RESEARCH PAPER | Engineering | Volume : 4 | Issue : 5 | May 2014 | ISSN - 2249-555X

Sustainable Bio Fuel For Aircraft

KEYWORDS: Bio-fuel, CO_2 mission, Sustainable aviation fuel, Greenhouse gases

Manoj Kumar Mandal.B	Srishti Bansal	Ch. TrigunaSaideep
Department of Aerospace Engineering, SRM University, Chennai- 600 043, INDIA	Department of Aerospace Engineering, SRM University, Chennai- 600 043, INDIA	Department of Mechanical Engineering, SRM University, Chennai- 603 203, INDIA

Ashok Marshall	Chandran. G	Karthikeyan D P
Department of Mechanical Engineering, Vels University, Chennai- 600 043, INDIA	Department of Mechanical Engineering, Jnn Engineering College, Chennai- 601 102, INDIA	School of Mechanical Engineering, RMK Engineering College, Chennai -601 206, INDIA

ABSTRACT *Bio-fuels are the chemical compounds that occur naturally in plants. Our objective is to come up with most suitable bio-fuel for aviation industry which has the least CO_2 emancipation to the surrounding and can give better performance. The aviation industry is active in the bio-jet fuel development and environmental progress must be joined by economic and social development to be truly sustainable. It is possible to fly a commercial aircraft on a "drop in" fuel, containing a high proportion of sustainably-sourced biofuel. In order to be accepted for the commercial use, Sustainable Aviation Fuel should have less lifecycle carbon discharge compared to the other traditional fossil based jet fuel, also should be 'drop-in' alternative to traditional fossil based jet fuel to avoid costly redesign of fuel delivery systems, engines or airframes. In terms of energy poises, discharges and air quality, the substantiation endorses wide dissimilarity in greenhouse gas hoards from biofuel use depending on feedstock, cultivation methods, adaptation technologies, and energy efficiency assumptions. The fuel supply to the commercial aviation industry is on a relatively small and less complex the other forms of transport. For this reason, it is expected that it will be easier to fully contrivance the use of sustainable biofuels in aviation than in other transport systems.*

INTRODUCTION

By the early-to-mid 19th century, fossil fuels have been accounts of crude oil and natural gas seeping to the Earth's surface. Refining process was not developed in the earlier 1850's, oil was not used commonly as fuel because of its coarse-smelling fumes but in current epoch, there is a scarceness of fossils fuels and thus the aviation industry is under mounting pressure to adopt the ecologically attuned systems. The predicaments in the fuel cot have been upsetting for the world's economy and have dramatically exposed the vulnerability of the aviation industry to fuel costs and availability. Renewable fuels are promptly becoming viable and cost competitive.

What are bio fuels? Biofuels are fuels produced from biomass, generally of agricultural origin Bioethanol, Biodiesel and Biogas. The stock of the bio fuel comes from crops like sugarcane, grains, seeds, grass etc., few trees , hardwood or softwood) like Jatropha, marine biomass like micro algae and macro algae and waste from domiciliary industry and agronomy. Raw material for bio fuel production also afford a latent new outlet for famers, who have been enlightened to become true magnate. Bioethanol are used as neat ethanol (95% ethanol and 5% water), E85 (85% volume ethanol with petrol) in bend-fuel vehicles and blend smaller than 5% volume (E5) in ordinary petrol.

Instruments for supporting biofuels are biofuel blending-compulsions, obliterate duty exemptions, tariff protection, subsidies, R&D and speculation supports and fuel standards. Production of biofuels for domestic use and export is dominated by a few countries. Bioethanol, making of which began in the 1970s, is still produced in much grander volumes than biodiesel for which production started in the early 1990s. The USA and Brazil are the largest manufacturers of bioethanol by a hefty margin. The European Union yields almost 93.2% of the world's biodiesel. Global manufacture has enflamed gradually over time. The major growths in construction bulks are anticipated in Brazil, the US, the European Union, China, Indonesia, India, and Malaysia with annual comprehensive production of bioethanol projected to upsurge to 120 billion litres by 2020, and that of biodiesel to 12 billion litres. By 2011 around 20% of Brazilian bioethanol manufacture will be disseminated, mainly to India and the USA. The most noteworthy increases in biodiesel trade, from a bounteous minor base, will possibly be distributed from Malaysia and Indonesia to the European Union, which aims to reach a 10% amalgamation of biofuels in transport fuel by 2020.

