Karnataka State Council for Science and Technology

Indian Institute of Science Campus, Bengaluru - 560 012

Telephone: 080-2334 1652, 2334 8848, 2334 8849 ♦ **Telefax** 080-2334 8840

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Dr. S. G. Sreekanteswara Swamy
Executive Secretary

31st March, 2017

Ref: 7.1.03/SPP/1112

The Principal
Sapthagiri College of Engineering,
14/5, Chickasandra,
Hesaraghatta Main Road,
Bengaluru - 560 057

Dear Sir,

Sub : Sanction of Student Project (Biofuel) - 40th Series : Year 2016-2017
Your Project Proposal Reference No. : 40S_B_BE_049
Ref : Your Project Proposal entitled " **PERFORMANCE AND EMISSION ANALYSIS OF THE SINGLE CYLINDER SI ENGINE VARYING ETHANOL BLENDS WITH PETROL**

I am happy to inform that your project proposal referred above, has been approved by the Secretary, KSCST for 'Student Project Programme (Biofuel) 40th Series" and has been sanctioned with a budgetary break-up as detailed below:

Students	Mr. Hari S.V.	**Budget**	**Amount (Rs)**
	and others	Materials/Consumables	8,000.00
Guide/s	Mr. Raghuthama Rao P.	Labor	1,000.00
		Travel	-
		Analysis	-
Department	Mechanical Engineering	Miscellaneous	500.00
		Report	500.00
		TOTAL	10,000.00
	Rupees Ten Thousand		

The following are the guidelines to carryout the project work :

a) The project should be carried out based on the objectives of the proposal sent by you.

b) The project should be completed in all respects and **a) One copy** of the hardbound report **b)** Softcopy of the full report (including coverpages, abstract & preliminary pages in a CD (.doc and .pdf format)

c) The project report shall mention the name of **"Karnataka State Bioenergy Development Board and Karnataka State Council for Science and Technology"** as sponsored organisations in the title page. Project Title or the Objectives can be altered only with prior permission of KSCST. Any change in the project are strictly prohibited and liable for rejection and the amount sanctioned has to be returned back to KSCST.The fund is to be utilised only for the activities to which it has been released.

d) Please quote your **project sanction reference number printed above** in all your future correspondences

e) **Important:** After completing the project, 2 to 3 page write-up (synopsis) needs to be sent by e-mail [biofuelcell.kscst@gmail.com] and should include following points:

1) Title of the project
2) Name of the College & Department
3) Name of the students & Guide(s)
4) Keywords

Principal
Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main Road
Bengaluru - 560 057

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI, KARNATAKA, INDIA

A PROJECT REPORT

ON

PERFORMANCE AND EMISSION ANALYSIS OF THE SINGLE CYLINDER SI ENGINE VARYING ETHANOL BLENDS WITH PETROL

Submitted in partial fulfillment for the award of the degree

BACHELOR OF ENGINEERING

IN

MECHANICAL ENGINEERING

Submitted by

1. S V HARI [1SG13ME098]
2. PRASANTH R [1SG13ME084]
3. MOHAN P [1SG13ME064]
4. VINOD RAJ P [1SG13ME122]

Under the Guidance of

Mr.P.RAGHUTHAMA RAO

Associate Professor,

SAPTHAGIRI

College of Engineering

Principal
Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main Road
Bengaluru - 560 057

DEPARTMENT OF MECHANICAL ENGINEERING

SAPTHAGIRI COLLEGE OF ENGINEERING

BENGALURU-560057

2016-2017

ABSTRACT

The performance & the pollution levels of the engine are studied. An already refurbished IC (petrol) engine & used ethanol blended fuels was checked for any damages/effects in the engine parts, & minor repairs were done and used for further tests. In this study the effects of petrol-ethanol blends such as Petrol, E20, E30, E40, and E50 and two different Compression ratios 11.03:1 and 11.19:1 on single cylinder four stroke air cooled Bajaj Pulsar 150 DTSi engine have been experimentally investigated. The experimental results showed that with the increase of ethanol blending leads to slightly decrease in the Engine power output and significantly increase the Specific fuel consumption (SFC). CO and HC emission decreases dramatically, CO2 and O2 emissions decrease significantly. When the engine was operating with E20 fuel at higher compression ratio (11.19:1), and Specific fuel consumption (SFC) increases with compared to lower compression ratio (11.03:1). Engine performance and CO_2, CO, HC, O_2 emissions for petrol and ethanol blended petrol with higher compression ratio (11.19:1) were increased significantly compared to lower compression ratio (11.03:1). But Exhaust emissions of E30 fuel with compression ratio 11.19:1 is very lower than E0 fuel with compression ratio 11.03:1. It was also observed that the increase of ethanol blending allows the engine to operate at higher compression ratio without knock occurrence. The engine performance and pollutant emission of the DTSi engine using petrol–ethanol blends (E0, E20, E30, E40, and E50)were investigated experimentally in Energy Conversion Lab.

