Green Support for fuel Use-Blends to Extend Deadlines of Comfort

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***Abstract*—As the Deadline for non availability of fossil fuel inches closer, options to continue the comfort of modern life by migrating to renewable sources of energy must be weighed. The present paper discusses renewable fuel sources. The best option is the use of blends of biofuels/bio diesel which can be increased from 5% to 15% and more gradually and uniformally increasing with time to extend the deadline for exaustion of non renewable fuel sources across all regions and to avail maximum advantage in global village combating on many fronts like climate change, depleting resources, ozon layer depletion etc for comfort by environmental management.**

***Index Terms*—biodiesel, fuel, non renewable sources, renewable sources of energy, blending of biodiesel, B5, B15**

I. Introduction

Fuels have become integral part of modern life and we can not think of life without fuels. Transportaion are primary needs of modern life and tyres need to keep running for continuous growth of humankind. Present review discusses renewable fuel sources and how they can be popularised to use to save finite sources.

A. Non Renewable Sources of Energy

Fuel: We are heavily dependent on petroleum sources which are non renewable.

Deadline: As such energy sources of non renewable nature can not be renewed and limited till exhausted. Petroleum oil can last only upto 60 years. Thus 60 years is the deadline for human comfort until and unless we have foolproof plan for the future.

Options: Use of Renewable sources of energy is an option but not immediately practicable. Hydrogen is flammable in nature. Battery vehicles are not affordable at present for regular use. We need large surface area on vehicle for solar powering and it is not possible everywhere. Thus there are many limitations holding us to wait for non renewable energy sources to empower our energy needs in future.

Solution: As it is clear that we have to opt for renewable energy sources in future, the best solution at present is to be prepared and preparedness can start from extending the deadline by saving non-renewable sources till we can make renewable sources practicable for everyday use. This saving is possible by blending few percentage of bio fuels to regular fuel thereby reducing rate of exhustion and extending timeline for exhaustion.

Planning: Implementation of this solution can be initiated immediately by starting 5% blending of bio fuel and gradually increasing it to 15% and more.

Implementation: To start with implementation, countries in asia pacific region may make it compulsory for all vehicles to use blended fuel. All Fuel stations/pumps should sell fuel blended with atleast 5% biofuel. This initiative may then be followed globally. Discussion on making such biofuel available is in the next section. At present the planning in different countries lack co-ordination amongst themselves and each country have their own and exclusive planning. Target values of Bioethanol and Bio-diesel in south east asian and Australasian countries are established.

The government of Japan as well as those of Southeast Asian countries are eager to expand the use of biofuels (bioethanol, biodiesel). This is because they want to cut down CO_2emission by the use of befouls that are renewable, as well as they intend to reduce import of fossil fuels by making use of their own biomass resources for producing fuels and, at the same time, consume the fuels in their own country. The following Table I to Table III [1], [2] shows the target values for popularization of biofuels in each country as country specific targets set.

Although some difference can be noted with regard to extent and speed of popularization with respect to the everincreasing energy demand (Table IV), it might be safely said that in several countries biofuels could replace 10 ~ 20 % of conventional fossil fuels by Y2020, and that by Y2030 most countries may be able to achieve 20 % of substitution (of fossil fuels) by biofuels provided they are able to go ahead as planned.

Future Strategy: use of blends may be encouraged all over the world and 5% may be increased to 15% or more i.e. 20% as per suitability of vehicle engine as per research and data support in future. Thus making fuel all over the globe to migrate to greener option and thereby extending the deadline of exhaustion of non renewable sources by few years by way of decreasing its use from 100% to 85% or 80% or so, thereby saving 15% to 20% or extending the deadline of comfort by 15% or 20%. Hopefully by than the world will be fully adaptable to renewable sources of energy.

Present Usage: Table I shows how much is the need of fuels in Million Metric Tonnes (MMT). Obviously the requirement is very high [1] and will further increase so it

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is pointless to act to reduce requirement and thereby retarding overall growth as fuel propels not only vehicles but drive growth by achieved speed.

