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Fuel Efficiency Improvement by Using Acetylene Powered Engine

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ABSTRACT -*An Acetylene vehicle is an alternative fuel vehicle that uses Acetylene as its onboard fuel for motive power. The term may refer to a personal transportation vehicle, such as an automobile, or any other vehicle that uses Acetylene in a similar fashion, such as an aircraft. The power plants of such vehicles convert the chemical energy of Acetylene to mechanical energy either by burning Acetylene in an internal combustion engine, or by reacting Acetylene with oxygen in a fuel cell to run electric motors. Widespread use of Acetylene for fueling transportation is a key element of a proposed Acetylene economy.*
Acetylene fuel does not occur naturally on Earth and thus is not an energy source, but is an energy carrier. Currently it is most frequently made from methane or other fossil fuels. However, it can be produced from a wide range of sources (such as wind, solar, or nuclear) that are intermittent, too diffuse or too cumbersome to directly propel vehicles. Integrated wind-to-Acetylene plants, using electrolysis of water, are exploring technologies to deliver costs low enough, and quantities great enough, to compete with traditional energy sources.

I. INTRODUCTION

Many companies are working to develop technologies that might efficiently exploit the potential of Acetylene energy for mobile uses. The attraction of using Acetylene as an energy currency is that, if Acetylene is prepared without using fossil fuel inputs, vehicle propulsion would not contribute to carbon dioxide emissions.

The drawbacks of Acetylene use are low energy content per unit volume, high tank age weights, the storage, transportation and filling of gaseous or liquid Acetylene in vehicles, the large investment in infrastructure that would be required to fuel vehicles, and the inefficiency of production processes.

Buses, trains, PHB bicycles, canal boats, cargo bikes, golf carts, motorcycles, wheelchairs, ships, airplanes, submarines, and rockets can already run on Acetylene, in various forms. NASA uses Acetylene to launch Space Shuttles into space. There is even a working toy model car that runs on solar power, using a regenerative fuel cell to store energy in the form of Acetylene and oxygen gas. It can then convert the fuel back into water to release the solar energy.

The current land speed record for a Acetylene-powered vehicle is 286.476 mph (461.038 km/h) set by Ohio State University's Buckeye Bullet 2, which achieved a "flying-mile" speed of 280.007 mph (450.628 km/h) at the Bonneville Salt Flats in August 2008.

For production-style vehicles, the current record for a Acetylene-powered vehicle is 333.38 km/h (207.2 mph) set by a prototype Ford Fusion Acetylene 999 Fuel Cell Race Car at Bonneville Salt Flats in Wend over, Utah in August 2007. It was accompanied by a large compressed oxygen tank to increase power. Honda has also created a concept called the FC Sport, which may be able to beat that record if put into production.

II. COMPONENTS AND DESCRIPTION

The components that are used in the project FUEL PROCESSING TECHNOLOGY TO REDUCE EMISSION are as follows,

1. Battery,
2. Chain drive,
3. Sprocket,
4. Bearings.

III. MATERIAL SELECTION

A. MATERIALS

The term 'mild steel' is also applied commercially to carbon steels not covered by standard specifications. Carbon content of this steel may vary from quite low levels up to approximately 0.3%. Generally, commercial 'mild steer' can be expected to be readily weldable and have reasonable cold bending properties but to specify 'mild steel' is technically inappropriate and should not be used as a term in engineering. Mild steel is

the most widely used steel which is not brittle and cheap in price. Mild steel is not readily tempered or hardened but possesses enough strength.

Mild steel Composition

- Mild steel contains -C45
- Carbon 0.35 to 0.45 % (maximum 0.5% is allowable)
- Manganese 0.60 to 0.90 %
- Silicon maximum 0.40%
- Sulfur maximum 0.04%
- Phosphorous maximum 0.04%
- Mildest grade of carbon steel or mild steel contains a very low amount of carbon - 0.05 to 0.26%
- Tensile strength - 63-71 kgf/mm2
- Yield stress -36 kgf/mm2
- Izod impact valve min -4.1 kgf m
- Brinell hardness (HB) – 229

