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A REVIEW ON METHANOL AS A FUEL FOR INTERNAL COMBUSTION ENGINES

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Abstract

Now a days the cost of fossil fuels as become more expensive. All most the Automobiles are running with diesel and petrol and causing a major problem with emissions like carbon monoxide (Co), hydrocarbons (HC), particulate matter (PM) and nitrogen dioxide (NO2). Research on methanol in a combustion engine has been increased due to it better performance, combustion, and emission. Methanol has been recently used as an alternative to conventional fuels for internal combustion (IC) engines, Including the productions from coal, natural gas, coke-oven gas, hydrogen, biomass etc. It introduces the potentials of methanol as a renewable resource taking in to account the world supply and demand, economic benefits and the effects on human health and the environment.

Keywords: Methanol, IC Engines, Emissions

Introduction

Initial interest in methanol was not in its role as a sustainable fuel, but as an octane booster when lead in gasoline was banned in 1976. The Clean Air Act Amendment in 1990 envisioned the potential of methanol blends as means of reducing reactivity of vehicle exhaust, although in the end, refiners were able to meet the goals with the use of reformulated gasoline. Interest in alternative fuels, including methanol, was also raised after the first and second oil crisis. Methanol is synthesized from natural gas, coal, coke oven gas, CO2, H2, and biomass. The methanol ignition quality and cetane number can be improved by blending with high cetane fuels like diesel and biodiesel. Methanol is the best alternative fuel for use in internal combustion engines.

Literature

Wang Xuan, et al.,[1]The optimization of vehicle energy structure plays a crucial role in reducing CO2 emissions and achieving energy efficiency in the transportation sector. Legislative requirements, as well as environmental commitments such as the Paris Agreement, have driven the need for technological advancements and innovations in the automotive industry. To meet the CO2 emission reduction targets set forth in the Paris Agreement, the transportation sector must transition from fossil fuels to low-carbon alternatives.

C.D. Rakopoulos, et al., [2] The internal combustion engine is a crucial component of many industries, and it is expected to remain so for the foreseeable future. In order to improve the thermal efficiency and reduce fuel consumption of internal combustion engines, researchers are constantly striving to find ways to optimize their performance. One area of research that has gained significant attention is the analysis of combustion irreversibility and medium availability in internal combustion engines. In a recent study, researchers presented a method for conducting a second-law analysis of engine operation in a high-speed, naturally-aspirated, four-stroke internal combustion engine cylinder. This method allows for the computation of both combustion irreversibility and working medium availability in the engine.

Nuthan Prasad, et al., [3] The ignition timing of a spark-ignition engine plays a crucial role in determining its performance characteristics and emissions. Several studies have investigated the influence of different fuels, including methanol and ethanol, on the performance and emissions of spark-ignition engines. Ashraf (year) investigated the performance and exhaust emissions from a spark-ignition engine fueled with ethanol-methanol-gasoline blends. These studies have provided valuable insights into the effects of fuel blends on engine performance and emissions. However, the specific influence of ignition timing on the performance and emissions of an SI engine fueled with an equi-volume blend of methanol and gasoline has not been extensively studied.

Puneet Bansal, et al., [4] In recent years, there has been a growing interest in exploring alternative fuels for internal combustion engines due to concerns over environmental pollution and the depletion of fossil fuels. Methanol, a type of alcohol, has emerged as a potential alternative fuel for IC engines. Methanol has several properties that make it a promising candidate for use as a fuel in IC engines. Firstly, methanol has a high auto-ignition temperature, which means it is less likely to pre-ignite or knock in the engine.

A A Anfilatov, et al., [5] We may draw the conclusion that the most acceptable approach to the issue of lowering exhaust gas toxicity and enhancing environmental performance is the result of global experience in resolving environmental issues connected with the use of diesel engines as propulsion systems. Alternative fuel usage. fuels made of gaseous hydrocarbons (like natural gas and propane-butane), are motor fuels that are kind to the environment and are mostly used in road transportation. between liquid. The most popular alternative fuels are methanol and fuel ethanol. State of agriculture in Vyatka Academy has been investigating the use of synthetic fuels in internal combustion engines.

