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# Experimental of Heat Transfer Coefficient and Effectiveness of Counter Flow Heat Exchanger Using CuO as a Nanofluids

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## 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 bikesgolf 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 aAcetylene-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 aAcetylene-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.

**COMPONENTS AND DESCRIPTION**

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

- **Battery,**
- **Chain drive,**
- **Sprocket,**
- **Bearings**

**1. BATTERY**

A battery is a self-contained, chemical power pack that can produce a limited amount of electrical energy wherever it's needed. The basic power unit inside a battery is called a cell, and it consists of three main bits. There are two electrodes (electrical terminals) and a chemical called an electrolyte in between them. For our convenience and safety, these things are usually packed inside a metal or plastic outer case. There are two more handy electrical terminals, marked with a plus (positive) and minus (negative), on the outside connected to the electrodes that are inside. The difference between a battery and a cell is simply that a battery consists of two or more cells hooked up so their power adds together.When you connect a battery's two electrodes into a circuit (for example, when you put one in a flashlight), the electrolyte starts buzzing with activity. Slowly, the chemicals inside it are converted into other substances. Ions (atoms with too few or too many electrons) are formed from the materials in the electrodes and take part in chemical reactions with the electrolyte. At the same time, electrons march from one terminal to the other through the outer circuit, powering whatever the battery is connected to. This process continues until the electrolyte is completely transformed. At that point, the ions stop moving through the electrolyte, the electrons stop flowing through the circuit, and the battery is flat.The lead-acid battery was invented in 1859 by French physicist Gaston Planté and is the oldest type of rechargeable battery. Despite having a very low energy-to-weight ratio and a low energy-to-volume ratio, its ability to supply high surge currents means that the cells have a relatively large power-to-weight ratio. These features, along with their low cost, makes it attractive for use in motor vehicles to provide the high current required by automobile starter motors.As they are inexpensive compared to newer technologies, lead-acid batteries are widely used even

when surge current is not important and other designs could provide higher energy densities. Large-format lead-acid designs are widely used for storage in backup power supplies in cell phone towers, high-availability settings like hospitals, and stand-alone power systems. For these roles, modified versions of the standard cell may be used to improve storage times and reduce maintenance requirements. Gel-cells and absorbed glass-mat batteries are common in these roles, collectively known as VRLA (valve-regulated lead-acid) batteries.Lead–acid battery sales account for 40–45% of the value from batteries sold worldwide (1999, not including China and Russia), a manufacturing market value of about $15 billion Modern batteries are lead-acid type and provide 12.6 volts of direct current, nominally 12 V. The battery is actually six cells connected serially. Battery electric vehicles are powered by a high-voltage electric vehicle battery, but they usually have an automotive battery as well, so that it can be equipped with standard automotive accessories which are designed to run on 12 V.

**Use and maintenance**

Heat is the primary cause of battery failure as it accelerates corrosion inside the battery. A vehicle with a flat battery can be jump started by the battery of another vehicle or by a portable battery booster, after which a running engine (but running faster than idle speed) will continue to charge the battery but it is preferable to use a battery charger.

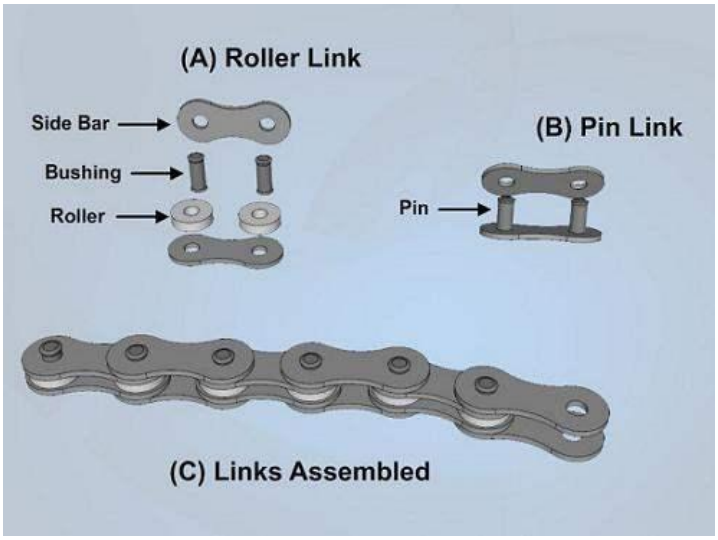
Corrosion at the battery terminals can prevent a car from starting due to electrical resistance, which can be prevented by the proper application of dielectric grease.occurs when the electrodes become coated with a hard layer of lead sulfate which weakens the battery. It occurs when a battery is not fully charged and remains discharged. Sulfated batteries should be charged slowly to prevent damage.

