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ETHANOL: A CLEAN FUEL

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Abstract: *Curiosity in producing ethanol from biomass is a incentive attempt for sustainable transportation. Ethanol is a colorless, slightly odoured and a nontoxic liquid produced from plants, and is formed by the fermentation of carbohydrates in the presence of yeast. It is also prepared from sorghum, corns, potato wastes, rice straw, corn fiber and wheat. A biofuel forms low green house gases, when burned compared to other conventional fuels. It is a substitute to fossil fuel which allows for fuel safety and security for many countries where there is less oil reserves. It is made from plants and other agricultural products through biological process rather than the geological process, which is involved in the formation of coal and petroleum. Biofuel is widely used as transportation fuels. Ethanol is considered a biofuel, and is widely used in some countries like U.S and Brazil. In this study, we studied the rising temperature of ethanol, diesel, and kerosene at a fixed point of time and found that ethanol as highest rising temperature compared to kerosene and diesel. It was also observed that the ethanol doesn't produce any smoke while burning compared to diesel and kerosene which makes it an excellent alternative and clean fuel.*

Keywords: *Biofuel, bio-ethanol, Bio-mass, carbon dioxide, carbon monoxide, environment.*

I. INTRODUCTION

The limited availability of fossil fuel has an enormous impact on sustainability of the current and future civilization. To support the widespread economic growth and battle against the inequity against resource accessibility, development of an alternative fuel is par essential. To lessen our dependency on fossil fuel, various research attempts are carried out to harvest energy from renewable resources in a short period of time. Importantly, fuels and electricity are ethanol derived from biomass is often attributed as a substantial fuel for transportation and energy harvest. Two aspects of research are currently under focus, efficient production of ethanol and methods to harvest energy out of it.

Biofuel has been used even before the discovery of fossil fuel. But after the exploration of fossil fuels like coal, oil and gas and its increased usage, the advantages and recognition gained among the developed countries, the use of biofuel suffered a major setback. The source (animal or plant material) used to make biofuel is called feedstock. Almost every plant based can be used as an ethanol feedstock. The three main types of plant feed stocks are starch based, sugar based and cellulosic. Barley, corn, wheat and sorghum are some of the starch based feedstocks. Biofuel were introduced to replace the existing fossil fuels (gasoline, petroleum, coal, and diesel). The fossil fuels were produced from the fossils of dead plants and animals, that have died many years ago but biofuel were produced from plants that are recently harvested. From the time of discovery of automobile ethanol has been used as a fuel, due to various reasons the advantage of ethanol were not well known (1). Since ethanol cannot be purely used as fuel it is mixed with other conventional fuels like gasoline in various ratios to be used as fuels (2). The use of ethanol as fuel was first discovered after the

invention of “Model T” by Henry Ford (2). During the combustion of ethanol it gives out carbon dioxide and water and does not release greenhouse gases (2).

Ethanol is a renewable fuel and can be used as a substitute to conventional fossil fuels (petrol and diesel etc.); it is produced from carbon based food products like corn, wheat, sorghum, sugarcane etc. In many countries such as United States, Brazil, European Union, china etc, ethanol has been used as an important fuel to run the vehicles. Although the source for manufacturing ethanol varies from countries, the properties remain the same. Ethanol is mixed with the conventional fuels in various ratios E10 (10% ethanol, 90% gasoline), E 85 (15% ethanol, 85% gasoline) etc, to aerate and to minimize the carbon emission (3). Ethanol is chiefly used in the production of varnishes and perfumes, disinfectant, drugs and chemicals and used as a solvent to preserve laboratory specimen. In this research paper we are focusing on the usage of ethanol in production of electricity.

In this study it is hypothesized that ethanol has highest rising temperature at a fixed period of time compared to kerosene and diesel and gives zero or low gas emission which is compared to kerosene and diesel. We chose three fuels: Ethanol, Kerosene, and Diesel for the study.

II. EXPERIMENT

MATERIALS REQUIRED

Ethanol, Petrol, Diesel, Small wick lamp, Hollow glass cylinder (approx about 60 cm), White colored cloth, Thermoelectric Cooler Peltier (TEC1-12706), Booster converter (0.9-5v) to 5v, Multimeter, LED bulb, Thermometer, Connecting wire and stopwatch.

III. METHODOLOGY

The rising temperature and the current produced from the heat were studied. The experimental set up is as shown in fig 1. 5 ml of the ethanol was taken in a small wick lamp. To top side of the cylinder a transducer (TEC1-12706 Thermoelectric Cooler Peltier) was attached on the aluminum foil kept above the flame. The transducer was connected to a circuit box containing booster and LED lamp. To study the gaseous emission, the burning lamp was covered with a hollow glass cylinder and the top of the glass cylinder was covered with clean white cloth to observe the smoke formed.

