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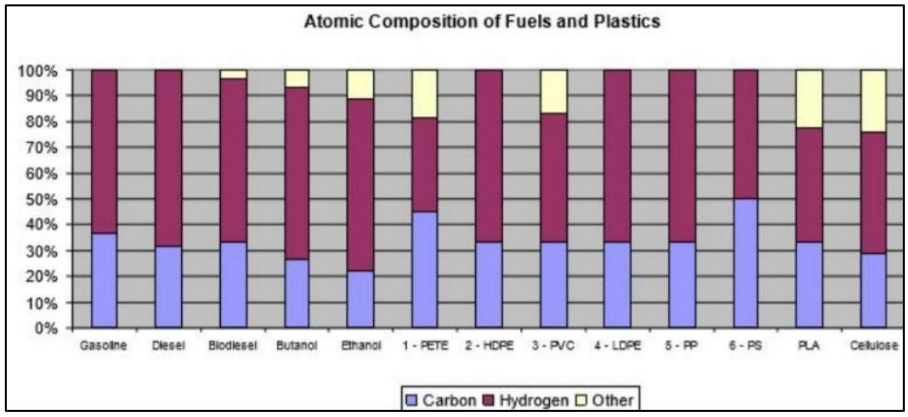
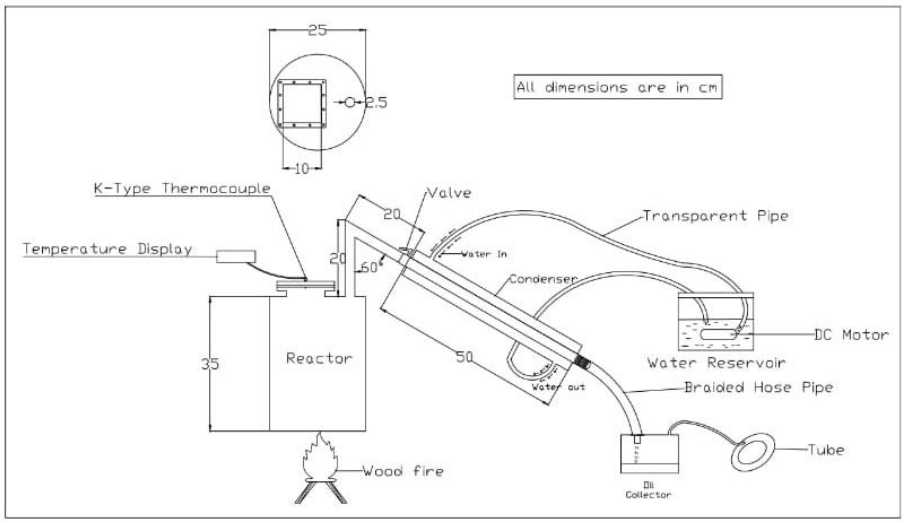
PROJECT SYNOPSIS

PROJECT PROPOSAL REFERENCE NUMBER	46S_BE_3005			
TITLE OF THE PROJECT	OIL EXTRACTION BY PYROLYSIS OF PLASTIC WASTE			
DEPARTMENT	CIVIL ENGINEERING			
STUDENT NAMES	PALLAVI D P	PRAKRUTHI D	SANATH KUMAR M	VARUN P
PROJECT GUIDE	Professor Dr S D VENKATARAJA MOHAN			
KEYWORDS	Pyrolysis , High Density Polethylene . Low Density Polyethylene			
INTRODUCTION	Pyrolysis is the chemical decomposition of organic substances by heating the word is originally coined from Greek-derived elements pyro “fire” and lysis “decomposition”. Pyrolysis is thermal degradation process in the absence or limited supply of oxygen. Plastic waste is heated in a cylindrical reactor at temperature of 300 - 350 C in the absence of oxygen. Plastic waste is very harmful to our nature and also for human beings. Plastic is not easily decomposable. Its affect in fertilization, atmosphere, mainly its harmful effect on ozone layer. So it is necessary to recycle these waste plastic into useful things. In this project we have designed a laboratory scale Pyrolysis Plant which can be used as a prototype for building larger commercial Pyrolysis plants. High Density Polyethylene (HDPE) & Low Density Polyethylene (LDPE) were used as feedstock and the yield of the liquid product has been calculated. The properties of oil extracted is encouraging as it has similar characteristics to that of Diesel and Petrol.			

OBJECTIVE	• To design and fabricate a new batch type reactor. • To conduct thermal pyrolysis, optimize the process conditions to maximize the liquid product yield. • To analyze the products obtained quantitatively and qualitatively and hence determine their potential a a fuel.
METHODOLOGY	The Methodology of our project includes: 1. Selection of Plastic Waste Materials. In order to perform our project, we selected High Density Polyethylene (HDPE) and Low Density Polyethylene because of its chemical composition which is similar to that of Diesel and Petrol and is evident in the graph below.  Source : Prof A.S. Tanksali , “Waste Plastic Pyrolysis” (2020) 2. Collection and Shredding of Plastic Waste. We collected the shredded plastic from “INDIAN PLASTICS” which is a plastic recycle factory located in Nayandanahalli, Bengaluru. 3. Development of Model/Prototype of Pyrolysis Plant : The picture below shows the laboratory scale model which was designed to conduct Pyrolysis.



4. Heating of Plastic waste in Limited supply of oxygen :

   For supply of heat we made use of wood fire and to measure the temperature inside the reactor we made use of K type thermocouple.

5. Condensation of Liquid Vapour :

   Water was used as a coolant and we made use of a DC Motor to pump the water from the reservoir into the condenser and a provision was made to circulate the same water for condensing without wasting.

6. Collection of Liquid Fuel :

   To transfer the oil from condenser to Oil collector we made use of braided hose pipe which can resist high temperatures.

7. Comparison of Properties of fuel with Petrol and Diesel :

   Important fuel properties like Density, Viscosity . Specific Gravity, Flash Point, Pour Point , Fire Point, Cloud Point and Colour was compared to that of Petrol and Diesel.

RESULTS

The Liquid yield of Pyrolysis of HDPE Plastics and LDPE Plastics were 32% and 60% respectively. Remaining products were wax and uncondensed gases.

Liquid Oils Collected

The Testing was done at AES Labs Nagasandra and following were the results :

Fuel Properties	**HDPE Oil**	**LDPE Oil**	**Diesel**	**Petrol**
Density	795.45 kg/m^3	530.35 kg/m^3	850 kg/m^3	720 kg/m^3
Viscosity	0.775 poise	0.652 poise	1 to 3.97 poise	1,5 to 4 poise
Specific Gravity	0.776	0.655	0.81 to 0.96	0.82
Flash Point (C)	23	24	26	22
Fire Point (C)	27	28	29	25
Cloud Point (C)	Below 2	Below 0	2.5 to 4	1 to 3
Pour Point (C)	-4.5 to -5	-2	-2 to -12	-4 to -20
Colour	Brown	Transparent Yellow	Dyed Blue	Brown Transparent
Calorific Value (kj/g)	39500	39800	45000	45000

CONCLUSION	As we compare the properties of Pyrolysis oil to those of Petrol and Diesel , the similarities are encouraging. In the coming years this type of chemical recycling will be more common all around the world due to depleting fossil fuels
SCOPE FOR FURTHER WORK	• To maximize the liquid product yield and also to improve the quality of liquid product, use of pyrolysis catalyst such as ZSM-5 is suggested. • Since wood fire is not suggestible, another renewable and eco friendly source of energy should be used for heating the plastics.
