FORMAT FOR STUDENT PROJECT PROPOSAL

1	Name of the Student(s)	1. S.AKSHAR ALI
		2. S.GANGATHARAN
		3. JOHNSON. V
		4. KARTHIK. M
	Student Email Id	vjohnson1997@gmail.com
2	Name of the Guide	Dr.M.Muthukannan
	Department / Designation	Professor/Mechanical
	Institutional Address	SSM Institute of Engineering and Technology,
		Dindigul-Palani Highway, Dindigul - 624 002.
	Phone No. & Mobile No	0451 2448800-2448899 & 9791427440
3	Project Title	Extraction of bio oil through Electronic Waste
4	Sector in which your Project proposal is to be Considered	Mechanical
5	Project Details	Annexure I
7	Has a similar project been carried out in your college / elsewhere? If so furnish details of the previous project and highlight the improvements suggested in the present one	No

CERTIFICATE

This is to certify that Mr. S.AKSHAR ALI, Mr.S.GANGATHARAN Mr.JOHNSON. V . Mr.KARTHIK are bona fide final year students of U.G. Engineering courses of our college and it is also certified that two copies of utilization certificate and final report along with seminar paper will be sent to the Council after completion of the project by the end of April 2020.

Signature of the Guide

Signature of the HOD

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Signature of the Principal

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380.	Mr. I. Rajkumar Assistant Professor Dept. of Mechanical Engineering Kalasalingam Academy of Research and Education Krishnankoil-626126	Copra Heater	A.Aswin Singh J. Sashikrishnan RM. Subramanian M. Soma Sundaram	EME-073	7500/-
381.	Mr. A. Shyam Assistant Professor Dept. of Mechanical Engineering Gojan School of Business and Technology Chennai-600 052	Portable solar refrigeration system- A novel food and vaccines preservation technology	A Amit Jain M Sakthivel K Sampathkumar R Wilson	EME-074	7500/-
382.	Mr. G. Muralidharan Assistant Professor Dept. of Aeronautical Engineering Surya Group of Institutions Vikravandi - 605 652	Alternative fuels for green aviation	K Dinesh Kumar N Prathip Raj R Srirama Subramania Moorthy T. R. B. Greetharan	EME-075	7500/-
383.	Mr.J.Jenix Rino Assistant Professor & Head, Dept. of Mech. Engg., Stella Maris College of Engg., Aruthenganvilai Kanyakuamari- 629 202	Study on influence of nanofiller in glass fiber reinforced polymer matrix composite	Leo Abijith Antony Jemson Dhas T.Liban Shajith J.Abison	EME-076	7500/-
384.	Mr. A. Gowrishankar Assistant Professor Dept. of Mechanical Engg. Paavai College of Engineering Namakkal-637018	Thermal desalination using diesel engine exhaust waste heat	V S Navinesh S Praveen A Preethkumar D Sathya	EME-077	7500/-
385.	Mr. B. Kalidasan Assistant Professor Dept. of Mechanical Engineering Bannari Amman Institute of Technology Sathyamangalam-638401	Experimental Investigation on performance of solar cooker using high density polyethylene (HDPE) phase change material	Balachander V	EME-078	7500/-
386.	Dr. V.A. Nagarajan Assistant Professor Dept. of Mechanical Engineering University College of Engineering Nagercoil-629004	Reuse of textile waste for the development of light weight composite panels for multistoried building	Akash R Faris Mohamed.S Saravanan. N.A J Sugan	EME-079	7500/-
387.	Dr.A.R.Suresh Head, Dept. of Mech. Engg. Kathir College of Engineering, Wisdom Coimbatore – 641 062	Mobile Solar Tunnel Dryer	M.Gowtham I.Johnpaul Newton P.Abiud	EME-080	7500/-
388.	Dr. M. Muthukannan Assistant Professor Dept. of Mechanical Engg. SSM Institute of Engg and Technology Dindigul-624002	Extraction of bio oil through electronic waste	S Akshar Ali S Gangatharan V Johnson M Karthik	EME-081	7500/-

