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Alternate fuels for vehicles and their effects on I.C. Engines Characteristics

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Abstract: ***The growing human population and rapid industrialization have caused an increase in the demand for energy around the world. The rapid depletion of fossil fuels and overdependence on petroleum based fuels have made it inevitable for the search for alternative fuels. The fossil fuels are also causing huge damage to the environment and it cannot be denied that vehicles are the main source of it. Pollutants emissions from the vehicle have disturbed the ecological system. The best alternative currently is the biofuels which have the ability to reduce engine emissions. The main focus area of this review is to discuss the important role biofuels can play to reduce the greenhouse gases in the environment and their effects on I.C. engines. Biofuels have the potential to reduce greenhouse gases by 80%. So, they are viable alternatives to be used for vehicles.***

I. INTRODUCTION

The rapid increase of number of automobiles on the road across the world has resulted in increased engine emissions to the environment. These engine emissions contains carbon dioxide, carbon monoxide, hydrocarbons and nitrogen oxides which are hugely responsible for deterioration of environment. It has been found that 22% of total greenhouse gases comes from transportation sector. The International Energy Agency (IEA) has estimated that the CO_2 emissions by vehicles will increase by 92% by 2020. So, it has become very necessary to find alternative fuels for transportation sector. Biodiesel and Ethanol are the potential alternatives to petroleum fuels. Biodiesel can be derived from renewable, non-renewable oils or animal fats, whereas, Ethanol can be derived from crops such as corns, potatoes, sugarcane. The present paper, therefore, focusses on the reduction of exhaust emissions and effects of biofuel on I.C. engines.

II. HARMFUL EFFECTS OF ENGINE EMISSIONS ON ENVIRONMENT AND HUMAN HEALTH

The main source of harmful greenhouse gases such as carbon monoxide is the transportation sector. Air pollutants are responsible for a number of adverse environmental effects such as reduced atmospheric visibility, photochemical smog and death of forests. Emissions of greenhouse gases from combustion of fossil fuels are causing the global warming of Earth's climate. Greenhouse gases (GHG) not only affect the environment but it also has adverse effects on human health. GHGs are the reasons for cancer, cardiovascular diseases, deterioration of mental health. Hydrocarbon emissions promotes morbidity in people who have respiratory problems. Climate change affects the environmental and social detriments of health- safe drinking water, sufficient food and secure shelter. It is estimated that climate change is expected to cause 250,000 deaths from diarrhoea, malnutrition, malaria. Reducing emissions of greenhouse gases through better transport, food and energy-use choices can result in improved health, particularly through reduced air pollution.

III. BIOFUEL AS A POTENTIAL ALTERNATIVE

A. Biodiesel

Biodiesel refers to a vegetable oil or animal fat-based fuel consisting of long-chain alkyl esters. It can be used in diesel engine without major modifications to the engine. Biodiesel can be obtained from vegetable oils by Transesterification. It is the process which is favoured due to its simplicity and less time consuming nature. Currently, the sources of biodiesel include olive oil, used fried oil, milkweed seed, palm oil, linseed oil, sunflower oil etc. There are mainly four different ways to produce biodiesel namely, transesterification, pyrolysis, emulsification and dilution with hydrocarbon blending.

B. Ethanol

Ethanol has the chemical formula C_2H_5OH and is generally known by the form of alcohol found in alcoholic beverages but less people know that it has been in motor fuel application since decades around the world. Whether used in low-level blends, such as E10 (10% ethanol, 90% gasoline), or in E85 (a gasoline-ethanol blend containing 51% to 83% ethanol, depending on geography and season), ethanol helps reducing greenhouse gas emissions. Ethanol can be produced by fermentation process using sources such as cassava root, sugarcane, beetroot, grains, sunflower, potatoes, molasses, barley and many types of cellulose waste. The steps for

production of ethanol are: fermentation of sugars, distillation, dehydration and denaturing. Before fermentation, hydrolysis of carbohydrates such as cellulose or starch into sugars is required. Enzymes help in this process.