**2. CHAIN DRIVE**

Chain drives consist of an endless series of chain links that mesh with toothed sprockets. Chain sprockets are locked to the shafts of the driver and driven machinery. Chain drives represent a form of flexible gearing. The chain acts like an endless gear rack, while the sprockets are similar to pinion gears.Chain drives provide a positive form of power transmission. The links of the chain mesh with the teeth of the sprockets and this action maintains a positive speed ratio between the driver and driven sprockets.Chains can be used to perform three basic functions:

- Transmitting power
- Conveying materials
- Timing purposes

Chains and sprockets are used to deliver positive power transmission in the forms of torque and speed ratio from one rotating shaft to another. Chains can be used in many forms to carry, slide, push, or pull a variety of materials found incountless industrial settings.Different types of chains are used as devices to synchronize or time movements such as valve timing in four-cycle engines.




**3. SPROCKET**

A sprocket or sprocket-wheel is a profiled wheel with teeth, cogs, or even sprockets that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are

never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth.Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel. Early automobiles were also largely driven by sprocket and chain mechanism, a practice largely copied from bicycles.

**4. BEARING WITH BEARING CAP**

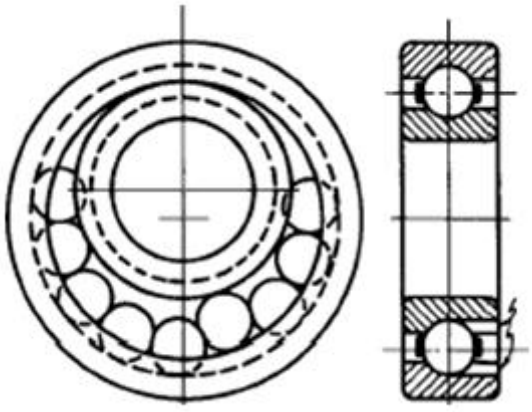
The bearings are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks. Bearing is made up of steel material and bearing cap is mild steel.Ball and roller bearings are used widely in instruments and machines in order to minimizefriction and power loss. While the concept of the ball bearing dates back at least to Leonardo daVinci, their design and manufacture has become remarkable. This technology was brought to its present state of perfection only after a long period ofresearch and development. The benefits of such specialized research can be obtained when it ispossible to use a standardized bearing of the proper size and type.

However, such bearingscannot be used indiscriminately without a careful study of the loads and operating conditions. Inaddition, the bearing must be provided with adequate mounting, lubrication and sealing.Design engineers have usually two possible sources for obtaining information which they canuse to select a bearing for their particular application:

a**) Textbooks**

**b) Manufacturers'**

CataloguesTextbooks are excellent sources; however, they tend to be overly detailed and aimed at thestudent of the subject matter rather than the practicing designer. They, in most cases, containinformation on how to design rather than how to select a bearing for a particular application.Manufacturers' catalogues, in turn, are also excellent and contain a wealth of information whichrelates to the products of the particular manufacturer. These catalogues, however, fail to providealternatives which may divert the designer's interest to products not manufactured by them.Our Company, however, provides the broadest selection of many types of bearings made bydifferent manufacturers.For this reason, we are interested in providing a condensed overview of the subject matter in an objective manner, using data obtained from different texts, handbooks and manufacturers' literature. This information will enable the reader to select the proper bearing in an expeditious manner. If the designer's interest exceeds the scope of the presented material, a list of references is provided at the end of the Technical Section. At the same time, we are expressing our thanks and are providing credit to the sources whichsupplied the material presented here.