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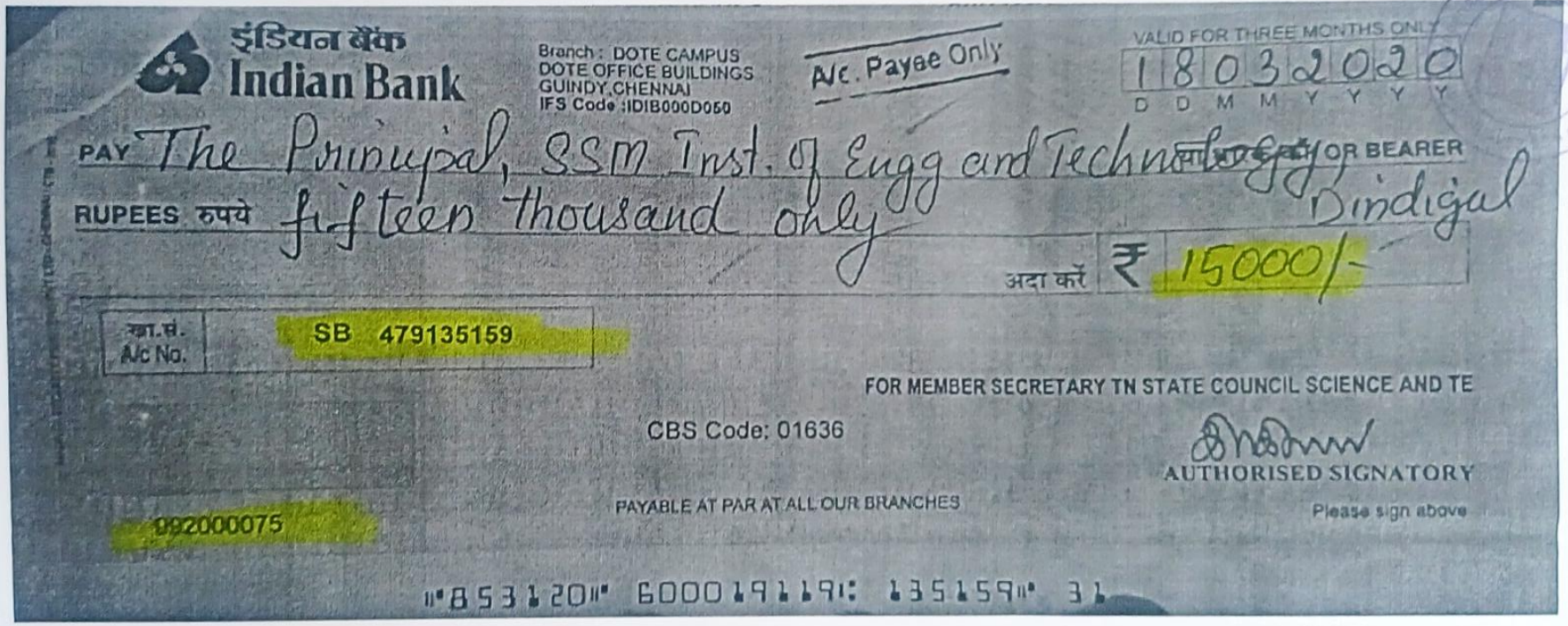
[illegible] Road, Dindigul 624 002



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1/2

TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY DOTE CAMPUS,
CHENNAI - 600 025

STUDENT PROJECT SCHEME 2019-2020
UTILISATION CERTIFICATE

(TWO COPIES)

1. Name of the guide and address : **Dr.M.MUTHUKANNAN,**
Professor/Mechanical,
SSM Institute of Engineering and Technology,
Dindigul-Palani Highway, Dindigul - 624 002.

2. Name of the student(s) : S.AKSHAR ALI
S.GANGATHARAN
JOHNSON. V
KARTHIK. M

3. Title of the project : Extraction of bio oil through Electronic Waste

4. Project code : EME -081

It is certified that a sum of **Rs.7500/-** (Rupees Seven thousand five hundred) Sanctioned by the council for carrying out above mentioned student project has been utilized for the purpose for which it was sanctioned and sum of Rs. 0 /-.....-- .....remaining unutilized is refunded.