TABLE I. TARGET VALUES OF BIO EHTANOL AND BIO DIESAEL IN COUNTRIES WITH ADVANCE STAGE

Country	Target Value bioethanol	TargetValue-biodiesel	Re-marks
Indonesia	15%(Yr2010)	-	Investment of 22 bn US $ in 5 years
Thailand	15%(Y2010) E10 & E20 50000kL (Y2010)	10%(Y2010) B5 (Y2010),B10(Y2012)	
Japan	1,900,000kL (Y2020) 3,800,000kl (Y2030)	1,000,000kL (Y2020) 2,000,000kL (Y2030)	20%byY2030
Vietnam	500,000kL (Y2020)	50,000kL (Y2020)	
New Zealand	3.4%(Y2020)		E10,
Sri Lanka	20%(Y2020)		
India	20%(Y2017)	20%(Y2017)	
Philipines	5% (2010) E10	B1	
China	E10 (Y2020)		
Korea	Testing Phase as to E3.E5	B3(Y2012) Testing Phase as B5, B20	
Taiwan	E3(Y2011)	B2(Y2010)	

Future usage: Fuel use is going to increase and not decrease in any way. Thus it is very necessary to reduce consumption by blending biofuel in small portion and to start at the earliest or immediately to save and extend deadline in long run.

TABLE II. TARGET VALUES OF BIO EHTANOL AND BIO DIESAEL IN COUNTRIES WITH ADVANCE DEGREE/STAGE

Country	Target Value for bioethanol	Target Value for biodiesel	Remarks
Malaysia	Developing technology for utilisung saba Palm	Plannig to Introduce B5	Change of palm oil to biofuel to be less than 6 million tonne/yr
Laos	Plans to establish technology		
Cambodia	Plans to establish technology		

TABLE III. TARGET VALUES OF BIO EHTANOL AND BIO DIESAEL IN COUNTRIES AT FEASIBILTY STUDY CASE

Country	Target Value for bioethanol	Target Value for biodiesel	Remarks
Australia	Target values not designated by the new cabinet. But consumer's tax will be applied and reduce subsidy.		Target of 35000KL set for 2010 was achieved in 2009
Pakistan			Proof Test for E10 admitted
Mynamar		Expan-sion of Jathropa area upto 3.2MHa planned	

TABLE IV. ANNUAL FUEL NEEDS OF PRESENT TIME IN SOME ASIA PACIFIC COUNTRIES IN MMT (APPROX)

Country	Fuel		
	Oil	Coal	Remark
India	200	60	To increase
Indonesia	80	45	To increase
Thailand	50	23	To increase
Malaysia	30	20	To increase
Philipines	15	12	To increase

B. Biofuels and Production/Blending

The Biofuels are not very difficult to produce but it is necessary to be ready to produce as presently no direct benefit is associated with it.

Bioethanol has taken precedence as Prime Biofuel after lot of controversy erupted on international food shortages and spiraling food prices.

In spite of all the controversy Shrouding Biofuels, there has been understanding that we need to continually look at alternate sources of fuels and feedstock's which are non food and this has seen visible interest for Sugarcane based Bioethanol to wheat, Maize and other food crops.

Also Biodiesel too has Feedstock problems as Palm oil, Rapeseed, Soya are also edible and Non food Crops like Jatropha, Karanjia have not seen visible success and are also viewed as invasive species by certain nations.

Compulsion from Authority may make such blending attractive and encourage production of it to comply with targets set. As the downward trend of fuel rates in temporary phase, it should not encourage excessive use of fuel but instead of that, rate fluctuations should encourage blending.

Following section discusses production of biofuels, especially biodiesel and blending.

II. Discussion

A. Bioethanol

Biologically produced alcohols (most commonly ethanol) are produced by the action of microorganisms and enzymes through the fermentation of sugars or starches (which is the easiest), or cellulose (which is more difficult). Biobutanol (also called biogasoline) is often claimed to provide a direct replacement for gasoline, because it can be used directly in a gasoline engines [3].