D.H Qj, et al., [6] The performance, emissions, and combustion characteristics of a direct injection diesel engine under various operating situations were examined through an experimental inquiry to determine the impacts of adding methanol to biodiesel-diesel mixes. The standard fuel was BD50, which is composed of 50% diesel and 50% biodiesel by volume. Methanol was added to BD50 as a volume-percent addition. BDM stands for 5% and BDM10 stands for 10%. The findings show that the combustion begins later for at low engine load, BDM5 and BDM10 perform better than BD50, but at high engine load, they are nearly identical. At BDM5 and BDM10 display identical peak cylinder pressure and peaks at modest engine loads of 1500 r/min. pressure increase to BD50 and increased heat peak.

Chen Liang, et al., [7] Methanol and dimethyl ether (DME) are among the most promising alternative fuels for IC engines. Meanwhile, earlier studies have shown that using DME and methanol in IC engines has good potential. To examine the impact of using a methanol/DME mixed fuel in a SI engine, the tests in this research were conducted at idle conditions. The engine was altered so that fuelled by a mixture of methanol and DME that was simultaneously fed into the engine's intake ports. To examine how adding DME affects engine performance, different DME fractions were chosen. The experimental findings demonstrated a 25% increase in thermal efficiency and Engine speed's coefficient of cyclic variation dropped by 29.2%.

N Chuvashev, et al., [8] Internal combustion engines have an increasing detrimental impact on the environment, which has led to a variety of global issues that have recently gotten much worse for humanity. Reducing the toxicity of engine exhaust gases has been a problem for become universal and widespread across all nations. toxic substances found in engine exhaust Air currents carry gases entering the atmosphere over great distances, lowering the problem of determining the harmful component composition of diesel engines is urgent and urgent, taken into government level. The article offers an examination of the primary hazardous elements and review of the principal applications for methanol in engines, including the use of the most how to use methyl alcohol in a diesel engine.

Changming Gong, et al.,[9] The effects of injection and ignition timings, engine speed and load, compression ratio, and injector type on cycle-by-cycle combustion variation in a methanol-fueled direct-injection spark ignition (DISI) engine have been experimentally explored. The cycle-by-cycle combustion variance was evaluated using the coefficient of variation (COV) of the maximum in cylinder pressure. The findings revealed that these variables have a considerable impact on the cycle-by-cycle combustion fluctuation. The COV is at its lowest at an Timing of injection and ignition is excellent. with mild load, the COV with a compression ratio of 14:1 is smaller than that at a compression ratio of 16:1, and vice versa at heavy load. The COV of injector type A is much lower than that of injector types B and C.

A A Anfilatov**,** et al.,[10] Limited oil-derived fuel reserves, as well as a large increase in the price of oil and its products, have made research into and justification for the use of other fuels relevant. Among the latter, methanol plays a key role, as raw ingredients for its manufacture are widely available. Methanol can be produced from natural gas, coal, or petroleum. Biomass, or municipal garbage. Methanol is associated with renewable energy sources. It ought to be It should be emphasized that developing a fundamentally new engine type that fulfills modern environmental and economic standards necessitates extensive research and substantial material prices, hence The research aims to improve commercially existing engines. The findings are presented in this article by putting in place a methanol-using method.

Xudong Zhen, et al.,[11] Methanol is a renewable, environmentally and economically appealing alternative fuel that is regarded as one of the most potential substitutes for conventional fossil-based fuels. To suit certain needs, methanol has recently been used as an alternative to conventional fuels in internal combustion (IC) engines. Concern about the economy and the environment. A number of large-scale research endeavors have lately been underway, and significant progress has been made that is worth noting. This research page describes methanol production in detail, covering coal, natural gas, and biomass. Coke oven gas, hydrogen, biomass, and other alternatives are available. It discusses the possibility of methanol as a renewable resource. Considers worldwide supply and demand, economic benefits, human health consequences, and the environment.

Vignesh Asokan,et al.,[12] Because of its superior performance, combustion, and emission characteristics, methanol is increasingly being used and researched in combustion engines. To gain a thorough understanding of the combustion behavior and emission benefits of a methanol-fueled internal combustion engine, a literature review on recent academic research was conducted and is provided in this study. Under dual fuel combustion technology, a maximum of 90% methanol was efficiently used in a compression ignition engine at high load situations. The methanol-fueled dual fuel combustion mode eliminates the trade-off between nitrogen oxides (NOx) and soot emissions, which was a key issue in conventional diesel combustion (CDC). The methanol-fueled dual fuel combustion produced totally premixed combustion. Methanol was mixed with high cetane fuels to improve the combustion rate due to the presence of oxygen content.