Signature of the guide

Signature of the HOD

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Signature of the
REGISTRAR/PRINCIPAL/DEAN
With SEAL

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Annexure I

Project Details

1. Introduction

Due to fossil fuel depletion and increasing the environmental pollution, researchers are motivated to find the fuel. The maximum use of non renewable source leads to cause of global warming. The temperature increased around 1° C in the global that could causes of human diseases and sea level also rises from 7 to 23 inches. Increase in CO_2 emissions are the important factors for searching new fuel, price of fossil fuel increasing day by day and increasing population. Pyrolysis oil is a one kind of fuel that derived from pyrolysis process which made from biomass such as agriculture waste, vegetable waste. In this proposal it is reviewed that pyrolysis oil production from E- Waste. E waste increasing rapidly over the global, due to vast usage of computers, laptops, television, tablets and smart phones. Electronic products can be discarded and thrown to environment after the usage. E- Waste is one among the sources for bio production and it consists of carbon content. The E- waste was collected from the local scrap shop, particularly this waste is thrown to atmosphere and dumped to the environment and it was considered as the solid waste. This solid waste can be recyclable one and cost of recycling is too high. In global e waste reaches nearly 41.8 million ton of waste was generated in 2014, it reaches 45 million ton of e waste in 2016 and it will reach 50 million ton in 2018. CPCB (Central Pollution Control Board) in 2005 made a survey in India in which they found 1,03,047 lakh ton of E-waste all over India. In recent years this has been increased more rapidly. These E-wastes are very harmful to the environment. Lead, Cadmium, Barium, Chromium etc, these are some of the harmful chemicals emitted from E waste. In the present proposal, to reduce environment pollution, and maintain the e waste management our proposed work is to convert the e waste into useful fuel into engines. E waste consist of base metals like Fe, Al and Cu, WEEE (waste electrical and electronic equipment) mainly consists of different plastics like acrylonitrile-butadiene-styrene (ABS), polystyrene (PS), polycarbonate-ABS (PCABS), polyethylene (PE), polyvinyl chloride (PVC), styrene acrylonitrile (SAN) or ethylenepropylene- diene monomer (EPDM). In addition to these main components, WEEE contains a number of precious and critical metals. Bakas et al. (2014) reported the amount of critical metals contained in waste mobile phones, laptops (both including batteries), computers and flat-screens in the EU for 2010. WEEE holds the potential for covering a considerable part of the demand of these metals in the EU: The percentages indicate that between 0.5 wt.-% (W) and up to 17.5 wt.-% (Co) of the total metal-demand in the EU could be supplied by WEEE. This quantity amounts to about 2,000 tons per year.

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2. Objectives

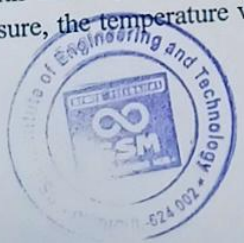
- Converting E-waste into bio oil which is used to run Internal Combustion Engine by applying E-Waste recycling method.
- To establish alternate fuel for Internal Combustion Engines
- To create environmental friendly fuel.
- To reduce the E-waste in abundant form.

3. Methodology

E-waste is collected from the waste electrical storage shop. Reduce the size of the specimen by using of ball milling. Then the powder is converted into bio oil by the pyrolysis set up. This pyrolysis set up consists of condenser, fixed bed reactor, temperature indicator and collecting tank. From this pyrolysis set up there are three important factors that affect the bio oil and bio char production such as pyrolysis temperature, particle size and heating rate [4]. In this study increasing the temperature from 300-600 °C at constant particle size and heating rate of mm and 30 °C/ min to 60 °C/ min

Pyroloysis set up:

Pyrolysis oil obtained from the sample E-waste powder was studied by using fixed bed reactor. Main parts of this pyrolysis system consist of reactor, heater, condenser and oil collector. The reactor which consists of a stainless tube and it has 100 mm diameter and 150 mm height. This stainless flange has 170 mm diameter and 10 mm thickness. A small opening between in the reactor opening for exiting gas out, a 2kW power of electric heater was provided with ammeter and voltmeter set up for heating the biomass. A two identical k type thermocouple was inserted in between the heater for measuring the temperature of the heater. With the help of autotransformer, the rate of heat input was varied. Under the atmospheric pressure, the temperature was varied about 400-700 °C.
Water cooled condenser was used to cool the condensable gas. The water circulate continuously at a temperature of 5 °C around the condenser set up which recovers or converts volatile/ condensable gas into liquid type fuel which was called pyrolysis oil and it was collected in the conical flasks. Under the atmospheric pressure, the temperature was varied about 400-700 °C. 100g of sample was carried out for investigation with varying temperature, rate of heat input and different particle size. From this reaction, fine charcoal, gas and volatile compounds are main outputs. A small opening between in the reactor opening for exiting gas out, a 2kW power of electric heater was provided with ammeter and voltmeter set up for heating the biomass. A two identical k type thermocouple was inserted in between the heater for measuring the temperature of the heater. With the help of autotransformer, the rate of heat input was varied. Under the atmospheric pressure, the temperature was varied about 400-700 °C. 1kg of sample was carried



