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Water Engine by Using Acetylene GAS

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ABSTRACT

The search for an alternative fuel is one of the needs for sustainable development, energy conservation, efficiency, management and environmental preservation. Therefore, any attempt to reduce the consumption of petrol and diesel possible alternative fuels is mostly preferable. Many research activities were developed in order to study the Internal Combustion Engines with alternative fuels. Acetylene is one of the tested fuels. The present project includes: providing a fuel comprising acetylene as a primary fuel and Alcohol as a Secondary fuel avoiding knocking for an internal combustion engine. The paper investigates working of SI engine on acetylene minor changes required to be done. Thus reducing the running cost and minimum pollutant emission, this makes it fit for use on economic and environment standard. It is more effective and eco-friendly alternative fuel option.

Keywords : Water Engine, Acetylene GAS, SI Engine, Sulphur Oxides, IC Engines, HCCI, BMEP

I. INTRODUCTION

In the present context, the world is facing difficulties with environmental degradation and the crisis of fossil fuel depletion. Conventional hydrocarbon fuels used by internal combustion engines, which continue to dominate many fields like power generation, transportation and agriculture leads to pollutants like particulates, HC (hydrocarbons) and SOx (Sulphur oxides), which are highly harmful to human health. CO2from Greenhouse gas increases global warming, sea level rise and Climatic changes.

The search for an alternative fuel promises a harmonious correlation with energy conservation and management, sustainable development, efficiency and environmental preservation. Therefore, any attempt to minimize the consumption of petroleum based possible alternative fuels will be the most welcome. Hence fuels which are clean burning, renewable and can be produced easily are being investigated as alternative fuels.

A lot of research has gone into use of alternative fuels in IC engines from few decades. Vegetable oils seem to be a forerunner as they are renewable and easily available. In an agricultural country like India use of vegetable oil would be economical because of reduced dependability and large productivity on import of petroleum products. But because of poor atomization and high viscosity and of straight vegetable oils leads to improper mixing and causes improper combustion. Further to minimize viscosity problem researchers went for vegetable oils.

G. Nagarajan and T.Lakshamanan et.al. Conducted experiments on a diesel engine aspirated acetylene along with air at different flow rates without dual fuel mode. Acetylene aspiration results came with a less thermal efficiency, reduced CO emissions, Smoke and

HC when compared with baseline diesel operation. With acetylene.

II. LITERATURE REVIEW

G.Nagarajan and T.Lakshamanan conducted experiments on a diesel engine aspirated acetylene along with air at different flow rates without dual fuel mode. They carried out the experiment on a single cylinder, air cooled, direct injection (DI), compression ignition engine designed to develop the rated power output of 4.4 kW at 1500 rpm under variable load condition. Acetylene aspiration results came with a lower thermal efficiency reduced Smoke, HC and CO emissions, when compared with baseline diesel operation.

Ashok Kumar et al. studied suitability of acetylene in SI engine along with EGR, and reported that emission got drastically reduced on par with hydrogen engine with marginal increase in thermal efficiency.

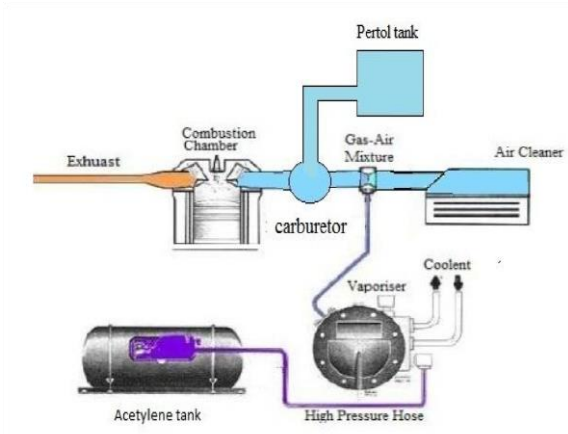
Gunea, Razavi, and Karim conducted experiments on a four-stroke, single cylinder, direct injection diesel engine fueled with natural gas. Tests were conducted with diesel as the pilot fuel having different cetane numbers in order to find the effects of pilot fuel quality on ignition delay. They concluded that ignition delay of a dual fuel engine mainly depends on pilot fuel quantity and quality. High cetane number pilot fuels can be used to improve performance of engines using low cetane value gaseous fuel.

Swami Nathan et al. conducted experiments on sole acetylene fuel in HCCI mode and shown the results with high thermal efficiencies in a wide range of BMEP. The thermal efficiencies were comparable to the base diesel engine and a slight increase in brake thermal efficiency was observed with optimized EGR operation. The intake charge temperature and amount of EGR have to be controlled based on the output of engine and at high BMEPs hot EGR leads to knock.

John W.H. Price described the explosion of an acetylene gas cylinder, which occurred in 1993 in Sydney. The failure caused severe fragmentation of the cylinder and resulted in a fatality and property damage. He examined the nature of the explosion which occurred and sought an explanation of the events. He gave more information to prevent accidents regarding while using acetylene and the reactions take place in combustion and safety precautions.

M. Senthil Kumar concluded that hydrogen can be inducted along with air to improve the performance and reduce hydrocarbons and smoke emissions of a Jatropha oil fuelled compression ignition engine with cleared dual fuel mode concept. The most significant environmental penalty will be an increase of NO emission. The amount of hydrogen that can be added depends on the output. At full load 7% of the total mass of fuel admitted has to be hydrogen for optimal performance. At low outputs it is not advantages to use hydrogen induction.