LITERATURE SURVEY

There have been many efficacious demonstration and commercial flights using fuels blended from a mixture of sustainable and fossil sources, demonstrating that these technologies can work and the opportunity is real and present. The aviation industry has seen huge growth since its beginning. Today, more than two billion people enjoy the social and economic benefits of flight each year. The industry worldwide provides jobs to some 32 million people and has a global economic assistance of around 7.5% of world gross domestic product. The ability to fly conveniently and efficiently between nations has been a reagent for the global economy and has shrivelled cultural cordons like no other transport sector. But this evolution comes at a cost. While at this stage sustainable fuels are produced at low volumes and high cost, in the coming years, with the right subsidiary environment, the cost could match and then compete with conventional kerosene prices, particularly since the long term trend is for rising kerosene prices. With the inclusion of aviation in the European Union Discharges Trading Scheme, the relevant cost hurdle for aviation sustainable fuels to overcome is the market price of jet kerosene plus the cost of buying carbon or CO_2 allowances, to offset the discharges resulting from burning that fuel. The aviation industry has acknowledged the development of biofuels as one of the major ways it can

Volume : 4 | Issue : 5 | May 2014 | ISSN - 2249-555X

condense its greenhouse gas discharges. Biofuels provide aviation with the capability to partially, and perhaps one day fully, replace carbon-intensive petrol European Union fuels. They will, over time, enable the industry to reduce its carbon footprint provocatively.

Azul Brazilian airlines conducted demonstration flight with Amyris bio jet fuel. Azul Brazilian airlines in partnership with Amyris Inc., Embraer and GE made a demonstration flight June 19, 2012 using a pioneering, renewable jet fuel produced from Brazilian sugarcane. The Embraer E195 jet operated by Azul departed from Campinas viracopos airport, flew over Rio de Janeiro, which accommodated UN conference for sustainable development and landed at Rios's Santos Dumont airport.

Lufthansa fuels international flight with neste oil bio jet fuel. The use of bio based aviation fuel took another step forward mid-January, when neste oil's NExBLT was used for the first time to power an international saleable Lufthansa flight, the plane travelled on a repeatedly programmed service from Frankfurt to Washington D.C. according to Lufthansa, the Boeing 747-400 carried about 40 metric tons of a biosynthetic fuel mix.

METHEODOLOGY

The 100% pure biofuel baptized as bio-jet fuel is extracted from algae and soybean. There are industrial methods to extract bio crude oil from algae. This fruition is based on a growth in aviation CO_2 discharges of 2-3% per year, with an annual traffic growth of 5%. The air transport industry is now functioning towards carbon European union growth, no increase in carbon discharges in spite of traffic growth, as a first step towards a carbon-free future The steps involved in this process includes increasing algae growth by providing suitable conditions in water, harvesting algae, extracting crude oil from it and then it is refined in refineries and at last the obtained bio-jet fuel from refineries, endures certain quality test and finally it is used for trails. The bio-jet fuel thus obtained by this method will fulfil certain requirements. Energy density, storage stability, freezing point, high temperature thermal stability, elastomeric compatibility, must be

'drop in' solution and low CO_2 footprints. Relative to fossil fuels, sustainably produced biofuels result in a reduction in CO_2 discharges across their lifecycle. Carbon dioxide captivated by plants during the growth of the biomass is roughly equivalent to the amount of carbon produced when the fuel is burned in a combustion engine, which is simply returning the CO_2 to the atmosphere.

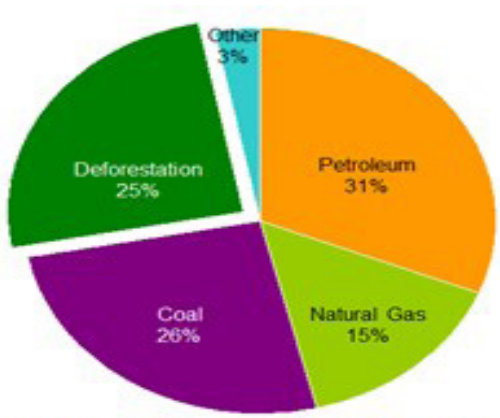
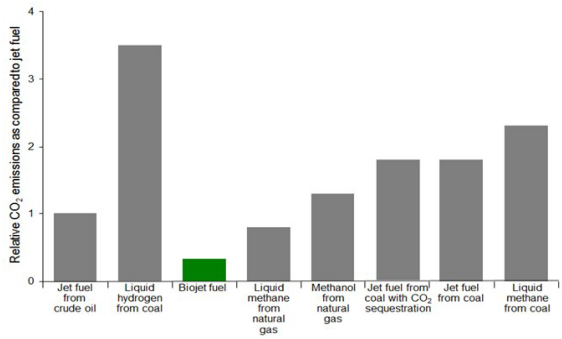