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out for investigation with varying temperature, rate of heat input and different particle size. From this reaction, fine charcoal, gas and volatile compounds are main outputs. The non condensable gas from the reactor was collected in the condenser and char was collected at the bottom of the reactor set up.

Fixed Bed Reactor

A mild steel (ms) reactor is used for pyrolysis of rubber shells. The reactor chamber have a capacity of about 2Kg and a Nichrome coil is used to heat the reactor. Glass wool is wrapped around the heating coil to avoid heat loss, it is again covered with an aluminum sheet for safety of the user. The reactor chamber is cylindrical in shape. The reactor lid consists of two thermocouples one for obtaining the material temperature and the other for obtaining the gas temperature. The opening at the top of the reactor enables the movement of gas to the condenser. A gasket is employed between the lid and top of the reactor to avoid gas leak during pyrolysis and six lock nuts are used to fix the lid

Experimental Procedure

The PCB boards were collected from various computer accessories that were sold from various scrap shops in the locality. Those boards were grinded using a grinding machine to remove the unwanted projections like integrated circuits and light emitting diodes. then the completely grinded PCB board was hammered into small pieces using a small hammer .It took nearly two complete hours to grind 5 kgs of PCB board. The board obtained after the grinding process was about 3 kgs ie,2 kgs of unwanted projections were there in the obtained PCB boards.The pieces that were broken was of the size of one inch approximately. These hammered pieces were subjected to further processing. The hammered PCB board was furtherly processed by make it into powder. The process that was used in powdering is known as milling process. The hammered pieces were subjected to a ball miller for powdering. It completely took 8 hrs for powdering.as the miller could not be run for more than 4 hrs continuously we ran it into two partition like 4 hrs a day and another 4 hrs another day. The powder obtained was of very minute configuration and we could not find the dimension so we thought of sieving it into different configuration, the sieving process was carried out with the help of a sieve shaker. The configuration that was seived into three categories like 300nm, 150nm and 90nm.The different configuration were differently subjected to pyrolysis process and oil yield was observed with various temperatures.

From the fixed bed reactor heating the bio mass (E waste powder) at a particular temperature, the temperature yields to attain the gaseous state, the gaseous products are allowed to condenser, the condenser condense the gaseous product and pass the liquid to collecting tank, balancing of obtaining the biomass from the reactor is called char.

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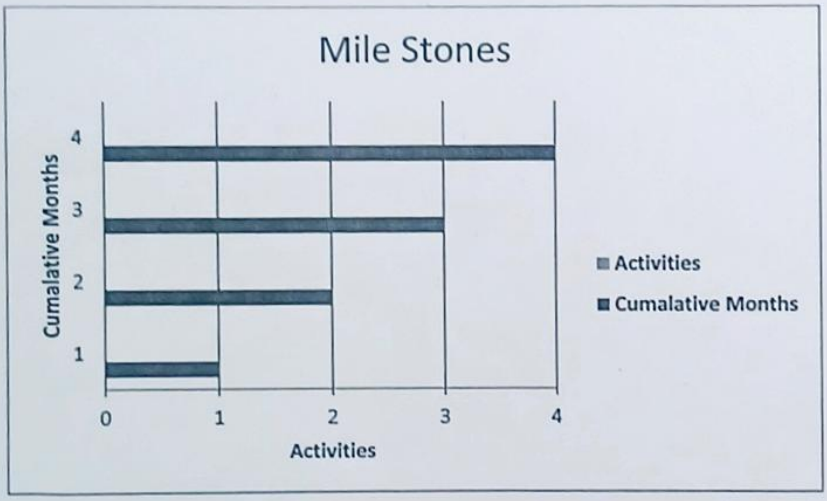
Work Plan

