REPLACEMENT OF SOLVENT IN PAINT BY PLASTIC WASTE USING PYROLYSIS METHOD

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Abstract - *There is an increase in the production and consumption of plastics as the day goes by. All plastics need to be disposed after their usefulness, as waste. The needs to manage this waste from plastic become more apparent. This leads to pyrolysis, which is a way of making to become very useful to us by recycling them to produce oil. In this study, plastic wastes (polyethylene) were usedfor the pyrolysis to get plastic oil that has the same physical properties as the solvent used in paint manufacturing industry. The experiment was carried out in such a way on, thermal pyrolysis (without the aid of a catalyst). Some of the plastics wastes that are suitable for pyrolysis are: HDPF (high density polyethylene). Thus the problems faced by the increasing in plastic waste and the increasing environmental crisis can be eliminated by making a system which can decrease the pollution due to plastic and increasing the availability of the alternative solvent. This was made by converting the waste plastic into useful alternative oil by means of pyrolysis process.Thus the derived oil is used in the replacement of solvent in paint for the effective alterations in the properties of paint and to use them in various phenomena. This new solvent is mixed with the other raw materials such as pigment, vehicle, drier, etc... And the paint is obtained which has high properties than the Normal paints in market.*

Key Words: Pyrolysis oil,Pyrolysis,Waste Plastic,Paint,Solvent.

1.INTRODUCTION

The use of plastics has been associated with significant environmental problems due to their continuous accumulation in landfills, as plastic waste does not degrade or degrades at a very low pace. On average, 50% of the waste plastic generated in Europe is recovered, while the rest is sent to landfills. In 2015, global plastic production reached 322 million tonnes, a dramatic increase compared to the 279 million tonnes produced in 2011 According to the World Bank, plastic waste accounts for 8–12% of the total municipal solid waste (MSW) worldwide, while it is estimated to increase to 9–13% of the MSW by 2025. The increasing availability of such waste material in local communities, coupled with the high energy density, render waste plastics one of the most promising resources for fuel production. The pyrolysis of plastics and other MSW (end-of-life tires, organic wastes, etc.) for fuel production is practiced by several small-size companies worldwide, especially those of emerging economies, where industries such as other energy- intensive secto cement, glass, and rs represent the reference market for this type of fuel (diesel-range hydrocarbons produced via the pyrolysis of plastics and MSW). The pyrolysis of plastics yields on average 45–50% of oil, 35–40% of gases, and 10-20% of tar, depending on the pyrolysis technology.According to previous analysis, there are some cases where a high amount of liquid yield, more than 80 wt %, could be produced in the pyrolysis of individual plastic,which is higher than the pyrolysis of wood-based biomass in general. The pyrolysis oil can be valorized better if separated into separate fractions with different boiling point ranges.This compendium of technologies aims to gift an summary of the technologies on the market for changing waste plastics into a resource.It emphasizes the typicalMethods for convertingwaste plastics into solid, liquid and gaseous fuels as well as the direct combustion of waste plastics for specific applications.

1.1 Plastics

Plastics are compound materials, a material built up from long repeating chains of molecules. Polymers such as rubber occur naturally, but it wasn't until the development of synthetic polymers around 1910 that the polymers tailored to the needs of the engineer first started to appear. One of the first commercial plastics developed was Bakelite and was used for the casting of early radios.Because the first plastics weren't fully with chemicals stable, they gained a reputation for being cheap and unreliable.Plastic may be a marvel of chemical compound chemistry, plastics have become an indispensable part of our daily life. But perennial reprocessing of plastic waste, and its disposal cause environmental issues, create health hazards, additionally to being a nuisance.The biggest current threat to the traditional industry is probably going to be environmental issues, together with the discharge of deadly pollutants, greenhouse emission and non-biodegrable lowland impact as a results of the assembly and disposal of petroleum based plastics.

Plastics ar cheap, light-weight, strong, durable, corrosion-resistant materials, with high thermal and electrical insulation properties. The diversity of polymers and therefore the skillfulness of their properties ar accustomed create a massive array of merchandise that bring medical and technological advances, energy savings and numerous other societal benefits. As a consequence, the production of plastics has increased substantially over the last 60 years from 0.5 million tonnes in 1950 to over 260 million tonnes today. In Europe alone the industry encompasses a turnover in way over three hundred million euros and employs one.6 million people. Almost all aspects of daily life involve plastics, in transport, telecommunications, clothing, footwear and as packaging materials that facilitate the transport of a wide range of food, drink and other goods. There is considerable potential for new applications of plastics that will bring benefits in the future, for example as novel medical applications, in the generation of renewable energy and by reducing energy used in transport. Some plastics wastes are suitable for pyrolysis such as: HDPE (high density polyethylene), LDPE (low density polyethylene), polypropylene' polystyrene' polyvinyl alcohol, polyoxy-methylene, polyamide, polyurethane, polyphenylene, polyvinyl chloride etc. But for tire pupose of this study low density polyethylene (LDPE) was used since it is.

Commonly found littered around our environment' Polyethylene is an excellent source of hydrocarbon products. The high temperature causes the loss of selectivity, increased secondary reactions, coke formations and reduced catalyst life. In general, the conversion of waste plastic into fuel requires feedstock which is non-hazardous and combustible. In particular every kind of waste plastic conversion methodology has itsown appropriate feedstock. The composition of the plastics used as feedstock is also terribly completely different and a few plastic articles would possibly contain undesirable substances (e.g. additives such as flame retardants containing bromine and antimony compounds or plastics containing nitrogen, halogens, sulphur or any other hazardous substances) which pose potential risks to humans and to the environment. The types of plastics and their composition can condition the conversion method and can verify the pretreatment necessities, the combustion temperature for the conversion and therefore the energy consumption required.The fly ash and bottom ash composition, and the potential of chemical corrosion of the equipment, Therefore the major quality concerns when converting waste plastics into fuel.

