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Indian Scenario Of Ethanol Blending

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Abstract: Due to the increasing demand for energy, limited fossil oil resources, and the need to reduce CO_2 emissions, renewable energy fuels are in the spotlight. The high price of Petroleum on the global market has a direct impact on the Indian economy because India is a net importer of crude oil. Ethanol blending is considered worldwide to be the most important and possible substitute for fossil fuels. It is produced by fermenting raw materials obtained from various renewable sources, such as sugar cane, corn, and sweet sorghum, around the world. Ethanol is usually mixed with gasoline in varying proportions and is commonly called "Gasohol." At present, 10% ethanol is blended into gasoline in India. Ethanol in the fuel increases the oxygen content and has replaced the use of Methyl Tertiary Butyl Ether (MTBE) and Ethyl Tertiary Butyl Ether (ETBE). Various studies conducted around the World have revealed that blending ethanol into gasoline in varying proportions has significantly reduced Green House Gas (GHG) emissions from vehicles. The purpose of the current study is to emphasize the processes used in ethanol manufacturing as well as the benefits of ethanol as a blended fuel.

KEY WORDS: Ethanol, Ethanol Blends, MTBE, ETBE, Gasohol

1. INTRODUCTION

Fossil fuels currently supply around 98% of the fuel required for the road transportation industry, with biofuels providing the remaining 2%. 85% of India's oil needs are now imported. This would have caused the number of vehicles on the road to rise even further, increasing the need for gasoline. India's net oil imports increased from 196.5 million tonnes the year before to 212.2 million tonnes in 2021–22. Most petroleum products are used in transportation.

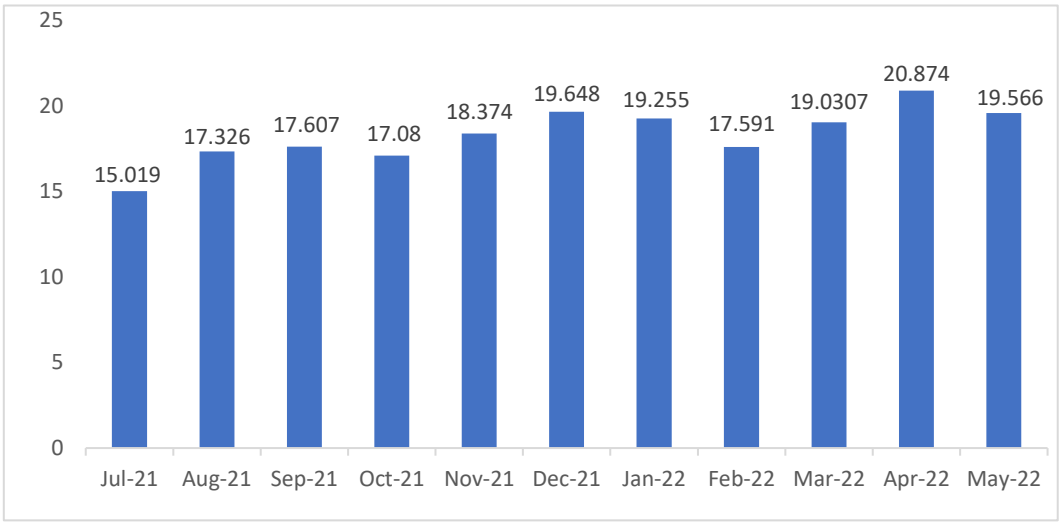

Figure 1: Imported quantity of Crude (MT)

Since domestic biofuel production decreases the country's reliance on foreign fossil fuel imports, it presents a strategic opportunity. In addition, biofuels can be sustainable and environment-friendly sources of energy provided they are handled with caution. As the need for energy in our nation rises as a result of a developing economy, a growing population, more urbanisation, changing lifestyles, and rising purchasing power, ethanol blending is the process of adding ethanol to gasoline. Ethanol is one of the main biofuels produced naturally via sugarcane with aid of yeast or by petrochemical processes such as the hydration of ethylene. In addition, ethanol emits less pollution than gasoline while providing the same efficiency. Large tracts of arable land are readily available, food grain and sugarcane output is expanding, creating surpluses, ethanol manufacturing technology is available, and it is simple to build ethanol-compliant gasoline automobiles. Thus, a successful Ethanol blending programme can significantly reduce net fuel import and save revenue which can be better utilized in other sectors.