Activities

S.No	Activities	Duration
1.	Purchasing of Electronic goods waste , Segregation of Electronic Waste and Converting E-Waste into powdered form	1 Month
2.	Completion of Experimental Setup for Pyrolysis process	1 Month
3.	Extracting of bio oil obtained from the Pyrolysis process	1 Month
4.	Collection of Results and Report Submission,	1 Month
Total Months		4 Months

Suggested Plan of action for utilization of research outcome expected from the project.



5. Budget

S.No	Description	Amount in Rupees	Remarks
1	Purchase of waste Electronic goods	0	Electronic waste are available in abundant form
2	Electronics goods in to powdered form through ball milling process	1000	Approaching External agency for conversion of E-Waste into powdered form

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3	Pyrolysis Setup	8000	
4	Other Expenses including Travelling allowances, Reportpreparation, communication of report into conference paper	1000	

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EXTRACTION OF BIO OIL THROUGH ELECTRONIC WASTE

,V.Johnson,Akshar Ali,Gangathatran and Karthik
Department of Mechanical Engineering, SSM Institute of Engineering and Technology,
Dindigul – 624 001

Abstract:

Now-a-days E-waste has increased rapidly in the world .CPCB (Central Pollution Control Board) in 2005 made a survey in India in which they found 1,03,047 lakh ton of E-waste all over India. This E waste is thrown to atmosphere and dumped to the environment and it was considered as the solid waste. This solid waste may not be recyclable one. In recent years this has been increased more rapidly. These E-waste are very harmful to the environment. Lead, Cadmium, Barium, Chromium etc, these are some of the harmful chemicals emitted from E-waste. In this study by implementing the technique pyrolysis process which converts this E waste into oil that is called pyrolysis oil. In this pyrolysis oil can be served as low grade oil and used for heating purposes in chemical and boiler heating purposes.

Introduction:

The E- waste was collected from the local scrap shop, particularly this waste is thrown to atmosphere and dumped to the environment and it was considered as the solid waste. This solid waste can be recyclable one and cost of recycling is too high. In global e waste reaches nearly 41.8 million ton of waste was generated in 2014, it reaches 45 million ton of e waste in 2016 and it will reach 50 million ton in 2018. CPCB (Central Pollution Control Board) in 2005 made a survey in India in which they found 1,03,047 lakh ton of E-waste all over India. In recent years this has been increased more rapidly. These E-wastes are very harmful to the environment. Lead, Cadmium, Barium, Chromium etc, these are some of the harmful chemicals emitted from E waste. In the present proposal, to reduce environment pollution, and maintain the e waste management our proposed work is to convert the e waste into useful fuel into engines. E waste consist of base metals like Fe, Al and Cu, WEEE (waste electrical and electronic equipment) mainly consists of different plastics like acrylonitrile-butadiene-styrene (ABS), polystyrene (PS), polycarbonate-ABS (PCABS), polyethylene (PE), polyvinyl chloride (PVC), styrene acrylonitrile (SAN) or ethylenepropylene- diene monomer (EPDM). In addition to these main components, WEEE contains a number of precious and critical metals. Bakas et al. (2014) reported the amount of critical metals contained in waste mobile phones, laptops (both including batteries), computers and flat-screens in the EU for 2010. WEEE holds the potential for covering a considerable part of the demand of these metals in the EU: The percentages indicate that between 0.5 wt.-% (W) and up to 17.5 wt.-% (Co) of the total metal-demand in the EU could be supplied by WEEE. This quantity amounts to about 2,000 tons per year.

Motivation:

- Converting E-waste into bio oil which is used to run Internal Combustion Engine by applying E-Waste recycling method.
- To establish alternate fuel for Internal Combustion Engines
- To create environmental friendly fuel.

