

Fuels and Biofuels

Vijayalakshmi, Meena Devi & Nagendra Prasad



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Agrobios (India)

Published by:

AGROBIOS (INDIA)

Behind Nasrani Cinema

Chopasani Road, Jodhpur 342003

Phone: +91-291-2643993, Fax: 642319

E. Mail: agrobios@sify.com, www.agrobiosindia.com



AGROBIOS (INDIA)

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ISBN (10) : 81-7754-315-6

ISBN (13) : 978-81-7754-315-5

Price: Rs. 695.00 / US\$ 35.00

Published by: Dr. Updesh Purohit for Agrobios (India)

Lasertypeset at: Shriya Computers and Printers

Cover Design by: Reena

Printed at: Bharat Printers (Press), (India)

PREFACE

Energy plays an important role in the development of the country by its continuous supply of energy for its industrial, transport and its related activities. The main sources of energy in our country are mineral and fossil fuels. About 85% of the sources are consumed by the industry, transport and residential sectors. But the major problem with these sources are that they are not only non renewable but also cannot be recycled or reused because they are easily destroyed during combustion.

India relies heavily on coal for meeting more than half of its total energy requirement. In terms of coal production India ranks 3rd with nearly 243 billion tonnes, the country accounts for 10% of the world's coal reserves. Coal consumption is projected to increase at an annual rate of 2.21% over the next two decades in India. The demand of coal is found to increase but the source is not sufficient to meet the demand. So the government planned to import gas to reduce the dependence on coal.

The single largest source of energy in India after coal is petroleum. India imports about 2/3 of its petroleum requirements and 70% of its oil requirements per year. In 1994, United Nations estimated that the available petroleum resources in the world would be enough only for the next 75 years. The energy demand in India would increase 1.64 times between 1990 and 2010 to reach 5.75 million barrel of oil equivalent per year. Now the world consumes 73 million barrel of oil each day (73 Mb/d) and one billion barrel of oil per 12 days (1 Bb/12d).

The price for the petroleum products is keeps on increasing. With this exponential rise in the petroleum prices and increase in the

demand for the petroleum and their products around the world it appears that the price of crude oil would remain high for a long time. Uncertain supplies and fluctuation in the prices for fossil fuel in international market necessitates switching over to a renewable, safe and environmentally safe fuel.

India has a larger population of diesel vehicles. In recent time, the combustion of the fossil fuels has been recognized as a major cause of air pollution in Indian cities. Although CNG and LPG are being promoted as cleaner alternatives but these fuels are in short supply. So there is an urgent need to resort to cleaner alternatives which could reduce the dependency on imports. Use of renewable energy sources like solar, wind, geothermal, tidal and biomass energy can be pollution free and viable alternative to fossil fuels. This can also reduce the dependence on crude oil and the import bill can be slashed, but the high cost in the production precludes their large scale commercial use. Among the various alternatives, the biomass energy mainly the biofuels in particular the biodiesel satisfies the feature of oil at affordable price, with non stop supply and can save the environment.

Biodiesel is the ethyl or methyl ester of long chain fatty acid made from virgin or used vegetable oil (both edible and non edible oil) and animal fats. Just like petroleum diesel fuel biodiesel operates in compression ignition engine and it can be mixed with any proportion. Blends up to 20% is normally called as B20 (20% biodiesel with 80% petroleum diesel fuel) can be used in all diesel equipment and are compatible with most storage and distribution equipment. It is not only environment friendly but renewable too and requires no engine modification and increase engine life. It is biodegradable, non toxic, easy to handle and store.

Biodiesel production is not something new because the concept of using vegetable oil as fuel dates back to 1895 when Rudolf Diesel developed the first diesel engine it run on vegetable oil namely with the ground nut oil. Then later it is slowly converted to use fossil fuel because of its availability. But the demand and price found to increase exponentially and also it's not safe to the environment. After 8 decades the awareness about environment

among people made to search for an alternative fuel that could go with less pollution.

Today biodiesel is being used in some European countries, where fossil fuel is mixed with vegetable oil and is used for transportation purpose. In France and Germany, the leading countries in biodiesel production, 50% of biodiesel is mixed with diesel to run different vehicles. In 1980, the British Institute of Standards, Kolkata ran the diesel engine using non edible oils. Indian Scientists has identified a list of more than 100 plants suitable for biodiesel production. It is important to note that most of the experiments conducted on biodiesel are mainly obtained from the edible refined oils and the price is high when compared to that of diesel. This increase the over all production cost of biodiesel and also cannot be produced commercially. Hence it is better to use non-edible type of oils for biodiesel production. In India, the non-edible oil yielding trees are available in large number. These kinds of oil yielding trees could be screened and planted for to obtain a good yield of raw material for the biodiesel production. At present the biodiesel production and utilization are found to be low. India has an excellent potential for the production of biodiesel by utilizing various bio-resources. Also large degradable lands are available where non-edible oil seeds could be grown for the biodiesel production.

In this book, the energy, sources of energy were discussed. Our country has been spending more and more in importing petroleum products and it is identified that our country has the potential to produce over 300 million of biomass energy from various sources, which could be substituted for the petroleum products. Also the high price of petroleum products, government incentives to reduce the dependence on imported oils and growing efforts to drastic climatic change have created a perfect storm for bio-based products driving demand for alternative feedstock for biofuels. The next challenge facing by the biorefinery industry is producing, harvesting and delivering abundant feedstock in an economically and environmentally suitable fashion. All these depend on the biomass on the earth and the process by which the final product is obtained.

In this book, the biomass energy, the biofuels namely the biodiesel is discussed more because of its advantage and it's emerging as an alternative for the petroleum diesel fuel. The list of vegetable oil and oils used for biodiesel production are also discussed. The list of oils given could be screened for the potential use of biodiesel. Pure biodiesel or B100 could be obtained through trasesterification process and the by product glycerol are discussed.

Biodiesel could be standardized by the ASTM standards and is discussed with the fuel property, characterization, fuel policy, biodiesel and environment, National and International scenarios. Finally some frequently Asked Questions on biofuels are given.

Authors

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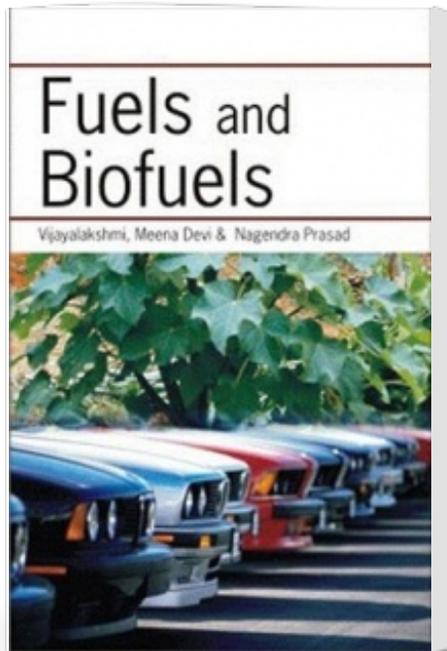
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Publisher : Agrobios
Publications

ISBN : 9788177543155

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Type the URL : <http://www.kopykitab.com/product/7053>



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