Dima Alexandru, et al.,[13] Alternative fuels for internal combustion engines have lately gained attention due to severe restrictions surrounding environmental preservation, pollution, and reducing reliance on fossil fuels. Methanol, which may be produced from renewable sources and combined with gasoline in any proportion, is one option. The purpose of this research is to compare the performance, combustion, and emission characteristics of methanol-gasoline mixes to those of gasoline. M5, M10, M15, M20, and M25 blends were tested in a single cylinder spark ignition engine often utilized in scooter applications. The experimental results in engine performance demonstrate a 10% drop in torque and power, as well as CO, CO2, and HC emissions. It is possible to conclude that gasohol is used in the engines to replace the fossil fuel.

Avinash Kumar Agarwal, et al.,[14] Researchers are more divided over reactivity-controlled compression ignition (RCCI) combustion than any other low-temperature combustion (LTC) strategy because of its superior combustion and performance characteristics and reduced emissions across a wide operating range. The effects of the timing of the commencement of diesel injection (SoIdiesel) employing various pilot injection strategies, such as single and Double pilot injection, also known as SPI and DPI, has been researched. Testing was done on a stationary engine. Utilizing various premixed ratios (rp: 0, 0.25, 0.50, and 1.5) at varied speeds and loads (1500 rpm and 3 bar BMEP, respectively 0.75 gallons (based on energy) of methanol. According to experimental findings, the start of combustion (SoC) and With increasing SoI diesel, combustion phasing (CP) also increased. However, combustion resulted from SoI diesel timings that were too advanced and too delayed.

A N Chuvashev, et al.,[15] Since the discovery of the internal combustion engine, the dilemma of identifying and utilising alternate energy carriers in transportation has arisen. It is conceivable to increase the raw material base of car fuels while reducing their negative environmental impact. By utilizing non-traditional or alternative fuels. Compressed natural gas and alcohols are two examples. are most commonly utilized in road transportation. Work is being done at the Vyatka Agricultural Academy. To investigate the characteristics of the usage of alcohols in diesel engines when fed with a dual fuel supply.

Hanfei Zhang, et al.,[16] The advancement of agriculture. Particularly, 2nd generation biofuels, such as synthetic biodiesel as a high-performance and alternative mobility fuel, can be created using biomass-gasification-based technologies. There are three types of biomass gasification processes: (1) moving-bed or fixed-bed gasifier for coal gasification with oxidizing blast gas (air + hot syngas) (2) fluidized-bed gasifier that employs air (oxidant agent) to fluidize the bed and the added carbon-containing particle, and (3) an entrained flow gasifier that uses pure oxygen to achieve a high working temperature. Due to the high pressure, the entrained flow gasifier appears to be a promising alternative with strong scale-up potential. The operation and no N2 diluted syngas generation, which can lead to the compact design of downstream equipment. The resulting syngas, in particular, has no tar.

V A Likhanov, et al.,[17] The knowledge gained by fixing the world's environmental problems through the usage of diesel engines enabled us to devise several solutions, including the transition to work on alternative fuels. The classification of alternative fuels is presented in this article. The article examines the usage of biofuel for transportation. The diesel engine. Utilization of alternative biofuels with varying chemical compositions and local conditions. This results in the diesel engine's particular performance. As a result, for scientific portrayal of Experiment investigations were conducted to obtain an accurate image of the power and economic indicators of the diesel engine. It was tested while it was run on methanol and rapeseed oil methyl ether. According to the findings laboratory and bench examinations of the load functioning mechanisms of a diesel engine operating on Methanol.

B. Baiju, et al.,[18] This research analyzes the feasibility of using biodiesel produced from Karanja oil using the methyl and ethyl alcohol routes (methyl and ethyl ester) as an alternative diesel fuel. The main issue with using neat Karanja oil as a fuel in a compression ignition engine is its extremely high volatility. The oil's viscosity is reduced via transesterification with alcohols, and other qualities are improved. They were found to be comparable to those of diesel. Karanja methyl and ethyl esters were used in this study. Transesterification using both methanol and ethanol was used to create the oil. The physical and chemical properties Ethyl esters' characteristics were equivalent to those of methyl esters. However, the viscosity of ethyl esters is higher was somewhat higher than for methyl esters.