B. PHYSICAL PROPERTIES OF ACETYLENE

Formula	**C2H2**
Molecular Weight (lb/mol)	**26.04**
Critical Temp. (°F)	**96.0**
Critical Pressure (psia)	**906.0**
Boiling Point (°F)	**-119.6**
Melting Point (°F)	**-113.4**
Psat @ 70°F (psia)	**586.2**
Liquid Density @ 70°F (lb/ft3)	**23.61**
Gas Density @ 70°F 1 atm (lb/ft3)	**0.0677**
Specific Volume @ 70°F 1 atm (ft3/lb)	**14.76**
Specific Gravity	**0.920**
Specific Heat @ 70°F (Btu/lbmol-°F)	**10.53**

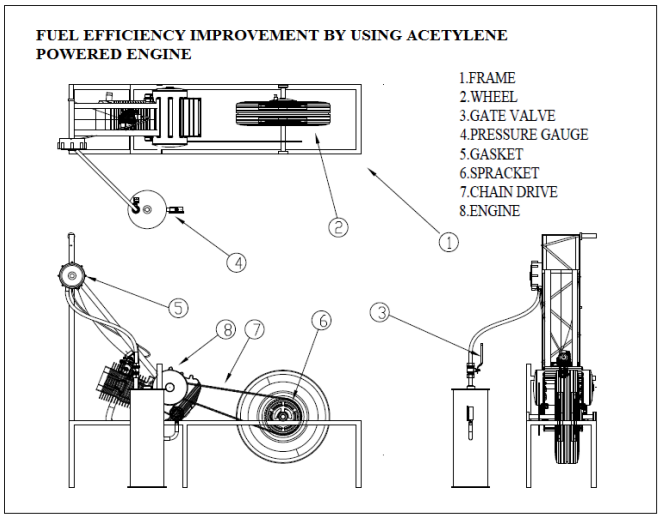
C. PREPARATION OF ACETYLENE

15g of calcium carbide are place in a 150 ml distilling-flask. A dropping funnel and a glass tube are fitted to the top of the flask. The glass tube is connected with a wash-bottle containing 10% aqueous copper sulfate solution.The tall dropping funnel is required in order to give a sufficient "head" of water in the funnel to force the acetylene to pass through the wash-bottle. Additionally adelivery-tube is fitted to the wash-bottle, which is used for the collecting acetyleneunder water or delivering the gas for required experiment.The dropping-funnel is filled with water, and added to the flaskdrop-wise. By contacting with calcium carbide acetylene is at once generated,and on passing through the copper sulfate solution is freed from hydrogensulfate, or other impurities. In the beginning of experiment the acetylenepasses through the apparatus until all the air is expelled. The acetylene as iscollected under water or directly used for an experiment.

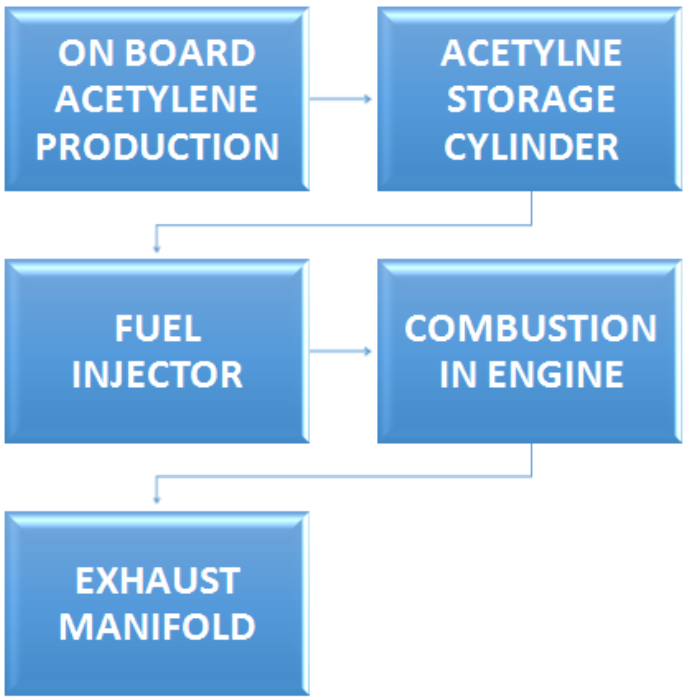
$$CaC_2 + 2H_2O \longrightarrow C_2H_2 + Ca(OH)_2$$

