THE EXTRACTION AND USE OF BIOMEDICAL WASTE PYROLYTIC OIL BLENDS AS A FUEL IN DIESEL ENGINE

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INTRODUCTION:

The transportation sector faces a major crisis and huge shortage of petroleum diesel for its applications. It is very much necessary for the researches to find an alternative way for the fuel to be used effectively in internal combustion engine. Public concern over disposal and treatment of medical waste has resulted in increasing regulations and court actions.

The phenomenon increase in the quantity of medical waste generated in the hospital is attributed to the growing use of disposables. A rule of the thumb for medical waste production in affluent countries seems to be 1kg per bed per 8 hour shift. Hospitals and other health care units and research facilities in our country produces of millions of tons of hazardous waste every year. This cannot be disposed in landfills, unless it is so thoroughly disinfected as to pose no risk to human health. In many hospitals medical wastes burnt at dump sites in an open environment. Landfills used to dump contaminated waste and toxic residue from incinerators; are quite often designed poorly and pollute ground water. Disposal of bio medical waste material causes air, water and soil pollution to a great extent which may be due to higher population density and increased hospitals in many developing countries. It is extremely difficult to dispose the bio medical waste material without causing environmental hazards. There are many methods illustrated for bio medical waste disposal among them high temperature pyrolysis is one.

OBJECTIVE:

The objective of this project is to design and fabricate the Pyrolytic equipment to extract the oil from biomedical waste by pyrolysis method and to study the performance, emission and combustion characteristics of bio oil and its blends with diesel to find its suitability as alternate fuel for diesel engine.

METHODOLOGY:

Plastic Pyrolysis:

A pyrolysis batch reactor has been successfully designed and fabricated with a handling capacity of 10 kg per cycle The Oil extraction plant consists of reactor, condenser, temperature controller, pressure gauge and vacuum pump. The reactor consists of electrical heating coil and bricks around the reactor where the combustion takes place. In condenser the change of phase takes place i.e. vapor to liquid. The temperature controller controls and sets
the temperature which is required for reactor to carryout combustion. Pressure gauge indicates the pressure in the reactor.

![Image 1: Oil Extraction Plant for Biomedical waste plastics](image1)

![Image 2: Pyrolytic Equipment](image2)

**Plastic Pyrolysis Process**

The collected bio medical plastic waste is fed in to the reactor and by regulating the valve and vacuum pump; vacuum is created inside the reactor. The nitrogen gas is filled into the reactor through the valve which is situated at the top of the reactor. Purpose the passing inert gas is reduces the formation of black carbon and to balance atmospheric pressure inside the reactor. Continues water supply is provided to condenser. Reactor is surrounded by heating coils and insulating bricks. Temperature is set up to 500°C and heater is kept on and the waste material in the reactor is heated to a required temperature. The waste material gets converted into a vapor which is passes through the condenser where the vapors are condensed to liquid. The liquid fuel thus obtained is tested as fuel in diesel engine.

![Image 3: Pyrolytic Process](image3)

**CONCLUSION:**

From the present experimental investigation, following conclusions were derived;

1. Pyrolysis process is found to be one of the best methods to treat waste plastic under solid waste management technique.
2. The overall yield of WPPO was found to be 42%.
3. Diesel Engine is able to run with 100% waste plastic oil.
4. Engine fuelled with waste plastic pyrolysis oil exhibits higher thermal efficiency up to 75% of the rated power for diesel engine.
5. The exhaust emissions are found to be lesser for waste plastic pyrolysis oil compared to diesel engine performance.

**FUTURE WORK:**

Pyrolysis is a very promising and reliable technology for the chemical recycling of plastic wastes. Pyrolysis offers a great hope in generating fuel oils, which are heavily priced now. This reduces the economical burden on developing countries. The capital cost required to invest on pyrolysis plant is low compared to other technologies. So, this technology may be the beacon light in the future to a world, which is now on the verge of acute fuel shortage.