Yu Yang, et al.,[19] The ReaxFF molecular dynamics (MD) simulations were used in this study to investigate the dynamic evolution of reactants and intermediates in the methanol oxidation reaction. The oxidation reaction path was determined, and the effects of O_2/methanol ratio and H_2O/CO_2 impurity on the oxidation were investigated. The findings show that Methanol consumption is substantially higher than that of O_2, and it is the favored fuel. The reaction produces H2O, H2, CO, and CO_2. As the reaction temperature rises,The rate of reactant consumption increases, which encourages the production of intermediate products ahead of time, resulting in an increase in product. The total amount of final At 3000 K, the products of H_2O, H_2, CO, and CO_2 are 1.59, 4.07, 4.36, and 3.20.

Nidhi Chaudhary ,et al.,[20] The performance and emission characteristics of a cycle engine fueled by methanol (M100) and ethanol (E100). When compared to E100, the high flame velocity of methanol resulted in high In-cylinder peak pressure and temperature at all speeds. When compared to M100, the commencement of combustion was faster. E100 ignited the combustion earlier than E100 due to its lower minimum ignition energy. Crank angle happened for 10% and 50% mass fraction incinerated due to the higher flame velocity of M100 than E100 methanol. Higher brake thermal efficiency came from improved combustion quality due to the creation of simpler intermediate product

species. M100 engines are more efficient than E100 engines. The volumetric efficiency of the engine rose somewhat with E100 as a result.
Nidhi Chaudhary, et al.,[21] The tests were carried out on a spark ignition Genset engine to investigate the influence of methanol-gasoline blends M15 and M85 on combustion characteristics and compare them to gasoline. The study's key findings are summarized here.M15 had a lower maximum in-cylinder pressure than fuel by 10.6%, whereas M85 is about the same. The rate of heat release rose as the methanol content in the blend. With M85, the maximum rate was only 6.4% lower. When compared to gasoline, it was 18.35% lower with M15.When the load is reduced, the flame development angle with M15 and The same goes for fuel. It was by far shorter with M85 than with gasoline. 30.5%. It was 11.1% higher with M15 at a higher load.
Aguk Zuhdi, et al.,[22] The usage of fossil diesel fuels continues to emit carbon dioxide (CO2), sulphur dioxide (SO2), hydrocarbon emissions (HC), nitrogen oxide (NOx), high total particles, and carbon monoxide (CO). Furthermore, the need for motor vehicle transportation will continue to rise year after year. The emission of exhaust gases as a result of the The combustion process can be significantly reduced by enhancing fuel quality, fuel mixture homogeneity, and combustion efficiency. ensuring optimal combustion. There are numerous approaches to reduce diesel engine exhaust emissions by providing accurate controls. injection pressures. This is done to ensure that the combustion is correct. Furthermore, improving fuel quality is a means to cut costs. Exhaust gas emissions. Another method is to add methanol to the diesel. Methanol can be used to lessen the emission.
I Wayan Agus Rantia Dana, et al.,[23] A two-stroke engine powered by biogas or methanol is still in the works. The goal of this effort is to develop a two-stroke engine for an electric generator that can run on flexible fuels such as methanol, biogas, and mixed methanol-biogas. A compact single-cylinder two-stroke engine of an electric generator was designed to be portable. Biogas (50% vol. CH4, 15% vol. CO2, 0 ppm H2S), methanol (CH3OH) and electricity are used to power the engine. Having 97% vol. purity and combined biogas-methanol. The electric generator employed is capable of producing 750 watts electricity. The compression pressure was around 10 Bar, and the cylinder volume was approximately 63 cc. The engine was started with a simple switch system.
Halil Erdi Gülcan, et al.,[24] The effects of methanol and dodecanol addition on engine performance and smoke emission in a single cylinder, four stroke, water cooled, normally aspirated, diesel CI engine were explored in this experimental investigation. The research was carried out at constant maximum engine torque speed and part loads for all participants. Fuels are being tested. Diesel, diesel-methanol, and diesel-methanol-dodecanol are all types of diesel engine. As test fuel, mixes were utilized. Methanol was added at a 10% concentration. Dodecanol was added at 1% by volume. The D89M10D1 outperformed all other test fuels in the study. When compared to other fuels, it has a higher BTE and a lower BSEC. in comparison. The smoke emission parameters of diesel, methanol-diesel, and methanol-dodecanol-diesel blends were reduced. Adding 1% dodecanol to methanol resulted in the lowest smoke emission.
Amira Nemmour, et al.,[25] Renewable power-to-fuel (PtF) technology is critical for the shift to fossil-free energy systems. The desire to divorce the energy industry from its reliance on fossil fuels is driving the development of carbon neutral synthetic fuels. Source of environmental difficulties. Hydrogen (H2) generated by water electrolysis driven by using renewable energy and capturing direct carbon dioxide (CO2) from exhaust gas generated by power plants, industry, transportation, and anaerobic biogas production Electricity is converted into carbon-neutral synthetic fuels via digestion. These are the fuels function as efficient energy carriers capable of being stored, transmitted, and utilised in different ways Transportation and industries use energy. Furthermore, the PtF concept is an energy transition capable of offering services for balancing.
Miqdam T. Chaichan, et al.,[26] The most critical characteristics that can affect the combustion process and minimize exhaust emissions concentrations are fuel injection timings, equivalency ratio, and exhaust gas recirculation. The impact of 15% EGR technique and operational parameters and NOX emissions and particulate matter (PM) emissions while using oxygenated gasoline. In this experiment,