III. CONSTRUCTION AND WORKING OF WATER ENGINE USING ACETELYEN GAS

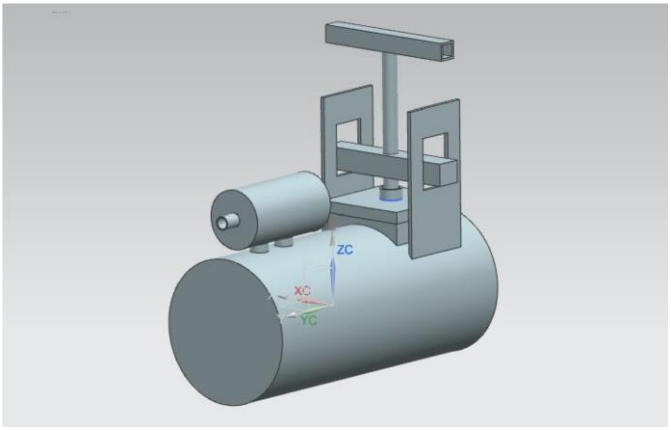


In the present work water and calcium carbide are added in the ratio of 2:1 to the reaction tank and small amount of aluminum oxide is used as catalyst to enrich the chemical reaction the reaction are shown in above chapters, due to reaction the acetylene gas is generated, and it stored in the storage tank. The stored acetylene gas enters the

regulator and then is vaporized using heat from the engine's coolant. Tank pressure is reduced to approximately 1.5 psi. As negative pressure is transmitted from the carburetor to the regulator, the regulator releases acetylene vapor to the air filter and acetylene gas was aspirated in the intake manifold through air filter. The SI engine will start with petrol being the ignition source, after that the performance and emission characteristics are compared with baseline acetylene gas.

IV. DESIGN

4.1.1 DESIGN OF REACTION TANK:



Material used –mild steel, round pipe Here we use this tank for the production of acetylene by using calcium carbide and here we used another secondary small cylinder for the purpose of storage of the acetylene gas. We select the mild steel as a material for the tank. It is the air sealed tank and it is also consists of 2 pressure gauges and flow control valve the dimensions of the tank followed below.

1. Cylinder length = 441mm
2. Diameter of the main cylinder = 196 mm
3. Length of the secondary cylinder = 150mm
4. Diameter of the secondary cylinder = 80mm

4.1.1.2 GAS VAPORIZER

It is very similar to carburetor, as carburetor mixes air and liquid fuel but vaporizer mixes air and gaseous fuel. The gas vaporizer is two-stage regulator is an acetylene gas withdrawal, high-pressure regulator with a heat exchanger that will vaporize enough fuel for up to 400hp engines. Quantity of outlet gas is controlled using this diaphragm mechanism. From this outlet fuel gas is moved to the engine for combustion process

It consists of three ports:

- Acetylene gas in
- Vacuum pressure In
- Gaseous fuel out

The acetylene gas enters the regulator and then is vaporized using heat from the engine's coolant. Tank pressure is reduced to approximately 1.5 psi. As negative pressure is transmitted from the carburetor to the regulator, the regulator releases acetylene vapor to the carburetor.

V. ADVANTAGES AND DISADVANTAGES

ADVANTAGE:

1. Emission is non-polluting as only carbon dioxide and water vapors are emitted.
2. Homogenous mixture is formed due to which complete combustion.
3. Better efficiency.
4. It is very cheap and available in abundance.
5. It uses same handling system which used in CNG and LPG cylinders.

6. It has very low photochemical ozone creation potential (POCP).
7. An engine operated on such a fuel can be interchangeably utilized for indoor and outdoor operations without environmental concerns.
8. The need for a three-way catalytic converter or other EGR device is eliminated.
9. Due to reduced operating temperatures, there are fewer tendencies for viscosity breakdown of engine lubricants and less component wear.
10. Due to cleanliness of the combustion process, buildup of carbon-and sulphur compounds are eliminated thereby substantially extending the time intervals between routine maintenance.

DISADVANTAGES:

1. Modification in SI engine is required.
2. Knocking possibilities.
3. Decrease in power of engine.
4. It cannot be available everywhere because there are no filling station as it is a new initiative.

VI. APPLICATIONS AND FUTURE SCOPE

APPLICATIONS:

1. A good replacement for gasoline and petrol.
2. It can be used in place of LPG directly with minor manipulation in engine.
3. As it emits CO2, so it is more ecofriendly thus its use can be beneficial in countries like India where in year 2050 fossil fuel will get depleted

VII. FUTURE SCOPE

- ✓ In nearby future, fossil future going to exhaust soon and at present we are facing acute scarcity of fuel due to which prices are rising day by day. On the other acetylene is cheap and is produced from calcium carbide which is in abundance.
- ✓ Another advantage which justifier the use of acetylene in future is in the exhaust emission
- ✓ on one hand fossil fuel during combustion produces CO_2, CO, NOx, some unborn hydrocarbon are produces but in case of acetylene carbon dioxide is produced with traces of water vapors.
- ✓ Acetylene being gas makes better homogenous mixture with air therefore better mixing of fuel which leads to better combustion; this is not possible with conventional SI engine fuel.
- ✓ In this project we used petrol as ignition source by doing some modification in the engine head we can directly start the engine by acetylene gas.

VIII. CONCLUSION

The study highlights the use of acetylene as a fuel for SI engine; this fuel can be used with conventional S.I. engine with minor fabrication and manipulations.

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 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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