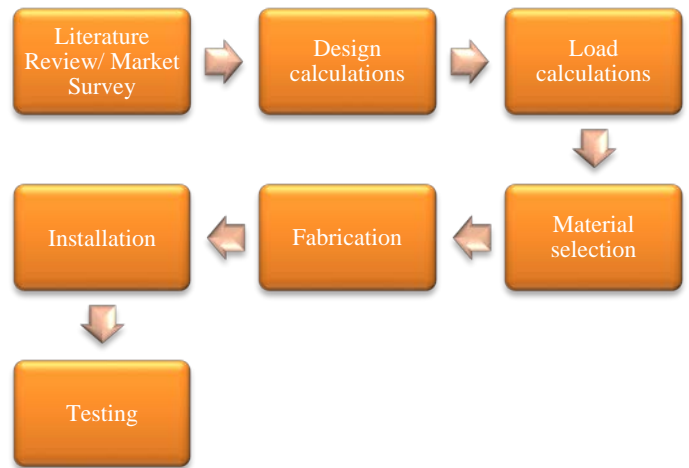


Figure 1: Methodology

A. Load calculation

Torque calculation:

From reference [1]

For ideal condition

N=2000 rpm

BP (brake power) = 6.85KW

Torque =?

We know,

$$\text{Brake power, BP} = \frac{2\pi NT}{60}$$

$$6.85 \times 10^3 = \frac{2\pi \times 2000 \times T}{60}$$

$$T = 32.706 \text{ Nm}$$

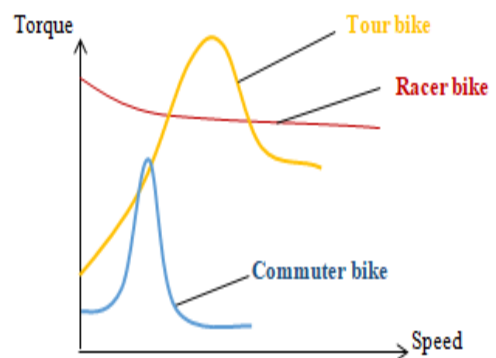


Figure 2: Torque v/s Speed of different types of bike

Basic calculation for torque and force acting on the vehicle
Now,

To calculate force we can use,
 $T = r \times F$ (cross product of radius times of force acting in the wheel)

Where;

$T = \text{torque}$

$r = \text{radius from the center of the rim to the extreme of the tyre.}$

$F = ?$ — (i)

Now;

By using,

$F = m \times a$

Where;

$a = \text{acceleration}$

$m = \text{total mass of vehicle with the rider}$

$a = ?$ — (ii)

Now,

$F_F = \mu \times F_N$

$\therefore F_N = m \times a_g$

$F_N = 196 \times 9.81$

$F_N = 1922.76\text{N}$

$\therefore F_F = \mu \times m \times a_g$

$\mu = 0.4 \text{ wet road } \{3\}$

$\mu = 0.7 \text{ dry road } \{3\}$

$F_F = 769.104 \text{ N (wet road)}$

$F_F = 1345.93 \text{ N (dry road)}$

Where;

$F_F = \text{friction force offered by the road on the bike}$

$a_g = \text{acceleration due to gravity.}$

When force applied:

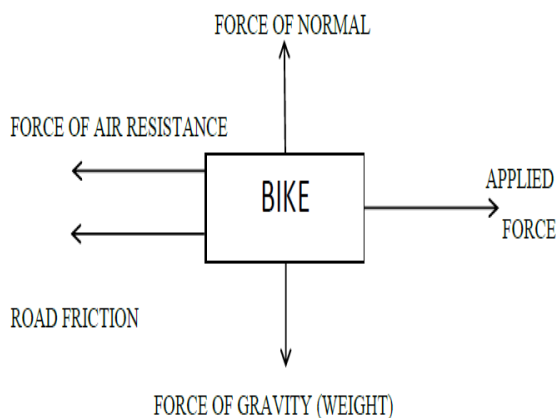


Figure 3: FBD of the bike

The force applied by bike on the road will be;

$F_A = F_{NET} + F_F$

$F_A = 3212.61 \text{ N wet road}$

$F_A = 5467.8 \text{ N dry road}$

B. Material Selection

Design of fuel tank and storage tank

Material selected is welded Low carbon steel as per BIS standards

Low carbon steel cylinder {1}

The currently used material for LPG cylinder is low carbon steel .The low carbon steel cylinder is designed according to the Indian Standards (IS 3196).

C. Installation

Using a proper welding system all the supports will be attached, proper insulation will be provided to the tanks so as not to come in contact with the atmosphere temperature. Safety measure will be provided to the whole system. All the leaks will be check before running the system.

D. Testing

1. Test run the bike with full load condition.
2. To compare observed torque with the calculated torque using DYNOTESTING.
3. To compare the bike performance before and after the modification check for any harmful gas emission (PUC certified).

VI. RESULT AND DISCUSSION

Bike selected is **HONDA CD- 100** (specifications are given above).

The load carrying capacity of the bike after modification will be approx. above 80 kgs that will be a single person rider. (This is the proposed result).

VII. CONCLUSION

The bike will run on the alternate fuel gobar gas. Hence, saving money over gasoline and also keeping pollution free.

Looking at the literature, more of the gobar gas is found in the rural region where more of disintegrators are found. The farmers and the people over there use gobar gas as a source of heat energy for their daily need for cooking. Thus they can also use this gobar gas as the fuel for their vehicle, which will be this bike.

This bike is mainly made for rural areas; the production of gobar gas is more. Thus the people here can easily afford to purchase the bike and the fuel for it.

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Video links of the project

1. https://drive.google.com/file/d/1YVjyDy5V_n9mgtRZSYNh4knsvQ5Y1JUq/view?usp=drivesdk
2. <https://drive.google.com/file/d/1WGVW1j6RSqYbqq8h3BMa1kJhWb1cyc6/view?usp=drivesdk>
3. <https://drive.google.com/file/d/1WzcXOnV58k4jWU0DBZ5hSRmKSWWt1T7n/view?usp=drivesdk>

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