methanol) mixes were tested. The findings revealed that the NOX Emissions concentrations rise when the equivalency ratio () rises and EGR is applied to all fuels. studied Furthermore, when compared to diesel fuel, E10 and M10 reduced PM concentrations a variety of equivalency ratios. The EGR used enhanced PM concentrations, but when the combination of oxygenated fuels and EGR results in a reduction in PM production. The NOX Emissions concentrations have reduced.
Shervin Karimkashi, et al.,[27] In dual-fuel compression-ignition engines, it is preferable to replace conventional fuels like methane with renewable and widely available fuels like methanol. However, a finer understanding of diesel/methanol ignition vs diesel/methane ignition is needed. Large-eddy simulation (LES) combined with finite rate chemistry is used to investigate diesel spray-assisted methane and methanol ignition. A spray of diesel surrogate fuel (n-dodecane) is injected into the environment. At various ambient temperatures, methane-air or methanol-air mixes with a fixed lean equivalency ratio fLRF = 0.5 were tested. The primary goals are to (1) compare the ignition properties of diesel/methanol. (2) investigate the relative importance of low-temperature chemistry (LTC) to high-temperature chemistry (HTC), and (3) determine the fundamental distinctions between n-dodecane oxidation reactions.
Ahmed I. EL-Seesy, et al.,[28] This study attempted to improve the application of methanol in CI engines by using n-decanol as a cosolvent. The project was divided into binary phases. First, the stabilities of pure methanol (M100) and hydrous-methanol (MH10) with diesel as a reference fuel were investigated using various techniques. Temperatures range from 10 to 20 to 30 degrees Celsius. The results revealed that the M100-diesel and MH10-diesel Combinations were volatile. As a result, n-decanol was used as a cosolvent. The engine comes next. The parameters of combustion and emissions were examined by varying three mixtures of M100-diesel blends containing n-decanol. Three combinations of 5, 10, and 15% M100 with 20% n-decanol, designated as M5, M10, and M15, respectively. These pairings were their thermogravimetric qualities were evaluated, as well as their physicochemical properties.
S. Kennedy, et al.,[29] Methanol is a sustainable, technologically and financially appealing alternative fuel that is one of the most favorable fuels over traditional fossil fuels. Methanol has lately been used to address some environmental and economic difficulties as an alternative to traditional fuels for internal combustion (IC) engines. We talked about it in this study. Methanol, techniques of using methanol as engine fuel, and applications of methanol fuel in internal combustion engines. Combustion engine, which leads to the conclusion of developing and employing methanol in order to by substituting existing fossil fuel fuels, conventional emissions regulation will be eliminated needs and economic costs.
Willy Yanto Wijaya, et al.,[30] In theory, the Methanol Steam Reforming (MSR) method for producing hydrogen only requires endothermic heat at temperatures below 100°C. Meanwhile, waste heat at temperatures ranging from 100 to 150°C is disposed of in massive quantities by numerous industrial sectors each year. If this plentiful waste heat can be collected and stored, Through the use of hydrogen energy from the MSR, a potential gain and high-efficiency energy system might be realized. However, Temperatures of 200°C are required empirically for the MSR process to achieve high conversion from methanol to hydrogen. As a result, an Absorption Heat Pump (AHP) system is used to raise the temperature waste heat. Nonetheless, the AHP system will undoubtedly demand greater input energy. The purpose of this study was to examine the viability of incorporating the AHP system into the MSR process.
İlker Örs, et al.,[31] The availability of methanol instead of ethanol was explored in terms of performance, emission, and combustion characteristics in this study. The tests were carried out in a single cylinder, four-stroke SI engine. At full engine load, the engine speeds vary. 10% of the test fuels were prepared. The incorporation of ethanol and methanol into gasoline. According to the results of the experiment methanol addition increased bsfc readings by 10.3% as compared to With the addition of ethanol, the bte levels were reduced by 6.12%. Methanol is a hydrocarbon. The combustion characteristics of addition fuel are comparable to those of ethanol addition. Despite the fact that the