2. Production of Ethanol Biofuel

2.1. 1st -Generation Biofuels

Ethanol and biodiesel are examples of first-generation biofuels that are directly tied to biomass, which is frequently edible. The process of making ethanol typically involves fermenting C_6 carbohydrates, primarily glucose, with either traditional or GMO yeast strains like Saccharomyces cerevisiae. The majority of the time, sugar cane or corn are the only two raw materials used to make first-generation bio ethanol.

2.2. 2nd Generation Biofuels

Fuels made from a range of diverse feedstocks, including but not limited to non-edible lignocellulosic biomass, are referred to as second-generation biofuels. An incentive is that the cost of this biomass is considerably less than the cost of corn, vegetable oil, and sugar cane. The generation of such biomass, however, requires the development of new technologies, and it is typically more challenging to convert. Two distinct processes—generally referred to as the "Thermos" or "Bio" routes—are typically used in the conversion process to manufacture second-generation biofuels. The graphic displays a condensed representation of the second-generation biofuels' production paths.

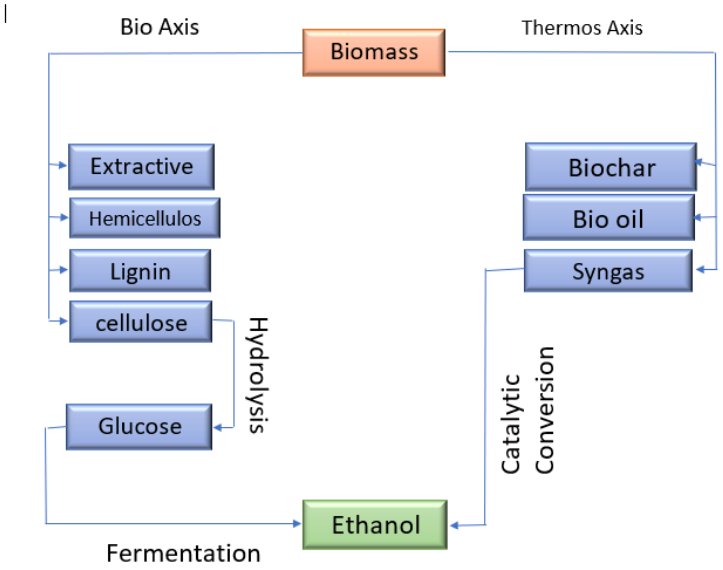

Figure 2: Biomass Path 1) Bio; and 2) Thermos

2.3. 3rd Generation Biofuels

The most widely accepted definition of third-generation biofuels is fuels made from algae biomass, which has a much higher growth yield than traditional lignocellulosic biofuels. The lipid content of the micro - organisms usually determines the production of bioethanol from algae. Species with high lipid content and productivity, such as Chlorella, are commonly targeted.

Table 1 Ethanol Requirement and Capacity

(in billions litres)	Ethanol Requirement	Installed capacity required	Current installed Capacity(2021)
From sugarcane & molasses	6-6.5	6.5-7	5.25
From grains and corn	4-4.5	5-5.5	0.75
total	10.5	12	6