PREPARATION OF ACETYLENE FROM CALCIUM CARBIDE AND WATERBLENDING RATIO

IV. EXPERIMENTAL SETUP



V. WORKING PRINCIPLE



Calcium carbide is a chemical compound with the chemical formula of CaC2. Its main use industrially is in the production of acetylene . The Acetylene is also produced by reacting Calcium carbide (CaC2) with water by the help of cathode and anode terminals. The 12 volt battery supply is given to these electrodes, so that the Acetylene is comes out from the negative terminal tank. This output gas is dipped to the multi tank so that Acetylene is produced. This will explained in the above chapter. Here's some information on a simple homegrown method for producing pure Acetylene and petrol gas. The beauty of this system is that it uses a common inexpensive chemical which is not consumed in the reaction, so it can be used again and again almost indefinitely (if you use pure multi in the reaction). The output fuel is used to run the engine. Until recently it has not been practical to use acetylene for gas engines, owing to the fact that but very few acetylene generators generate acetylene at a temperature low enough to obtain a purity of gas or quantity sufficient to bring about the practical use of acetylene in an engine, but there are some generators producing acetylene of a sufficiently low degree of temperature to bring about a purity of quality and increase of volume of acetylene to such an extent that cooking and heating with acetylene has not only been made practical and profitable to many who are now

using acetylene, but its use is now applied very practically to engines, which have been formerly used with gas and gasoline.

"Of course, engines used for this purpose are especially constructed, owing to the fact that a much smaller quantity of acetylene is required, when properly mixed with oxygen, to bring about good results in an engine than is used when coal gas is applied. A engine of this kind may be applied for running various kinds of machinery for factory purposes and the generator used for furnishing acetylene for heat, light and power. The heat may be used in the laboratory, the light for illuminating the entire premises, acetylene as applied to the engine, power for the entire institution - all supplied from one source. Te advent of the acetylene engine in the field of active industry will be a great boon to the trade generally, inasmuch as in many places acetylene generators will be purchased strictly for the sake of obtaining the gas for power purposes.

"A country home or estate may now be fitted out with an acetylene plant, whereby the lighting of the buildings, as well as the grounds, is supplied from the machine, acetylene for heating and cooking purposes in the culinary department and hot water heating appliances in the bath room. The acetylene engine can be used for the purpose of forcing water through pipes in the most modern manner possible to conceive of, thus supplying the suburbanite with all the luxuries of city life so far as these particular items are concerned.

"It is very interesting indeed to know the various uses to which acetylene is being applied. There is hardly a day at the present time but what some new application is made of this valuable combination of carbon and hydrogen. e see it in use on all up-to-date automobiles, launches, bicycles and many other similar uses, where the very brightest and best results are desired by way of illumination. ow, since the acetylene engine has come into the field, it would not be at all surprising to see within the next year at the automobile show, an automobile propelled as well as illuminated with acetylene

VI. RESULTS

A. FUEL EFFICIENCY TEST RESULT

ACETYLENE (gram)	PETROL (ml)	PRESSURE (acetylene)	RUNNING TIME (acetylene)	RUNNING TIME (petrol)
50	50	1.5bar	8min	5.45min
100	100	3bar	15.7min	10.9min
150	150	4.5bar	23.8min	16.35min
200	200	6bar	31.5min	21.8min
250	250	7.5bar	40.5min	27.25min
300	300	9bar	47.35min	32.7min

VII. CONCLUSION

In the present work experiments were carried out on acetylene based dual fuel engine, and its performance combustion and emission characteristics were studied. DEE and water was injected electronically into the port to improve the combustion characteristics, and to reduce NOx emissions and backfire. An injection system was developed for precise monitoring and accurate injection of acetylene into the intake manifold and port. To improve the part load performance in TMI technique, EGR was added as a charge diluent into the intake air. The significant conclusion drawn based on the experimental work is presented in this chapter.

As acetylene has wide range of merits on environmental as well as economic grounds. It produces only carbon dioxide during combustion and is less costly than conventional fuel as acetylene is produced from calcium carbonate which is in abundance. Acetylene have proved out to be better fuel due its non-polluting nature and more economic.

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Journal Papers

[1]. Prabin K. Sharma et al.: "Use of Acetylene as an Alternative Fuel in IC Engine" proceeding of Rentech Symposium Compendium, Volume 1, March 2012.