**PRODUCT DESCRIPTION**

FOUR STROKE PETROL ENGINE:

| | | |
|---|---|---|
| **Type** | | **:four strokes** |
| **Cooling System** | **:** | **AirCooled** |
| **Bore/Stroke** | | **:50 x 50 mm** |
| **Piston Displacement** | **:** | **98.2 cc** |
| **Compression Ratio** | | **:6.6: 1** |
| **Maximum Torque** | | **0.98 kg-m at 5,500RPM** |

**BEARING**
**SIZE : 20 X 45 X 12 MM**
**MATERIAL: STEEL**
**WHY?? Mild steel???**
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**

**PREPARATION OF ACETYLENE**

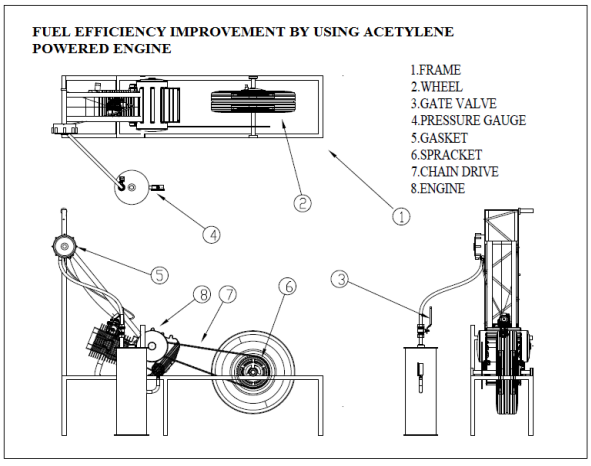
15 g of calcium carbide are place in a 150 ml distilling-flask. A droppingfunnel and a glass tube are fitted to the top of the flask. The glass tube isconnectedwith a wash-bottle containing 10% aqueous copper sulfate solution.The tall dropping funnel is required in order to give a sufficient "head"of 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 thecollecting acetyleneunder water or delivering the gas for requiredexperiment. 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.

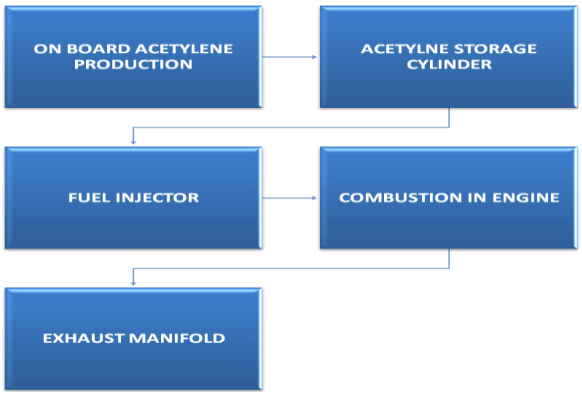
$$CaC_2 + 2H_2O \longrightarrow C_2H_2 + Ca(OH)_2$$

PREPARATION OF ACETYLENE FROM CALCIUM CARBIDE AND WATER

**SCHEMATIC DIAGRAM OF EXPERIMENTAL SETUP**



**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

**EXPERIMENTAL SETUP PICTURE**:

**COMPONENTS PICTURE:**
**CYLINDER:**

**PRESSURE GAUGE:**

**GATE VALVE:**

**ENGINE:**


**FRAME:**

**CARBIDE:**

**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** |

**SAFETY AND HANDLING OF ACETYLENE:**

Acetylene is not especially toxic, but when generated from calcium carbide, it can contain toxic impurities such as traces of phosphine and arsine, which give it a distinct garlic-like smell.[citation needed] It is also highly flammable, as most light hydrocarbons, hence its use in welding. Its most singular hazard is associated with its intrinsic instability, especially when it is pressurized: under certain conditions acetylene can react in an exothermic addition-type reaction to form a number of products, typically benzene and/or vinylacetylene, possibly in addition to carbon and hydrogen.[citation needed] Consequently, acetylene, if initiated by intense heat or a shockwave, can decompose explosively if the absolute pressure of the gas exceeds about 200 kilopascals (29 psi). Most regulators and pressure gauges on equipment report gauge pressure, and the safe limit for acetylene therefore is 101 kPagage, or 15 psig. It is therefore supplied and stored dissolved in acetone or dimethyl formamide (DMF), contained in a gas cylinder with a porous filling (Agamassan), which renders it safe to transport and use, given proper handling. Acetylene cylinders should be used in the upright position to avoid withdrawing acetone during use.Information on safe storage of acetylene in upright cylinders is provided by the OSHA, Compressed Gas Association, United States Mine Safety and Health Administration (MSHA), EIGA, and other agencies.Copper catalyses the decomposition of acetylene, and as a result acetylene should not be transported in copper pipes. Brass pipe fittings should also be avoided.[citation needed]Cylinders should be stored in an area segregated from oxidizers to avoid exacerbated reaction in case of fire/leakage. Acetylene cylinders should not be stored in confined spaces, enclosed vehicles, garages, and buildings, to avoid unintended leakage leading to explosive atmosphere. In the USA, National Electric Code (NEC) requires consideration for hazardous areas including those where acetylene may be released during accidents or leaks. Consideration may include electrical classification and use of listed Group A electrical components in USA. Further information on determining the areas requiring special consideration is in NFPA 497. In Europe, ATEX also requires consideration for hazardous areas where flammable gases may be released during accidents or leaks.