CHAPTER – 1

INTRODUCTION

1.1 Preamble

A challenge that humanity must take seriously is to limit and decrease the greenhouse effect caused by various human activities. A major contributor to the greenhouse effect is the transport sector* due to the heavy, and increasing, traffic levels. In spite of ongoing activity to promote efficiency, the sector is still generating significant increases in CO2 emissions. As transport levels are expected to rise substantially, especially in developing countries, fairly drastic political decisions may have to be taken to address this problem in the future. Furthermore, the dwindling supply of petroleum fuels will sooner or later become a limiting factor. An important step in efforts to solve the problem is to replace fossil source of energy with bio-energy. In the transport sector this means either introducing bio fuels and using adapted vehicles, or blending bio fuels with petroleum-based fuels for use with present vehicle fleets. The two alternatives are not, of course, mutually exclusive.

However, blending bio fuels with petroleum-based fuels for use by the present conventional vehicle fleets has the advantages that even using quite low blending concentrations will result in substantial total volumes of gasoline being substituted by bio fuels, and that the present infrastructure for distributing fuels can be used. Today, the transport sector is a major contributor to net emissions of greenhouse gases, of which carbon dioxide is particularly important. In Sweden this sector accounts for roughly 20 % of total energy consumption, and almost 50 % of the total emissions of carbon dioxide. The carbon dioxide emissions originate mainly from the use of fossil fuels, mostly gasoline and diesel oil in road transportation systems, although some originates from other types of fossil fuels such as natural gas and Liquefied Petroleum Gas (LPG). If international and national goals (such as those set out in the Kyoto protocol) for reducing net emissions of carbon dioxide are to be met, the use of fossil fuels in the transport sector has to be substantially reduced. This can be done, to some extent, by increasing the energy efficiency of engines and vehicles and thus reducing fuel consumption on a volume per unit distance travelled basis.

Since, the total transportation work load is steadily increasing such measures will not be sufficient if we really want to reduce the emissions of carbon dioxide. In order to reduce

absolute amounts of these emissions we have to go further and an additional measure that will be required is to replace fossil vehicle fuels with renewable ones. Primarily, especially in the short term, this means bio-based fuels. Probably the best candidate bio fuels to replace gasoline in the short term are alcohols. Alcohols can be blended with gasoline or used as neat fuel in both 3crganized spark ignition engines and compression ignition engines. In the medium term ethanol produced from grain will probably be the most important alternative fuel for replacing gasoline, and in the long term ethanol produced from cellulose might take over from grain ethanol. Today, ethanol accounts for a substantial part of the alternative fuel market, especially in Brazil, the USA and Sweden.

The advantages of ethanol are that it can:

- Provide a viable alternative to reduce the greenhouse effect.
- Be produced domestically, thereby reducing dependence on imported petroleum.
- Be easily mixed with gasoline.
- Be used (and already is on a wide scale) as an oxygenate in gasoline.
- Create new jobs in the country related to its production.

From an international perspective, most research up to 1990 was focused on blends of methanol and gasoline, but some studies were carried out on ethanol-gasoline blends. Since these studies were carried out in the USA, it can be assumed that they mainly included vehicles with efficient emission control systems, but at the same time technical features of cars in the USA have historically differed, at least in part, from those in Sweden. It should also be noted that for a long time 10% ethanol has been added to commercial gasoline in many parts of the USA. In the USA there is considerable experience of adding higher proportions of ethanol to gasoline than those allowed by gasoline regulations in Sweden (Europe).