IV. EFFECTS OF BIOFUEL ON I.C ENGINE EMISSION CHARACTERISTICS

The expanding industrialization and modernization of the world have to a stage up for the request of oil determined fuel which is suitable to human well-being and also environmental conditions. Ekrem [1] found that the utilization of biodiesel in diesel motors produces less CO and smoke mistiness and NOx emissions contrasted with diesel fuel at full load condition. He recommended that lone low fixation mixes as far as execution effectiveness and naturally agreeable discharges could be perceived as the potential a contender to be ensured for full-scale use in unmodified diesel motors. Saleh [2] found that Jojoba methyl ester (JME) increment 14% and 16% NOx discharge at 1600 rpm and 1200 rpm individually contrasted with fossil diesel fuel. At bringing down motor speed JME create higher HC and CO outflows yet at higher motor speed, there is no noteworthy contrast amongst HC and diesel fuel while CO is lower than diesel. The outcomes additionally demonstrated that when the fumes gas distribution (EGR) rate is expanded, the NOx outflows diminished. Be that as it may, CO and HC emissions expanded. They prescribed that the ideal EGR level is 5-15% for all motor speeds and stacks and that might be positive in an exchange off between HC, CO and NOx outflows with little economy punishment. A study directed by Zhihao et al. [3] portrays that Pistacia Chinensis Bunge biodiesel mixed fuel emanates bring down HC, CO and fumes smoke discharges. B10, B20 lessens NOx outflow, while, B30 marginally expands NOx discharge due to having higher oxygen substance which brings about higher chamber temperature. The outflow examination by Selvam and Vadivel [4] demonstrates a radical decrease (34.7-63%) in carbon monoxide (CO), unburned hydrocarbon (UHC) and smoke thickness for all beef tallow biodiesel mixed fuel. However, on account of oxides of nitrogen, there is a slight increment for all the mixed fuels and with neat biodiesel (6.35%) contrasted with diesel fuel. Nurun Nabi et al. [5] revealed that Pongamia biodiesel decreases CO, smoke and motor commotion by half, 43% and 2.5dB individually however expanded NOx increases by 15% at high load conditions. The reason can be ascribed to the nearness of oxygen in Karanja biodiesel atomic structure. Raheman and Phadatare [6] discovered Karanja biodiesel mix (B20-B100) in a diesel motor lessen CO discharge (73- 94%), smoke thickness (20-80%) and 26% in normal NOx outflow than diesel fuel due to the total burning of the biodiesel mix fuel. Shi et al. [7] found that the utilization of biodiesel-diesel-ethanol mixes diminishes particulate issue outflows by 30% and a general decrease in complete hydrocarbon yet somewhat (5.6–11.4%) increases the NOx emissions. Banapurmath and Tewari [8] worked a diesel motor with 0%, 5%, 10%, 15% ethanol mixes and discovered a decrease in HC and increment in NOx outflow with ethanol-biodiesel mixes contrasted with diesel and biodiesel powers. Zhu et al. [9] tried Euro V diesel fuel and ethanol-biodiesel mixes in a four-chamber coordinate infusion diesel motor. It was discovered that the expansion of 5% ethanol in biodiesel somewhat enhances motor execution. It additionally could lessen NOx, PM, CO and HC emissions contrasted with diesel fuel. Yilmaz et al. [10] found at full load condition the mixed fuel expanded CO and HC emissions yet lessened NO outflows. They inferred that including ethanol in the mixes would be the ideal decision to lessen NO outflows for the fixations displayed in this examination. Fang et al. [11] detailed that ethanol–diesel– biodiesel mixed fuel bring down NOx emissions and increase HC and CO outflows because of higher latent heat of vaporization which causes brings down the combustion temperature. The smoke emissions were decreased to a substantial degree with the expansion of level of ethanol in mixed energies. At last, they concluded that ethanol–diesel–biodiesel is reasonable other option to diminish NOx and smoke outflows in premixed lower temperature condition. Yilmaz et al. [12] researched the outflow of biodiesel-diesel-ethanol (BDE3, BDE5, BDE15, and BDE25) mixes in a diesel motor at diverse motor load condition. The test comes about show that discharges firmly rely upon motor working conditions and biofuel focus in the mix. Ethanol mixed fuels increased CO emissions contrasted with that of diesel fuel for every single working condition, whereas, the blended fuels diminished NO emissions for all concentrations. Generally speaking, lower concentration of ethanol in the mix, diminishes HC emissions and the other way around. In any case, ethanol mixed fuel diminishes HC discharges at more than half load conditions.