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- To reduce the E-waste in abundant form

Materials and Methods:

E-waste is collected from the waste electrical storage shop. Reduce the size of the specimen by using of ball milling. Then the powder is converted into bio oil by the pyrolysis set up. This pyrolysis set up consists of condenser, fixed bed reactor, temperature indicator and collecting tank. From this pyrolysis set up there are three important factors that affect the bio oil and bio char production such as pyrolysis temperature, particle size and heating rate [4]. In this study increasing the temperature from 300-600 °C at constant particle size and heating rate of mm and 30 °C/ min to 60 °C/ min

Working:

The PCB boards were collected from various computer accessories that were sold from various scrap shops in the locality. Those boards were grinded using a grinding machine to remove the unwanted projections like integrated circuits and light emitting diodes. then the completely grinded PCB board was hammered into small pieces using a small hammer .It took nearly two complete hours to grind 5 kgs of PCB board. The board obtained after the grinding process was about 3 kgs ie,2 kgs of unwanted projections were there in the obtained PCB boards.The pieces that were broken was of the size of one inch approximately. These hammered pieces were subjected to further processing. The hammered PCB board was furtherly processed by make it into powder. The process that was used in powdering is known as milling process. The hammered pieces were subjected to a ball miller for powdering. It completely took 8 hrs for powdering.as the miller could not be run for more than 4 hrs continuously we ran it into two partition like 4 hrs a day and another 4 hrs another day. The powder obtained was of very minute configuration and we could not find the dimension so we thought of sieving it into different configuration, the sieving process was carried out with the help of a sieve shaker. The configuration that was seived into three categories like 300nm, 150nm and 90nm.The different configuration were differently subjected to pyrolysis process and oil yield was observed with various temperatures.

From the fixed bed reactor heating the bio mass (E waste powder) at a particular temperature, the temperature yields to attain the gaseous state, the gaseous products are allowed to condenser, the condenser condense the gaseous product and pass the liquid to collecting tank, balancing of obtaining the biomass from the reactor is called char.

Advantages:

Economic Friendly

Environmental Friendly

Alternate fuel for IC engines

Dependence on conventional fuel will be reduced.

Conclusion:

The bio oil extracted from the Ewaste and in future it will be tested for further work.

Guide:Dr.M.Muthukannan, Associate Professor, Department of Mechanical Engineering, SSM Institute of Engineering and Technology, Dindigul – 624 001.

Institute of Engineering and Technology

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TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

GOVERNMENT OF TAMILNADU

CERTIFICATE

This is to certify that **Mr. M. Karthik,** **SSM Institute of Engineering and Technology, Dindigul – 624 002** has successfully completed the project titled "***Extraction of Bio Oil through Electronic Waste***" in the Sector **MECHANICAL ENGINEERING** under **STUDENT PROJECT SCHEME** sponsored by the Council during the academic year 2019-2020.

Dr.D.SENTHIL KUMAR
Principal
SSM Institute of Engineering and Technology

Chennai-600025
18.12.2020

DR.R.SRINIVASAN
Member Secretary

No.EME-081/2020

TAMILNADU STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

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This is to certify that **Mr. S. Gangatharan**, **SSM Institute of Engineering and Technology, Dindigul – 624 002** has successfully completed the project titled "***Extraction of Bio Oil through Electronic Waste***" in the Sector **MECHANICAL ENGINEERING** under **STUDENT PROJECT SCHEME** sponsored by the Council during the academic year 2019-2020.

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DR.R.SRINIVASAN
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GOVERNMENT OF TAMILNADU

Dr.D.SENTHIL KUMARAN
Principal
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CERTIFICATE

This is to certify that **Mr. S. Akshar Ali, SSM Institute of Engineering and Technology, Dindigul – 624 002** has successfully completed the project titled "***Extraction of Bio Oil through Electronic Waste***" in the Sector **MECHANICAL ENGINEERING** under **STUDENT PROJECT SCHEME** sponsored by the Council during the academic year 2019-2020.

Chennai-600025
18.12.2020

DR.R.SRINIVASAN
Member Secretary

No.EME-081/2020

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GOVERNMENT OF TAMILNADU

CERTIFICATE

This is to certify that **Mr. V. Johnson,** **SSM Institute of Engineering and Technology, Dindigul – 624 002** has successfully completed the project titled "***Extraction of Bio Oil through Electronic Waste***" in the Sector **MECHANICAL ENGINEERING** under **STUDENT PROJECT SCHEME** sponsored by the Council during the academic year 2019-2020.

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