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ENVIRONMENTAL IMPACT OF BIODIESEL DERIVED FROM ANIMAL FAT & ITS BLEND

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Abstract—*This research paper consist of attention to acquiring knowledge of preparation of different blends of biodiesel using catalyst methyl ester from unused animal fat, and in this we assess engine analysis and performance of respective blends. Need of preparation of biodiesel emerges due to energy crisis. Energy crisis has become very serious and significant problem all over the world and it is better understand by more and more energy users. Bio-diesel can be made from many vegetables like jatropha, soyabean, sunflower, Mexicana seeds and waste cooking oil but This vegetables oils are edible and useful for human being hence we will look for another feedstock .We derived biodiesel from waste chicken fat along with small percentage of low fat oil.*

***Index Terms*—Biodiesel, Waste chicken fat oil, Engine testing, Biodiesel production.**

1. INTRODUCTION

A .General Introduction-

In the 21st century world is facing day by day two major conflicts, one is fossil fuel depletion and another one is bio-degradability. Up to 2078 Diesel will be very limited available source or it will be diminished.

So it became necessary to find alternative source so the production of biodiesel In 19th century, it has main advantage that the physical and chemical properties similar to the pure diesel fuel. Main definition of biodiesel is mono alkyl ester of long fatty acid and the process for producing it is called trans esterification. Generally the biodiesel is preparing from the vegetable oil which ultimately effects increase the price in food market and expected to increase more in future. Concentrating to that condition production of biodiesel started in which the vegetable oil or edible sources which can effect to human routine.

Generally utilised feedstock for the production of biodiesel contains soybean, rapeseed/canola, used (waste) vegetable oils, and animal fat. Safflower, sunflower, and hazelnut produce oil that could be used for biodiesel. Warm climate tree oils such as palm oil and jatropha are used as biodiesel feedstock in some parts of the world. Feedstock for biodiesel are generally chosen based on price and performance. Some are better for cold temperature conditions. All the above feedstock have alternative uses and markets, so the prices can fluctuate depending on demand. But the waste chicken fat is low cost raw material for preparing biodiesel and massively available. This biodiesel from chicken fat is renewable, nontoxic and also less harms to the environment. Biodiesel is frequently blended with petroleum diesel in ratio of 6%(B6) , 12%(B12), 18%(B18), 30%(B30), 36%(B36).

B. Problem Statement-

Recent studies show that oil is the main source of energy for many countries. Due to increasing demand from end customers for renewable fuel sources with low negative environmental impacts biodiesel has become greater relief source for the problem.

The use of biodiesel from reuse of cooking oil presents a proposal for the minimization of waste to be disposed of in sewage systems and contaminating rivers and Groundwater, taking into account that litters of such waste oil can contaminate thousands of litters of water source. The development of this work aims at exploring alternatives for the use of biofuels and evaluating the environmental impacts as well as performance of engine.

Hence various alternative methods for production of biodiesel must be searched which don't leads to any harmful impacts and no compromise in the energy obtained. This led us to foundation of extraction of biodiesel from waste fried oil.

C .Objectives-

- Identification of environment friendly and renewable resources as alternative for petro diesel.
- This project aims to improve the energy balance, the carbon performance, the sustainability and the overall economics of biodiesel production, and to reduce the sensitivity of biodiesel to volatile methanol and glycerine spot prices.

- Preparation of blends of biodiesel with diesel fuel chicken fat by using esterification and Trans esterification reaction.
- Extraction of oil from chicken fat by steam distillation process.
- To perform engine analysis and exhaust analysis.
- Quality testing of all biodiesel blend along with diesel fuel e.g. density, viscosity, flash point, fire point, cetane number etc. (B00, B06, B12, B18, B24, B30, and B36.
- To find best blends for diesel fuel with no need of modification in diesel engine.

