DESIGN AND ANALYSIS OF MICROCONTROLLER BASED CHARACTERIZATION FOR BIO-DIESEL FROM JATROPHA AND PONGAMIA OIL

A Research Project Carried-out under the sponsorship of

KSCST

KSCST - 35TH SERIES OF STUDENT PROJECTS PROGRAMME

Submitted to KSCST for final Project Presentation program

KARNATAKA STATE COUNCIL FOR SCIENCE & TECHNOLOGY (KSCST)

INDIAN INSTITUTE OF SCIENCE, BENGALURU- 560012.

A collaborative interdisciplinary Project executed by

ELECTRONICS & COMMUNICATION ENGINEERING

And

BIOTECHNOLOGY & ENGINEERING

Project Team

Bharathi P	**1SV08EC014**
Priyanka C	**1SV08EC039**
Shubhashree J	**1SV08BT033**
Kavya C	**1SV08BT016**
Bavitha N	**1SV08BT007**

Guide

MR. B.Y.MALLESH

Sr. Lecturer, Dept. of Electronics & Communication Engineering

Co-Guide

DR.G.PANDURANGA MURTHY

Scientist & Head, R&D-Biotechnology

SHRIDEVI

CENTRE FOR SHRIDEVI RESEARCH FOUNDATION

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Affiliated to VTU, Belgaum, Karnataka and An ISO Certified institution)

SIRA ROAD, TUMKUR-572106.

ABSTRACT

'Bio-diesel' has become more attractive recently because of its environmental benefits and the fact that it is made from renewable resources. The cost of biodiesel, however, is the main hurdle to commercialization of the product. In the present study, the non-edible crude oils from ***Jatropha oil*** and ***Pongamia oil*** were used as raw material and by adapting continuous transesterification process towards recovery of good quality of bio-diesel at optimum level and value addition like, Oil cake and glycerol (as by-products) are primary options to be considered to lower the cost of bio-diesel. A suitable technique was developed to produce bio-diesel from crude ***Jatropha oil*** and ***Pongamia oil*** having high free fatty acids. The first step was carried out with Methanol to Oil ratio in the presence of NaOH as catalyst in 60min reaction at 60°C. After the reaction, the mixture was allowed to settle for 2 h and the Methanol water mixture separated at the top layer was removed to produce biodiesel at 65°C. The final yield for methyl-esters of fatty acids was achieved at 90% in 2 h. the optimum production of Bio-diesel from Jatropha (72%) and Pongamia (88%) was achieved. The chemical properties of both ***Jatropha*** and ***Pongamia*** bio-diesel such as, *Viscosity, Specific gravity, Solidifying Point, Cetane value, Flash Point, Carbon Residue, Distillation, Sulphur, Saponification Value, Iodine Value* and *Refractive Index* were analyzed. Similar characterization was also carried out for the commercial diesel for obtaining the base line data for comparative analysis. The values obtained from both *Jatropha* and *Pongamia* biodiesel is closely matched with the values of conventional diesel and can be used even as mixed ratio (80:20 and 60:40) in the existing diesel Engine without any modification.

Further, the most efficient analysis has been done to measure all the necessary elements/parameters in bio-diesel samples simultaneously, using Sensor based Microcontroller System **(SBMS)** and connection oriented communication. The use of low cost sensor networks for optical frequency synthesis using I R sensor interfaced to a Microcontroller unit found effective in determining the physical parameters of bio-fuel. In the study, a novel approach was proposed to discover a sensor network and optical frequency synthesis for the effective spectrum analysis to determine the fuel characterization. We support our claims through analysis and a prototype of a sensor network. An Electronic system (Hardware) with Microcontroller device which can perform analysis of Bio-fuel characteristics by sensing optical properties of bio-diesel at specific temperature can be used to evaluate the performance during production of bio-diesel by measuring the characteristics. In conclusion, the IR sensor network based microcontroller system was found to be significant with respect to characterization of Bio-diesel parameters namely; *Viscosity, Specific gravity, Solidifying Point, Distillation, Flash Point, Fire point, Carbon Residue and Refractive Index* at different temperatures. Further, availability of specific sensors compatible to interface to the microcontroller system needs to be proposed for evaluation of remaining parameters such as *acid value, saponification value, iodine value, sulphur and cetane values.*