The primary advantage of adding a bio based alcohol to gasoline is that it reduces net CO2 emissions but it also has other positive effects, such as increasing the octane value of the fuel and reducing the benzene content of the exhaust gases. The use of alcohol blended gasoline and neat fuel alcohols as substitutes for neat gasoline have become matters of interest in many countries. The International Energy Agency (IEA), established in 1974,

CHAPTER - 9

CONCLUSIONS AND FUTURE SCOPE

9.1 CONCLUSIONS

- The power generated by Ethanol blended Petrol is lower to maximum 17.28% and is expected due to lower colorific value of Ethanol compared to Petrol.
- SFC is higher for all blends to an extent of 51.51% maximum compared to Petrol which is also expected due to lower colorific value.
- With higher Compression Ratio the power generated as well as SFC showed improvement but is found always lower than pure Petrol. It is probably indicated that higher ethanol blends definitely need higher Compression Ratio to restore power levels to a great extent.
- This study clearly establishes the Ethanol blended Petrol reduces pollution levels in SI Engine exhaust gas emission for all blends tested.
- Optimum blend for both **C.R (11.03:1) & C.R (11.19:1)** is between **E20 - E30** with **76.86%** reduction in CO levels and least reduction in brake thermal efficiency.
- Blends up to **E30** can be used with minimum loss in brake thermal efficiency.
- Blends beyond **E20** have a significant reduction in CO emissions. However the loss in brake thermal efficiency is considerable.
- The CO_2 emissions decreases with increase in ethanol blend in petrol as shown in the data & graphs.
- The decrease in CO_2 emissions seen in our data is on par with the literatures of previously conducted researches.
- The oxygen levels slightly increases with the increase in percentage of ethanol blends. As the percentage of ethanol increases the air suction also increases which results in the better combustion. Due to which the oxygen level in exhaust increases.

SRI SRINIVASA EDUCATIONAL & CHARITABLE TRUST (R)

SAPTHAGIRI COLLEGE OF ENGINEERING

(Affiliated to Visveswaraya Technological University, Belgaum & Approved by AICTE - New Delhi)

KSCST PROJECTS

UTILIZATION CERTIFICATE

KSCST Student project program 40th series -2016-2017

Sl No	Title of the project	Amount
1	Isolation & identification of Micro labs for absorption and conversion of ammonia, nitrates and nitrogen using Aquaponics system	6,500/-
2	Forest Monitoring System based on GPRS and powered by iot	7,500/-
3	Performance and emission analysis of single cylinder si engine varying ethanol blends with petrol	10,000/-
4	Reduction of pollution levels in the atmosphere by the use of methanol blended petrol fuel in automobile IC engine and study of its effects on the performance of the engine	12,000/-

Certified that KSCST has provided partial financial support of **RS 36000/-** towards Biofuel and SPP student project program 40th series

Sum of **Rs36000/-** only has been utilize for the purpose Biofuel and SPP student project program for which it was sanction

Certified that I have satisfied myself that condition on which the grant in aid sanctioned has been duly/are be fulfilled and that I have excise the following check to see that the money was actually utilized for the purpose for which it was sanctioned.

Kinds of check exercised

1. Cash book
2. Vouchers

Principal
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Bengaluru - 560 057

Principal
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Bangalore - 560 057

Sl. No	Project proposal ref no	Title of the project	Dept./Guide	Amount Sanction by KSCST	Amount utilized by the college	Balance if any to be refunded to KSCST
1	40S_B_0183	Isolation & identification of Micro labs for absorption and conversion of ammonia, nitrates and nitrogen using Aquaponics system	BT/ Prof. Saranya D / Prof. Ananda H V/ Prof. Blessy Baby Mathew	6,500/-	6,500/-	0
2	40S_B_2312	Forest Monitoring System based on GPRS and powered by iot	EC/ Prof. Suma V Shetty	7,500/-	7,500/-	0
3	40S_B_049	Performance and emission analysis of single cylinder si engine varying ethanol blends with petrol	ME/ Prof. Raghuthama Rao	10, 000/-	10, 000/-	0
4	40S_B_064	Reduction of pollution levels in the atmosphere by the use of methanol blended petrol fuel in automobile IC engine and study of its effects on the performance of the engine	ME/ Prof. Raghuthama Rao	12,000	12,000	0

MAS & CO. CHARTERED ACCOS. VERIFIED BANGALORE 26/2/2020

Signature of the Principal with seal

Principal
Sapthagiri College of Engineering
Chikkasandra, Hesaraghatta Road
Bangalore- 560 057

Date:

Signature of Auditor with seal

Date:

Principal
Sapthagiri College of Engineering
Chikkasandra, Hesaraghatta Road
Bangalore- 560 057