2. MATERIALS AN D METHODOLOGY FOR BLEND PREPARATION

A. Material & Chemicals:

- Waste chicken fat
- Small percentage of edible oil
- Sodium Chloride
- Methyl alcohol
- Sulphuric Acid
- Sodium Hydroxide

B. Equipment:

- Reactor flask
- Thermometer
- Magnetic stirrer
- Distillation Setup
- Beakers and Test tubes

C. Methodology:

PART A: EXTRACTION OF OIL

1. Take 2 kg chicken fat and add low fat oil (400 ml) with 100 gm sodium chloride as an ingredients.
2. mixture is heated at medium flame for 16 hrs and stirred so that it will not stick to the vessel.
3. After 16 hrs extraction of oil done from chicken fat.
4. Extracted oil is taken in reactor flask set up which consist of 4 inputs valves ,one for thermometer ,one for magnetic stirrer, and one for adding additives and another for distillation setup.
5. Now in the flask 10% CH_3OH and 0.5% sulphuric acid is added as an solvent and catalyst respectively. The temp is maintain at 60 degree centigrade.

PART B: ESTERIFICATION-TRANSESTERIFICATION

6. To get homogenous mixture with help of stirrer rigorously stirring is done (mechanical stirrer) for 2 hours at constant temperature 56-60 'C ,process known as Esterification
7. After esterification one separate solution is prepared of 0.5% sodium hydroxide & 10% Methyl alcohol in separated beaker, that solution will add to previous mixture in reactor flask and stirring is continued for 2 hours process known as Transesterification.
8. After 10 hours 2 layers will formed, upper will be cloudy layer (impure biodiesel) and bottom is glycerin which is byproduct. That high density glycerin will be separated.
9. Obtained impure cloudy biodiesel contains catalyst & solvent which is removed by washing step by hot water (having temperature 64'C), usually 3-4 steps are followed.
10. Finally moisturized Biodiesel will be formed, to remove moisture pure biodiesel is heated and pure biodiesel is obtained.

Table 1.Properties of diesel & Biodiesel

Chicken fat oil biodiesel blends				
B6%	B12%	B18%	B24%	B30%
0.833	0.384	0.836	0.838	0.841
42.41	42.2	42.09	41.96	41.86
49.44	49.7	49.88	49.95	50.11
_	_		2.96	_
NA	NA	NA	NA	NA
75	89	96	102	110
_	_	_	111	_
_	_	_	3	_
_	_	_	-1	_
_	_	_	0.1	_

Engine testing: Engine testing was carried out on IC engine

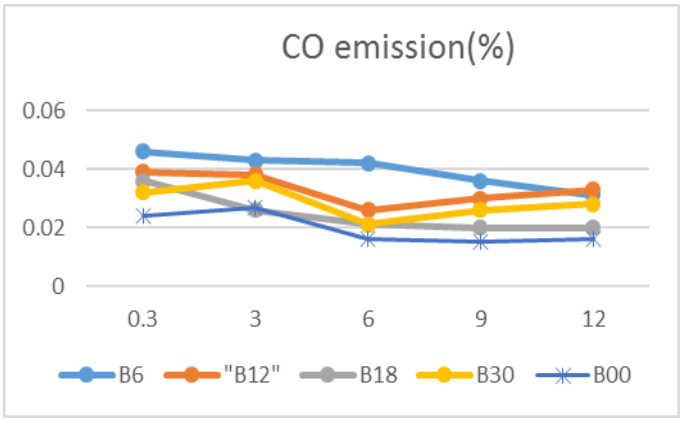
with following specifications-

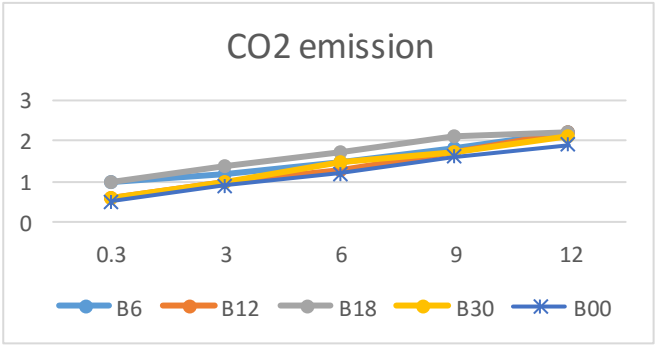
Fuel	:Diesel
No. of cylinders	:1
No. of strokes	:4
Cylinder diameter	:87.5mm
Stroke length	:110mm
Connecting rod length	:234mm
Orifice diameter	:20mm
Dynamometer arm length	:185mm
Power	:3.5kW
Speed	:1500RPM
CR	:18:1