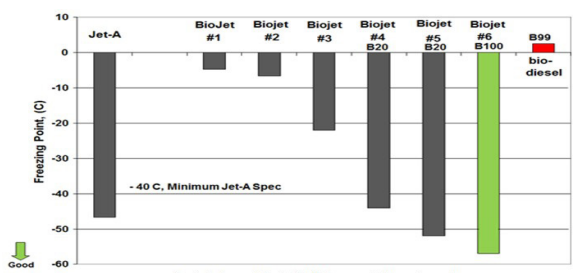
Fig 1. CO_2 emissions life-cycle

The supply of fuel to the commercial aviation industry is on a reasonably small scale and less intricate than for other forms of transport. Among all the requirements of a sustainable fuel, the most important one is its impact on the surrounding environment. Thus, the discharges of detrimental gases and the residual left should be taken in account of studies. In the current scenario, all the organisations of world are concentrating on the gases with leads to the destruction of Ozone layer and CO_2 is one of the supreme important cause. When the CO_2 discharges of bio-jet fuel is compared with other liquid fuel like liquid hydrogen, liquid methane and liquid jet fuel, the bio-jet is found to be most feasible.



Graph 1. Fuels that have low life-cycle CO_2discharge

Several bio-jet fuels are taken in consideration on the basis of their carbon content release into the surrounding, one is to be chosen on the basis of other necessities of sustainable fuel, therefore the freezing point of several bio-jet fuel is paralleled and establish out that B100 bio-jet fuel has the superlative subzero temperature of -57 ^{0}C.



Graph 2. Several Bio jet fuel's freeze point requirements

RESULT

Biofuels should be integrated within a broader context of investment in rural infrastructure and human capital formation. Biofuel sustainability criteria defined by the industry are challenging, but needed. Lowincome countries ought to assess whether the underlying conditions for a successful biofuel programme exist or could be established in the near-term, including infrastructure and essential public services. Being able to understand and accomplish sustainability risks and prospects is indispensable to the accomplishment of organisations in the aviation industry. Still a great degree of ambiguity over its production costs as aviation biofuels are not currently being produced on a commercial scale. The biofuel found is B100 bio-jet fuel it is compared with the jet-A as well as biodiesel fuel and it is found to be better because it fulfils all the requirements of a fuel in trails conducted. The 100% bio-jet can be obtained from soybean and algae stocks.

CONCLUSION

"Drop-in" supernumerary fuels presently work best for commercial aviation. Replacements prerequisite to be environmentally eye-catching and defensible. Algae and soybean feedstock looks very promising. Governments and industry need to work together. The improvement of biofuels has potentially imperative roles to play in poverty lessening, through employment effects, extensive growth multipliers and energy price effects. There are risks that some of this potential may be lost as economies of large scale operation kick in, especially with bioethanol, and as pressure is increased on land access in approximately settings. Global environmental inducements to small scale producers remain slight. The distributional effects of bio-

Volume : 4 | Issue : 5 | May 2014 | ISSN - 2249-555X

fuel development are crucial between producers and consumers and also between food/feed/energy deficit and surplus countries.

REFERENCE

1. Bakker, S. J. A. (2006) 'CDM and biofuels: Can the CDM assist biofuel production and deployment. Energy Research Centre of the Netherlands (ECN), the Netherlands | 2. Monbiot, G. (2004) 'Feeding Cars not People' The Guardian 22 November 2004 | 3. CD4CDM (2007) 'CDM Pipeline Overview', March 2007 | 4. FAO (2000) "The Energy and Agriculture Nexus", Environment and Natural Resource Working Paper 4 | 5. Kojima, M. and Johnson, T. Potential of biofuels for Transport in Developing Countries', World Bank Energy Sector Management Assistance Program (ESMAP), Washington, DC, 2005 | 6. Koonin, S. (2006) 'Getting Serious About Biofuels' Science 311, 27 January | 7. RFA (2007) 'Building New Horizons' Ethanol Industry Outlook, 2007 | 8. UN-Energy, Sustainable Bioenergy: A Framework for Decision Makers, United Nations, 2007 |