**ACETYLENE GAS IN SI ENGINE:**

Use of Acetylene as an Alternative Fuel in IC Engine the overview of project in three steps is as follows.The first step involves the production of acetylene gas through the Calcium Carbide reacting with water in the reaction tank. $CaC2+2H2O \rightarrow C2H2+Ca(OH)2$ The reaction tank constitutes two chambers. The water is kept in first (upper) chamber. The calcium carbide is kept in second (lower) chamber. The water from the first chamber is released in such away to carry out the reaction spontaneously. The water is passed through the control valve. In the second chamber the calcium carbide is kept in desirable amount to react with water. Through second chamber a valve is connected to the storage tank where the gas produced during reaction is stored. In this step the acetylene gas is stored in the storage tank and the pressure is measured by the pressure gauge. Overview of the project In this step the produced gas is stored and is passed through the pipes. Here the gas is stored to avoid moisture and the gas stored in storage tank is provided pressure through pressure gauge so the gas is of high concentration. The gas is passed in the pipe in very sophisticated manner and then pipe is joined in the carburetor fitted with the filter, this then filters the air and then combines with petrol as secondary fuel which is added in very few amount ( in about 10 to 15%) to prevent knocking for smooth operation of an engine. Then the mixture is passed in the engine.

**USES OF ACETYLENE:**

Acetylene forms an important part of many crucial processes in industries. Although the current uses of acetylene are few, the scope is not limited. In-depth research is being conducted in this regard to ensure utilization of this resource in the most beneficial manner possible. Acetylene is an important natural gas that is put to various uses including:

**Portable Lighting:**

In the late 1800s, acetylene was for the first time used to light a portable lamp known as a carbide or acetylene gas lamp. These lamps were installed on cars, in homes, on bicycles, etc. They were also used extensively by miners. In some cases, acetylene was used to light some cities and towns.

In the lamps, calcium carbide and water are used to produce acetylene. The flow of the acetylene is carefully monitored to control the amount of acetylene used. The amount of acetylene used has a direct effect on the intensity of the light. Many hunters or cavers still use these lamps for terrain activities.

**Welding, Cutting, and Heat Treating:**

Acetylene is used for welding and cutting. The welding process that uses acetylene is known as oxy-fuel cutting or gas cutting. This method is used to cut or weld materials that require temperatures as high as 3,500 °C (6,330 °F). Among all other gases, acetylene is capable of producing the hottest flame. For this reason, acetylene serves as an important medium for heat treating metals and other materials. Acetylene is used in automotive part manufacturing as well as fabrication of other metal parts where accuracy is crucial.

**Production of Chemicals:**

Chemical synthesis is a major application of acetylene. Acetylene is used to produce several inorganic compounds. It is used in the synthesis of certain vitamins like Vitamin A and E. It can also be used to produce certain components of perfumes, solvents, etc. it is used to produce acetic acid, 1,4-butanediol (BDO), several acetylenic alcohols, etc. In production of these chemicals and vitamins, the purity levels of acetylene should be strictly maintained.

**Used in Production of Polyethylene Plastics:**

Polyethylene plastics, PVC and PVDF are produced from ethylene or methane, which are in turn derived from acetylene. Another production process comprises mixing acetylene with other chemicals or elements like chlorine, hydrochloric acid, etc. to produce different variants of plastic like PVC, PVDF, etc. These plastics are commonly used to fabricate several household and commercial products.

**IMPORTANCE OF PURITY OF ACETYLENE:**

Acetylene can react with oxygen or impurities causing massive explosions. Hence, the production process should be flawless. During the production process, if the acetylene is not completely pure, the resultant product could change dramatically. Maintaining the purity of the acetylene produced is vital. Depending on the process, some allowances can be made with regard to the quality of the acetylene produced. For instance, the acetylene used in chemical synthesis should not contain more than 0.5% of impurities. This acetylene is known as Grade A acetylene. For oxy-cutting or heat treating processes the acetylene used is of a lower grade. Grade B acetylene can contain up to 2% impurities. These gases can be further processed and refined to produce an extremely pure gas.Acetylene in any form, whether solid or liquid, is extremely explosive. Hence, extreme care should be taken when manufacturing acetylene or using it to produce chemicals, or other products. For the same reason, cautious handling of acetylene cylinders is recommended. The control equipment used during acetylene production or processing should be handled carefully as well.Acetylene forms an important part of our daily lives. Several key products are produced using this gas. It also helps in the production of some vital chemicals that serve as raw materials for important products. Thus, acetylene forms an integral part of several industries