injection of methanol reduced CO2, CO, HC, and NOx, Compared to ethanol, these alternatives reduce emissions by 6.48%, 26.6%, 4.75%, and 9.16%, respectively. Furthermore, because of its greater oxygen emission values, it has 15.3% higher oxygen emission values.
Luke Oxenham, et al.,[32] This study investigates and optimizes the Miller cycle, methanol, ethanol, and turbocharging when used in a high-performance gasoline engine. These technologies were used separately and jointly to assess for potential compounding effects. Both emission output and performance have been targeted for improvement. Also the engine's ability to operate when solely powered by biofuels is evaluated. This has resulted a 1D Navier-Stokes equation, and the 1D gas dynamics tool 'WAVE' solver. These technologies are used in the McLaren M838T 3.8L twin-turbo engine. The Miller cycle early intake valve shut (EIVC) increased peak efficiency by 0.17% and decreased peak efficiency by 0.17%.11% improvement in power output under low and medium loads. NOx and CO reductions of 6%.
Mr.Avhale Swapnil, et al.,[33] Because of the benefits of low specific weight, compactness and simplicity in design, low production cost, and low maintenance cost, petrol engines are commonly utilized in automobiles today. However, this engine has two significant drawbacks: poor fuel economy and large unburned hydrocarbon emissions. Methanol can be made from any material that can degrade. hydrogen and carbon monoxide (or carbon dioxide). It has a higher heat of evaporation, which results in a higher. It also aids in the regulation of the internal engine by lowering the temperature and therefore increasing volumetric efficiency. temperatures and heat fluxes in order to reduce heat losses and hence increase fuel efficiency, which is extremely important. Because methanol can easily be supplied from low-cost sources, it is appealing to underdeveloped countries.
Shu-hao Li, et al.,[34] This paper proposes a revised variation disturbance method to provide valuable information and a reference for fuel design or optimization of internal combustion engines in order to achieve a comprehensive and quantitative evaluation of the effects of blending agents on primary fuel combustion performance. Methanol and ethanol are blended into gasoline in this way. There are six different types of alcohol gasoline (E10, E20, E30, M10, M20, and M30). Then there's the ignition delay, adiabatic flame temperature, and so on. The component concentration, fuel-burning rate, extinction strain rate, and CO emission of gasoline and alcohol gasoline are being investigated. System simulation under a variety of operating situations. The effects of methanol were studied using the novel variation disturbance method. The effects of and ethanol on gasoline combustion performance are then evaluated globally and quantitatively.
Simeon Iliev, et al.,[35] Air pollution, particularly in large cities around the world, is linked to serious issues affecting both people's health and the environment. There has been an especially intense need for alternatives to fossil fuels in recent years, because when they are burned, compounds that are harmful to the environment are released. Pollutants that harm the environment are released. In addition to the smoke produced by the combustion of fuels used for heating and cooking. The toxic emissions emitted by industrial facilities, as well as car exhaust emissions, contribute significantly to global warming fraction of the pollution caused by fossil fuels. Non-conventional and advanced fuels are examples of alternative fuels are derived from non-fossil fuel sources. Because alcoholic fuels have a number of physical and chemical properties. They have propellant qualities similar to gasoline and can be considered as one of the alternatives fuels alcoholic or alcohol-based energy.
M. Hanifuddina, et al.,[36] While oil production has been dropping over the last ten years, fossil fuels continue to dominate future energy needs. One answer to this problem is to use new and renewable energy sources. One of the most important sectors in transportation wide spread environmental issues caused by the use of fossil fuels in Internal combustion engines emit pollution. This is the foundation for combining gasoline and alcohol. The composition of gasoline-ethanol-methanol is calculated in this work. With RON-based 89, aim towards RON 92, 95, and 98. This blend's makeup is the linear molar calculation was used. Ethanol and methanol blends in gasoline their chemical and physical properties are also affected. The qualities, for example, research The RON and density of gasoline-ethanol-methanol fuel mixtures of RON.