Ethanol fuel is the most common biofuel worldwide, particularly in Brazil. Alcohol fuels are produced by fermentation of sugars derived from wheat, corn, sugar beets, sugar cane, molasses and any sugar or starch from which alcoholic beverages such as whiskey, can be made (such as potato and fruit waste, etc.). The ethanol production methods used are enzyme digestion (to release sugars from stored starches), fermentation of the sugars, distillation and drying. The distillation process requires significant energy input for heat (sometimes unsustainable natural gas fossil fuel, but cellulosic biomass such as bagasse, the waste left after sugar cane is pressed to extract its juice, is the most common fuel in Brazil, while pellets, wood chips and also waste heat are more common in Europe Waste steam fuels ethanol factory- where waste heat from the factories also is used in the district heating grid.

Ethanol can be used in petrol engines as a replacement for gasoline; it can be mixed with gasoline to any percentage. Most existing car petrol engines can run on blends of up to 15% bioethanol with petroleum/gasoline. Ethanol has a smaller energy density than that of gasoline; this means it takes more fuel (volume and mass) to produce the same amount of work. An advantage of ethanol(CH_3CH_2OH) is that it has a higher octane rating than ethanol-free gasoline available at roadside gas stations, which allows an increase of an engine's compression ratio for increased thermal efficiency. In high-altitude (thin air) locations, some states mandate a mix of gasoline and ethanol as a winteroxidizer to reduce atmospheric pollution emissions.

Examining the bioethanol production process and its energy and environmental aspects. So many techniques are used in the industrial ethanol production process. However, the biggest concern of the process is its cost. A lot of researchers are working on bioethanol to improve its productive efficiency. Also, some of new technologies are very effective, but for industrial use, the balance between the cost and the effectiveness is very important. On the other hand, the energy balance bioethanol is another big issue. The energy balance of bioethanol is not still very clear because of the differences among the each calculation method. However, it is true that the energy balance is improving according with time. Unfortunately, not all aspects of bioethanol are positive. There are so many environmental concerns. Thus, to say bioethnaol is a real ideal energy source, we have to solve various problems.

Bioethanol is a Major source of Energy (Fuel Oxygenate) and also other advantages that accrue with Ethanol Distillation.

The two major fuels for source of Fuel energy are diesel and petrol.

Bioethanol when blended with Petrol acts as oxygenate to burn Hydrocarbons completely reducing emissions, particulates and noxious gases.

Feedstock availability and Scale is critical for successful blending, Sugarcane has proven to be the most successful feedstock.

With little controversy of Food Diversion to Fuel and Sugarcane Distillation moving towards second generation, Technological advancements, Carbon, Energy and Water foot print models being worked out we foresee Optimization deriving Enhanced Yields.

Most of SAARC/ ASEAN nations have successfully cultivated Sugarcane for Centuries and have known all aspects and Implications of this Crop on Soil, water, Air and Animal Husbandry unlike other Crops.

Recent New Developments in Agronomy, Harvesting, Crushing whole Cane, Improved Distillation Practices using better Enzymes, catalysts have been Improving Capacities of Ethanol Production. All countries have learnt lesson from Brazil model failure.

Governmental Support & Incentives are very much essential to Mandate and successfully implement Blending Targets. As such targets at present are country specific and not uniform worldwide.

B. Biodiesel

Search for alternative Fuel drew immense attention since start of new century due to inevitable depletion of fossil fuels. Limited availability of fossil fuels; public health and Environmental issues (greenhouse gases, Ozone layer depletion, global warming etc.) promoted interests in biodiesel as an alternative renewable, non toxic and eco-friendly source of biofuel. Biodiesel is a mixture of fatty acid methyl esters (FAME) and produced from renewable resources. Biodiesel can be easily produced by transesterification of oils-Crude, refined or waste. Transesterfication can be carried out by chemical or enzymetic methods. Oil feedstock may be plant derived(vegetable oils) or animal derived or from waste. Edible oil are not used as it may increase food prices and increased use of fertilizers for increased production of vegetable oil may ultimately lead to increase in greenhouse gases [4]. Biodiesel can be used alone or by blending with petrodiesel without modifying the engine. A general equation of transesterification can be presented as Fig. 1 elow:

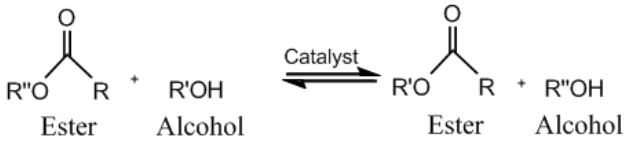

Figure 1. Transesterification reaction

where group R is a fatty acid, R' is the length of the acyl acceptor and R" is the rest of the triglycerides molecule.