3. Ethanol Blending in India

Tert-butyl methyl ether, also known as MTBE, is used as a fuel component in gasoline engine fuel. It belongs to a class of substances called "oxygenates" since they raise the oxygen content of gasoline. Low concentrations of MTBE are used in gasoline as an anti-knock (octane) additive to replace tetraethyl lead (TEL), which helps keep engines from knocking. Ethyl tert-butyl ether, often known as ETBE, is frequently used as an oxygenator in the process of making gasoline from crude oil. Since ETBE is less technically and logistically demanding than ethanol while providing benefits for air quality .Unlike ethanol, ETBE does not absorb moisture from the air and does not result in the evaporation of gasoline, which is one of the causes of smog. Methanol-based MTBE is less expensive than ethanol-based ETBE. Ethanol can replace these chemicals and economically viable solution to these chemicals. E10 blends, which are typically 2 to 3 octane higher than conventional gasoline and can cut carbon monoxide (CO) pollutants by 20 to 30%. E10 does minimise CO emissions and greenhouse gases like CO2 by an estimated 2% compared to standard gasoline. E10 can increase evaporative emissions and some harmful gases depending on variables like vehicle age and weather conditions, even though it can increase exhaust emissions and some pollutants, depending on the age of the vehicle and the weather and can reduce carbon monoxide (CO) by 20–30% under the right circumstances, even if it does cut carbon emissions of CO and greenhouse gases like CO2 by an estimated 2% when compared to conventional gasoline. E15 is composed of 85% gasoline and 15% ethanol. In general, this is the greatest ethanol-to-E15-gasoline ratio. E20 and E25: E20 has 80% gasoline and 20% ethanol, while E25 has 25% ethanol. E70 and E75: E70 has a 70% ethanol content and a 30% gasoline content, while E75 has a 75% ethanol content. E85: E85 is typically the fuel blend with the highest ethanol percentage. It is a blend of 15% gasoline and 85% ethanol. E70 and E75 flex fuel cars in cold weather. 108 is the octane rating for this combination. At temperatures beneath 11 °C, the 85% ethanol concentration limit was set in order to minimize ethanol emissions and prevent cold starting issues. In modified diesel engines, where high compression is utilised to ignite the fuel rather than spark plugs as in gasoline engines, E95 is a mixture of 95% ethanol and 5% ignition improver. E100: E100 is 100 percent ethanol. The Ford Model T, which was produced between 1908 and 1927, was the very first commercial vehicle that could run on pure ethanol. It had an adjustable-jet carburettor that could run on either gasoline, ethanol, or a mix of the two. Three localities, namely Miraj, Manmad (Maharashtra), and Aonla/Bareilly in Uttar Pradesh, launched trial projects for ethanol-blend gasoline in 2001. The Indian government made the decision to start the Ethanol Blended Petrol (EBP) initiative in January 2003 to sell gasoline with 5% ethanol blended into it. According to the survey, some of India's top sugar producers, including Bajaj Hindustan Sugar, Dalmia Bharat Sugar, Triveni Engineering, Shree Renuka Sugar, Balarampur Chinni Mills, EID-Parry India, Jaipur Sugar Company, India Glycols, Marwan Sugar, and BSM Sugar, are in the forefront when it comes to ethanol production. The ethanol's price has increased to Rs. 63.45 per litre from Rs. 62.65 per litre as a result of the rise in demand. E10 is a fuel blend that combines 90% gasoline and 10% anhydrous ethanol. It may be used in the internal combustion engines of the majority of contemporary cars and light trucks without requiring any modifications to the engine or fuel system.