**USING AND STORING OF ACETYLENE GAS:** Companies that fail to use or store compressed gases properly are inviting disaster. Improper handling of compressed gases can lead to serious fires, explosions or releases due to pressure buildup in cylinders or reactivity with other materials. Proper procedures for handling and using acetylene gas should be understood and followed by all employees. Acetylene is a well known fuel gas used almost universally in gas welding. Even though it is very common, this gas is an extremely dangerous material. Acetylene is so reactive, it should never be allowed to come into contact with certain metals such as unalloyed copper. Nor should it be stored or used at pressures greater than 15 psi. (Cylinder pressures are rated for 250 psi but this is acceptable because the gas is dissolved in acetone.) Acetylene is so flammable, that the National Electric Code has a special designation (its most stringent) for using electrical equipment around acetylene. No other substance falls into this classification! Acetylene leaks, no matter how small can have serious consequences. The explosive range of the gas, when mixed with air, is from 2.5% to 82%, the widest of any commonly used gas.

- When using acetylene gas, always observe the following procedures: Close the cylinder valve before shutting off the regulator, to permit gas to bleed from the regulator.
- When returning empty cylinders to storage or for refill, close the valves. Even though the acetylene gas is used up, the flammable acetone in the cylinders can still evaporate into the air and create its own dangers.

Acetylene gas is lighter than air so any leaking gas should rise. However, it is only slightly lighter so certain atmospheric conditions can prevent this.

- Acetylene cylinders are not hollow. They are packed with porous rock that is saturated with acetone. Cylinders should be used or stored only in an upright position to avoid the possibility of the acetone leaking from the cylinder. If this is not possible, it is recommended that the cylinder be placed upright and left to stand for one-half hour before using. This is to prevent liquid acetone from running through your regulator.
- Cylinders containing acetylene must not be taken into a confined space.
- Always use acetylene in a well vented area. Never store cylinders near open flames or electrical equipment, where in case of a leak, gas can diffuse to a flame or spark from a motor.
- Never store acetylene, or any other fuel gas, within 25 feet of oxygen cylinders. If this separation is not possible, erect a non combustible (1/2-hour fire rated) partition, at least five feet high, between the two gases in storage.
- Always cap and secure stored cylinders upright to prevent them from falling over and damaging the valve or cylinder.

**ADVANTAGES**:

- Emission is non-polluting as only carbondioxide and water vapors are emitted.
- Homogenous mixture is formed due to which complete combustion.
- Better efficiency.It is very cheap and available in abundance.It uses same handling system which is used inCNG and LPG cylinders.

**DISADAVANTAGES:**

- Modification in SI engine is required
- Decrease in power of engine.
- It cannot be available everywhere because there are no filling station as it is a new initiative.

**FUTURE SCOPE:**

Study with direct injection of acetylene into the cylinder.Study with DEE as an ignition source in direct injection of acetylene into thecylinder.

HCCI study with acetylene.Study ofalcoholinjection in acetylene diesel engine. Study with automatic control of acetylene and EGR flow.Study of durability analysis in acetylene diesel dual fuel mode in diesel engine. Study with portinjection of water and DEE in manifold injection technique.

## II. CONCLUSIONS:

In the present work experiments were carried out on acetylenebased 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 andport. 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.

**REFERENCES**:

[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.

LIST OF MATERIALS USED:

| SL.NO | PARTS | QUANTITY | MATERIAL |
|---|---|---|---|
| 1 | Frame stand | 1 | Mild steel |
| 2 | Acetylene gas Tank | 1 | Mild steel |
| 3 | Bearing with | 2 | Mild steel |

| | | | |
|---|---|---|---|
| | bearing cap | | |
| 4 | Engine | 1 | 100cc |
| 5 | Chain drive | 1 | Mild steel |
| 6 | sprockets | 2 | Mild steel |
| 7 | Connecting tube | 1 | Plastic |
| 8 | Pressure gauge | 1 | - |
| 9 | Wheel | 1 | - |

| 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 |