Methanol is the most popular alcohol used in the trans-esterification process due to its relatively cheaper price compared to other alcohols. When methanol is used in the process, the reaction is known as methanolysis as shown in Fig. 2 below:

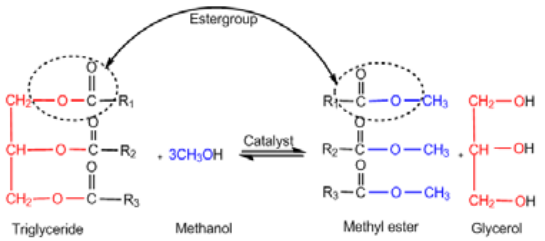

Figure 2. Methanolysis reaction

A figure depicting typical methanolysis reaction of sunflower oil is shown in Fig. 3.

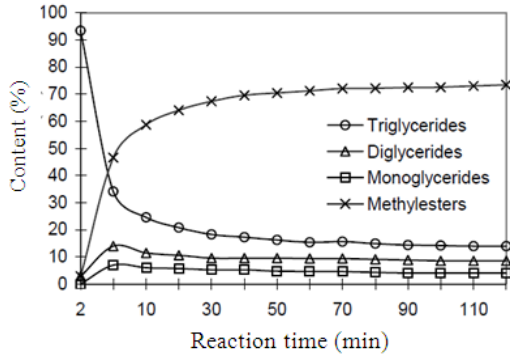

Figure 3. Methanolysis reaction of sunflower oil.

Thus content of Methyl ester increases with time. Transesterification generally proceed by simple mixing of the reactants. Usually the process is accelerated by application of catalysts. Catalysts used are alkaline, acids or enzymes. The catalyst used affects directly the purity of feedstock required, rate of reaction and post reaction processing required.

C. Production by Industry

Biodiesel Industry is suffering for existence due downward trend in crude prices. Falling prices remove margin related interest for production worldwide and in turn making everyone forget of the exhaustion deadline of petroleum source.

There are very few plants operating regularly as most are fighting for existance [5].

D. Production by Kits

In countries like US, biodiesel kits are also available to produce it in the backyard of the house [6].

Using such kits one can make biodiesel for personal vehicles and use.

E. Blending

Blending of biodiesel upto 15% do not require any modification in diesel engine. It is proposed that blending should be started with 5% and gradually increased to 15%.

F. Supply and Sales

Biodiesel industry should supply to oil companies to blend it in petrodiesel and all fuel stations should sell only biodiesel blended petrodiesel.

G. Requirement of Authority Support

It should be made mandatory by all Governments to sell(by fuel stations) and use(in all diesel powered vehicles) Biodiesel blended petrodiesel.

H. Petrol Blends

Blends of petrol with etanol are slowly becoming popular thereby decresing petrol use to certain extent and needs to be encouraged further.

I. Future Trends

Use of no/low cost waste materials as feedstocks for production of biodiesel will have double environmental benefits by reducing the environmental pollution potential of the wastes and producing an environmentally friendly fuel. As such targets at present are country specific and not uniform in the Global Village combating climate change.

J. Biogas

Use of Biogas is highly encouraged and followed. However it is not covered in present discussion as not directly related to transportation.

III. Summary

It is summarised that

Non renewable sources of energy in general and fuel in particular are fast becoming obsolete.

It is required to replace these sources with renewable sources.

Renewable fuel sources like bio based ethanol and biodiesel can be produced as per available technology. Planning to shift to renewable sources is country specific and lacks uniformity.

As immediate replacement of non renewable sources are not possible, it can be replaced gradually by initiating blending in petro counterparts.

Blending may be increased up to 20% in next 10 years to save finite non renewable sources of energy till full replacement become practicable

Blending of bioethanol to petrol and biodiesel to petrodiesel should be coordinated at uniform level worldwide to avail maximum advantage in global village combating on many fronts like climate change, depleting resources, ozon layer depletion etc for comfort by environmental management.

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