T. Yusaf, et al.,[37] A complete investigation on the use of methanol as an alternative fuel for diesel engines was conducted in the current work. Methanol was blended in various proportions with diesel fuel. Methanol to diesel mixture ratios were 0:100, 10:90, and 20:80. and 30:70. Methanol fraction affects on engine power, torque, and brake specific fuel. The BSFC, brake thermal efficiency, and exhaust temperature were all measured. Variable engine speeds were examined experimentally. The engine that was used to carry out these tasks. A four-stroke four-cylinder diesel engine is being tested. The findings revealed that mixing methanol, in various fractions, has a considerable effect on the engine performance. The methanol to diesel ratio of 10:90 produced the least amount of emissions.

Anren Yao, et al.,[38] To alleviate the burden of energy security from reliance on foreign oil supply, methanol is playing an essential role as an alternative fuel in China's automotive industry. Methanol is now commonly used as a fuel additive in spark ignition (SI) engines and industrial utilities in a variety of industries. However, due to its low cetane number, low vaporization rate, and low solubility with diesel, it is rarely used in compression ignition (CI) engines. As a result, using methanol as fuel in CI engines poses a significant difficulty because these engines power the majority of heavy-duty vehicles, construction equipment, and marine power units. During our group's many years of research.

Dr. Osama Ghazal, et al.,[39] In general, dual-fuel internal combustion engines have higher performance and lower emissions. Many alternative fuels have been proposed by scientists, including Methane, LG, ethanol, hydrogen, and methanol are all examples of fuels. However, Many engine parameters need be tweaked to provide the best results. The greatest gain from using low-emission fuels. This paper discusses engine compression ratio, engine speed, and valve timing. The effect of timing on SI engine performance and emissions. Methanol-powered vehicles have been researched. The cylinder pressure, fuel economy, and engine output power. Volumetric and thermal efficiencies are computed and talked about. According to the findings, increasing engine speed boosted the engine output power and fuel consumption. Furthermore, increasing engine speed reduces BMEP.

Chengjiang Li, et al.,[40] China has been pursuing methanol vehicle research since the early 2010s in order to secure energy supplies and minimize pollution. Although completed pilot projects have proved methanol vehicles' economic and technological maturity, their overall emissions remain high because methanol is mostly manufactured from coal in China. Two green methanol approaches (CO2-to-methanol and biomass-to-methanol) have been proposed as car fuels to tackle this. Before further deployment, it is critical to thoroughly compare green methanol vehicles with other vehicles; thus, this study compared green methanol vehicles with coal-to-methanol, conventional gasoline, and electric vehicles, taking into account energy-focused, environmental, and economic perspectives. In conjunction with these findings, we created a complete evaluation model to prioritize green methanol vehicles among the various vehicles in China.

Conclusion

When methanol fuel is used, the CO2 emission in exhaust gas is less than that of traditional fuel vehicles, which is environmental clean and can lead to an overall improvement in vehicle engine emissions. The results as shown that methanol can be produced from coal, natural gas, coke-oven gas, hydrogen and biomass etc. The production capacity of methanol can fully meet the demand. Air pollution regulation in industrial cities limits economic growth. The development and application of methanol to replace the current fossil fuels can reduce the need for and economic cost of traditional add-on pollution controls. Compared with the fossil fuels, methanol has the potential to reduce vehicle emissions, and consequently to improve the atmospheric environment and reduce regulatory pressure on economic growth and energy demand.

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