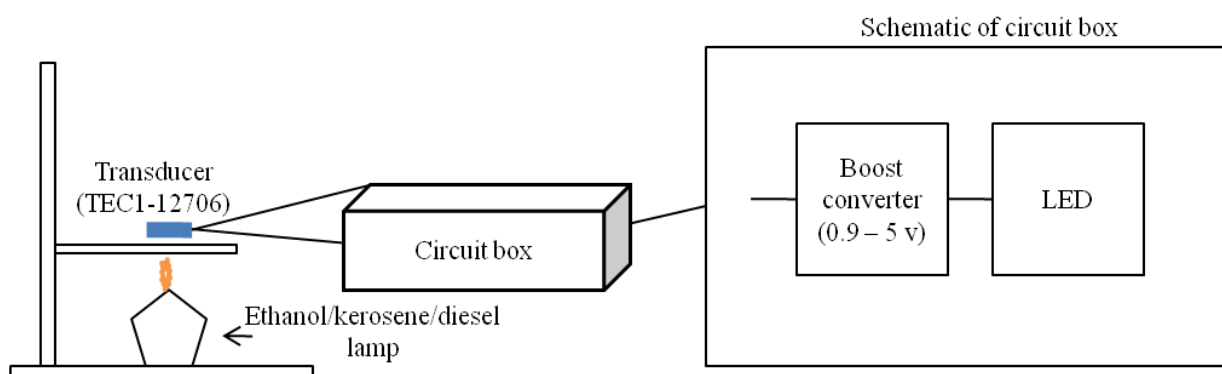


Fig 1: Current generated using the fuels

The transducer is connected to booster circuit (0.9-5v to 5v), multimeter and an LED bulb as shown in the figure 1. The input for transducer can be temperature, pressure, displacement or light. In the current study we used the heat generated by the flames as the input. With the provided heat input from the burning lamp, the transducer converts the heat energy to electrical energy which can be detected with the glow of LED bulb and the current can be measured using multimeter. A boost converter stabilizes the voltage which lights the LED bulb that is attached. The rise in temperature was recorded at a fixed burning time point of 150 s. To measure the rise in temperature, a beaker containing water was placed on top of the flames and rise in temperature was recorded using

thermometer for a fixed time point of 150 s. To check for the emission and to check the emission from combustion of fuel, the discoloration in the cloth for all the fuels was observed and the values were noted down.

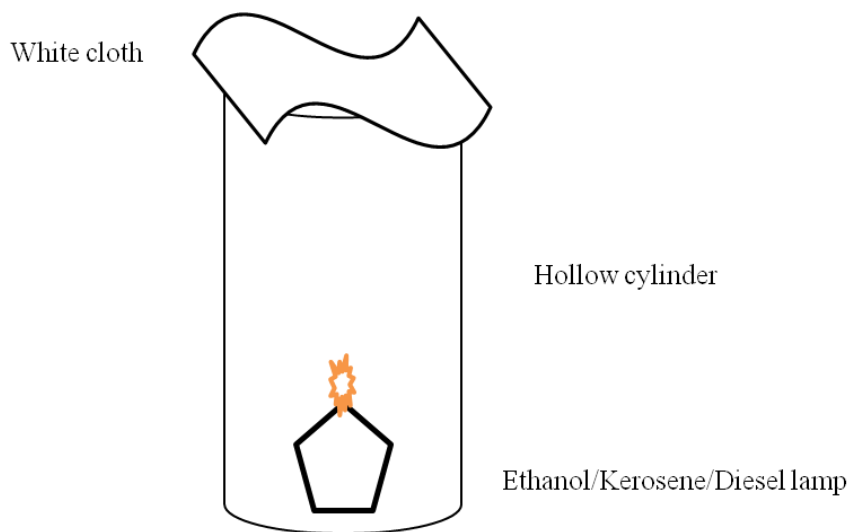


Fig 2: Smoke emission test

IV. RESULTS & DISCUSSION

Rising temperature

At the constant burning temperature, ethanol has a rising temperature of 50 °C compared to kerosene 44°C and petrol 46 °C. The current produced for all the fuels were 6.4 amps, while the voltage was 16.4 V for ethanol, 15 V for kerosene and 15.5 V for petrol. The results are summarized in Table 1. Thus, ethanol has highest rising temperature compared to kerosene and diesel at lowest time point.

Fuel Type	Ethanol 10ml/ 150 sec	Kerosene 10ml/ 150 sec	Diesel 10ml/ 150 sec
Temperature (°C)	50	44	46
Current (amp)	6.4 amp	6.4 amp	6.4 amp
Voltage (v)	16.4 v	15 v	15.5 v
Watts (w)	57 w	48 w	52 w

Table 1

Smoke Emission

It was observed that the white cloth placed above ethanol flame were clean compared to diesel and kerosene which has black residues deposited on the cloth. This shows that ethanol produced clean flames and causes less pollution compared to Diesel and Kerosene.

CONCLUSION

The hypothesis that ethanol has highest rising temperature in a fixed time compared to kerosene and diesel, has been proven to be true. This is due to chemical constituents of ethanol which makes it easy for combustion at short period of time. It is also clear that ethanol has least emission compared to kerosene and diesel. Ethanol is already used as an alternative fuel in electricity generation in Brazil. This preliminary study indicates the same.

With the rising concerns of pollution and alternative for existing resources, ethanol can be considered as an alternative and clean fuel.

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