V. CONCLUSION

From this survey, it is discovered that vehicular emissions is generally in charge of GHG emissions which in turn pose risks for human lives. This issue could be tended to by utilizing biofuel in diesel motors in a mixed frame as biofuel can possibly decrease motor outflow to the earth. This survey shows that biofuel has potential to decrease GHG outflow by over 80%. Some developed nations have put their objective and command to utilize biofuel. For instance, the United States wants to utilize 25% ethanol before 2020, Brazil focuses to actualize B20 before 2020 and India focuses to utilize B10 nationwide by 2017. A few developing nations are sending out bio fuel yet not utilizing as they are not sufficiently cognizant about the environmental contamination. These

developing nations can come forward in making biofuel as the prime fuel of use in their transportation sector to decrease worldwide IC motor emissions.

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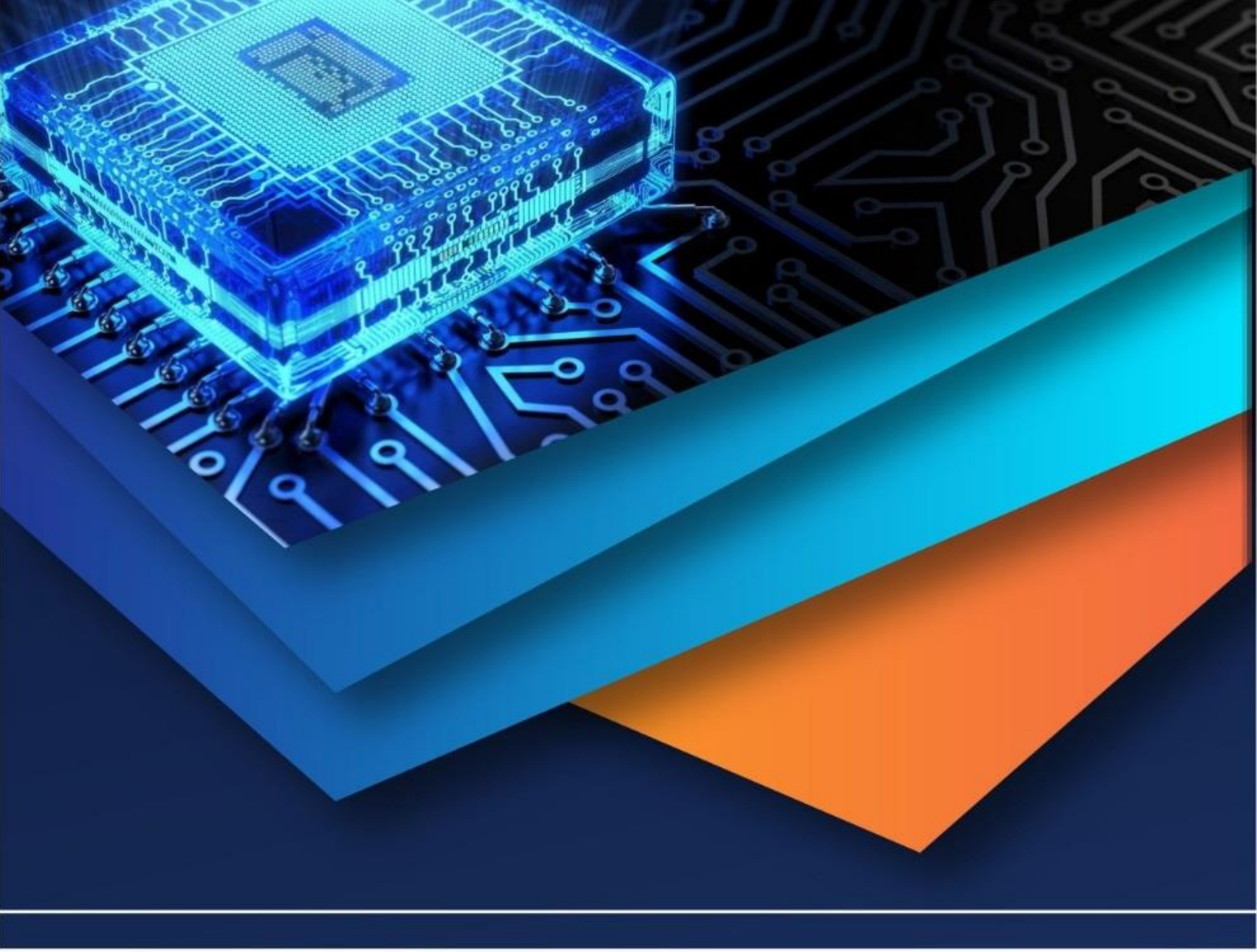

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