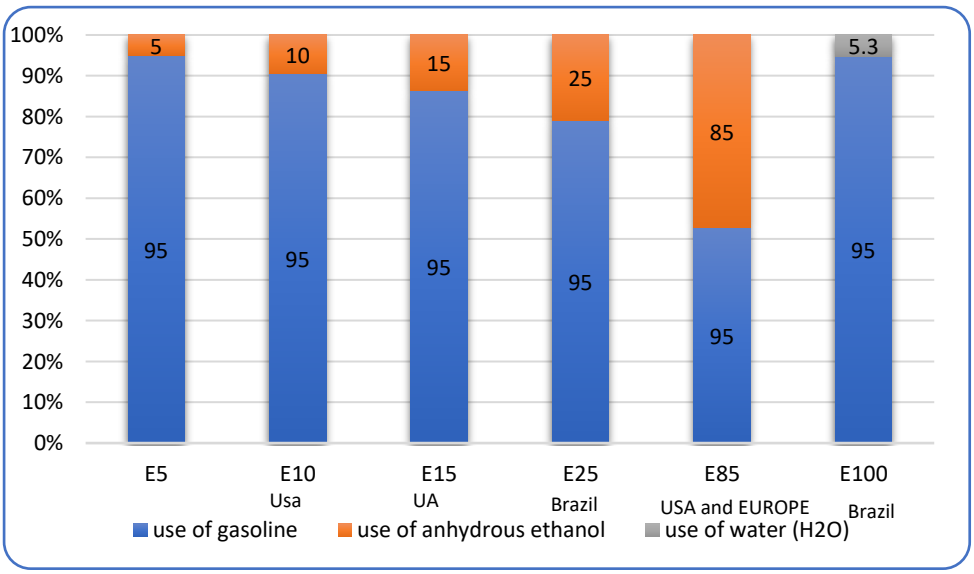

Figure 3: Composition of Ethanol blended fuel

4. Initiatives Taken by the Government of India

The Government will provide consumption relief for 12% and 15% ethanol-blend gasoline. To encourage ethanol blending in India, only 88% of gasoline and 85% of diesel will have to pay excise duty. 5% GST will be relaxed on 12% and 15% ethanol. It can help the government achieve its 20% ethanol blending target by 2025. By 2030, the Ethanol Blended Petrol (EBP) programme aims to blend 20% ethanol. Wherever it is accessible, several Oil Marketing Companies (OMCs) in India currently sell gasoline with a 10% ethanol blend (E10). Unfortunately, due to a lack of ethanol, only around 50% of the gasoline sold is blended with E10, with the remaining 50% being regular gasoline (E0). The average ethanol blend in the nation right now is 5%. (2019–2020 ethanol supply year). The Ministry of Petroleum wants to reach a 10% ethanol blending level in the Ethanol Supply Year (ESY) 2021–22, or April 2022, in light of multiple initiatives on the ethanol supply side. This stage, along with reaching the E20 targets, will require emission norms for national standardisation and acceptance. Ethanol requirement of 1016 million litres based on predicted growth in vehicle population modelling of expected electric car penetration forecasts demand for ethanol in the range of 722 to 921 million litres after gasoline blending in 2025. However, the committee's recommendations were based on a conservative ethanol demand estimate (1016 million litres) to guarantee that E20 requirements be satisfied by 2025. India now has a 426 million litre capacity for ethanol production, with 258 million litres coming from molasses-based distilleries. The suggested increase is to 760 and 740 kilolitres, respectively, or the 1016 crore litres of ethanol required for the EBP (Ethanol Blended Petrol Program) and 334 crore litres for other

Applications could be produced with this amount. In ESY 2025, this will require using 60 lakh metric tonnes (MT) of sugar and 165 lakh metric tonnes (MT) of grains, both of which the nation can produce.

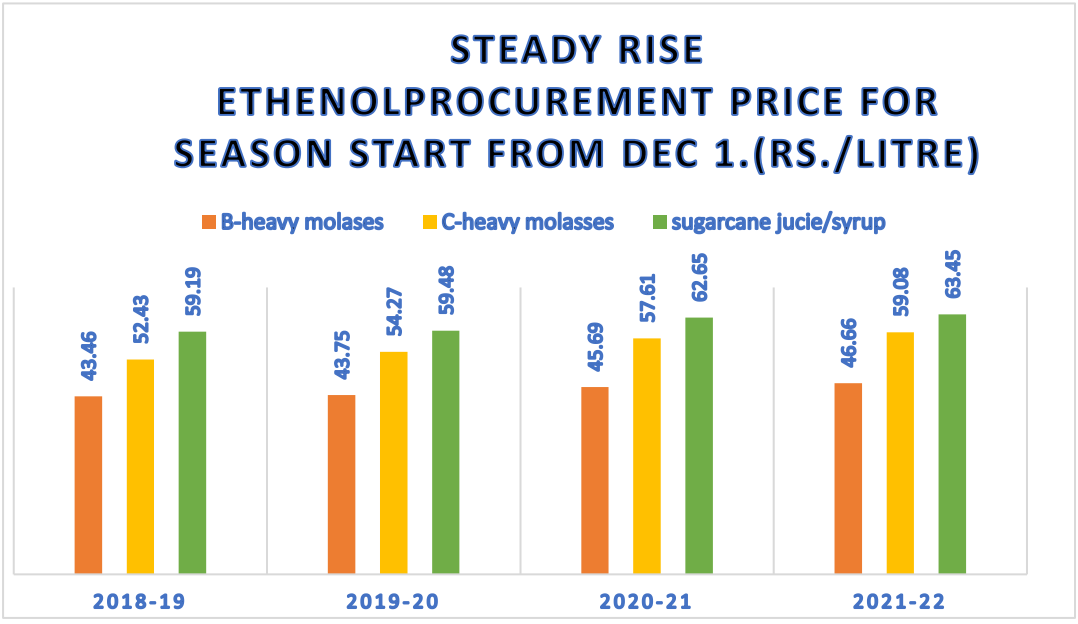

Figure 4: Cost of ethanol production per litre

5. Conclusion

Recently Ethanol blending is the most efficient and sustainable resource. The production of ethanol from renewable sources is considered worldwide to be the most important and possible substitute for fossil fuels. The production of ethanol has been taken from fermenting agricultural based raw materials like sugarcane, corn, sweet sorghum etc. As being additive in gasoline, ethanol has replaced the usage of other additives such as MTBE, ETBE and BTEX. Since ETBE is an alternative of ethanol but due to some aspects like degradation in environment is difficult and its higher cost makes it uneconomic additive. By blending ethanol in gasoline it reduces the amount of petrol required which ultimately connects to the environmental aspects such that declination in pollution rate and greenhouse gas emission. Thus, ethanol is more promising and environmental friendly gasoline additive.

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