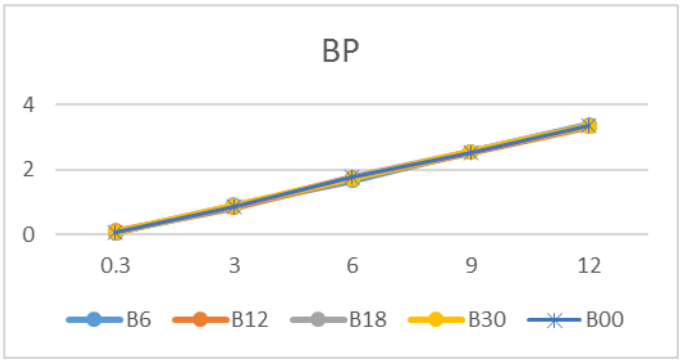
As above engine specifications keeping as C.R. 18 readings been taken. The fuel tank and pipe were cleaned before inserting each blends of biodiesel. The emission testings were carried on AVL 437 smoke meter Operating Unit.

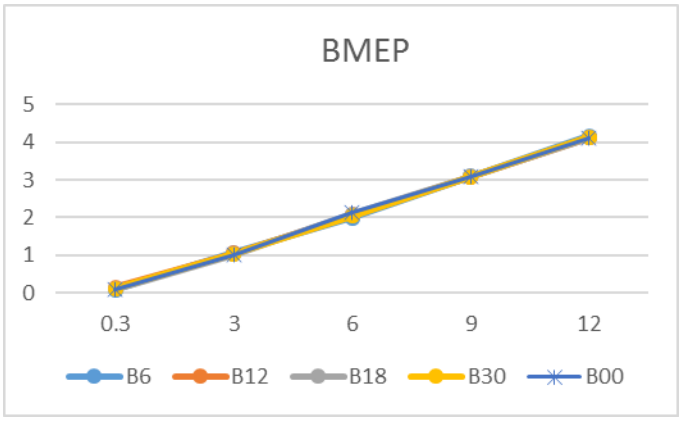
Blends	Load(in kg)	CO %	CO2 %
B00	0.3	0.024	0.5
	3	0.027	0.9
	6	0.016	1.2
	9	0.015	1.6
	12	0.016	1.9
B06	0.3	0.046	0.98
	3	0.043	1.2
	6	0.042	1.5
	9	0.036	1.8
	12	0.031	2.2
B12	0.3	0.039	0.6
	3	0.038	1
	6	0.026	1.3
	9	0.03	1.7
	12	0.033	2.2
B18	0.3	0.036	1
	3	0.026	1.4
	6	0.021	1.7
	9	0.02	2.09
	12	0.02	2.2
B30	0.3	0.032	0.6
	3	0.036	1
	6	0.021	1.5
	9	0.026	1.7
	12	0.028	2.09

3. RESULT EMISSION ANALYSIS









4. CONCLUSION AND SCOPE FOR FUTURE WORK

Conclusion:

In this project we produced biodiesel from waste chicken fat in the form of various blends viz., B6 B12, B18, B30, B00. We Achieved biodiesel using method which has very few difficulties to prepare biodiesel and make the best or most effective use .After preparing this biodiesel we analysed the properties of biodiesel and compared with pure diesel along with that we did engine analysis (IC engine) & emission analysis which showed us some characteristic properties of this prepared blends. On the basis of the obtained data we arrive at a judgement that the blends B18 and B12 shows similar properties as the pure diesel shows (According to ASTM Std) and we can use this as alternative source for pure diesel.

According to today's circumstance of fossil fuel depletion and bio-degradability biodiesel is best alternative source. This biodiesel has very less harmful effect on environment.

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