1.2 Target Waste Plastics

Waste plastics ar one amongst the foremost promising resources for fuel production as a result of its high heat of combustion and because of the increasing availableness in native communities. Unlike paper and wood, plastics don't absorb a lot of wetness and therefore the water content of plastics is way less than thewater content of biomass like crops and room wastes. The conversion strategies of waste plastics into fuel rely upon the categories of plastics to be targeted and therefore the properties of different wastes that may be utilized in the method. Additionally the effective conversion needs applicable technologies to be hand-picked per native economic, environmental, social and technical characteristics.

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Any other venturesome substances) that cause potential risks to humans and to the setting. The types of plastics and their composition can condition the conversion method and can verify the pre-treatment necessities, the combustion temperature for the conversion and therefore the energy consumption required.The ash and bottom ash composition and also the potential of chemical corrosion of the instrumentality, thus the main quality issues once changing waste plastics into fuel resources ar as follows:

- Conversion into fuel products:In solid fuel production, thermoplastics act as binders which form pellets or briquettes by melting and adhering to other non-melting substances such as paper, wood and thermosetting plastics. Although picket materials square measure fashioned into pellets employing a pelletizer, mixing plastics with wood or paper complicates the pellet preparation process. Suitable heating is needed to provide pellets from thermoplastics and alternative flamable waste. The type of plastic being employed determines the process rate also because the product yield. Contamination by undesirable substances and therefore the presence of wet will increase energy consumption and promotes the formation of byproducts within the fuel production method.

- Well-controlled combustion and clean flue gas in fuel user facilities: It is important to match the fuel type and its quality to the burner in order to improve heat recovery efficiency. Contamination by chemical element, chlorine, and inorganic species, for instance, can affect the flue gas composition and the amount of ash produced. When victimisation fuel ready from waste plastics, it must be assured that the flue gas composition complies with local air pollution regulations. In the same way, ash quality must also be in compliance with local regulations when disposed at the landfill.

2. Sources of Waste generation

RESIDENTIAL:

Biscuit and chocolate wrappers, milk packets, garbage bags, shopping bags, packing plastic covers, etc…

INDUSTRIAL:

Insulating materials, packing covers for goods, housekeeping wastes, special wastes, etc…

COMMERCIAL:

Plastic cans, plastic tins, Drums, plastic bottles, product covers, etc…

TYPES OF PLASTIC

TYPE1 (PETE):Polyethylene terephthalate. Soft drink and water bottles, some water proof packaging. Commonly recycled.

TYPE 2 (HDPE):High density polyethylene. Milk, detergent, and oil bottles, toys and some plastic bags. Commonly recycled.

TYPE 3 (V):Vinyl/polyvinyl chloride (PVC).Food construction materials, shower curtains. Not additives and is known to off gas in the air wrap, vegetable oil bottles, recyclable, can leach chemical

TYPE 4 (LDPE):Low density polyethylene. Many plastic bags squeezable bottles, garment bags recycle at most centers but not curbside programs.

TYPE 5(PP):Polypropylene cold containers, sorne bags, most bottle tops, solne carpets, some food wrap. Recycled at most centered but not curbside prograIns.

TYPE 6(PS):Throwaway utensils, neat packing, take out containers, protective packing. Recycled at some centers however not pavement programs and illegal in some cities.

TYPE 7 (OTHER):Composite plastics, Nalgene bottles, milk cartons, toothpaste tubes.

3.Pyrolysis technology

Pyro: heat, lysis: breakdown into pafis. Pyrolysis is a chemical unbond process in which large molecules are broken down into smaller molecules. Simplest example of pyrolysis is cooking in which complex food molecules are broken down into smaller & easy to digestible molecules.Waste plastic and tire are long chain molecules or polymer hydrocarbons. Pyrolysis technology is that the process of breaking down giant molecules of plastic/tire into smaller molecules of oil, gas and carbon black. Pyrolysis of waste plastic or tire takes place in absence of oxygen, at about 350-550 degree C and reaction time is about 15-90 minute.

3.1.Pyrolysis oil

Pyrolysis oil is sometimes known as bio crude oil or bio oil, is a synthetic fuel under investigation as substitute for petroleum. It is extracted by biornass to liquid technology of destructive distillation from dried biornass in a reactor at a temperature of about 500 degree Celsius with subsequent cooling. Pyrolysis oil (bio oil) could be a reasonably tar and ordinarily contains too high level of gas to be a hydro carbon.

3.2.PYROLYSIS OIL CHARACTERISTICS:

The oil produced in a pyrolysis process is acidic, with a PH of 1.5-3.8. The acidity may be lessened by the addition of readily available base components.Little work has been done on the stability of bio oil acidity that has been altered with base components while the exact composition of bio oil depends on the bio mass source and processing conditions a typical composition is as falls water 20- 28 %, suspended solids and pyrolytic lignin 22-36yo, hydroxyl-acetaldehyde 8-120 , levoglucosan3-8o/o, acetic acid4-8%, acetol 3 -6o/o, sellubiosonl-2%o, glycol 1-2 0/o, formic acid3-6. The water molecules are split during pyrolysis and held separately in other compounds within the complex with the pyrolysis liquid. The distinction is significant, as the "water" in pyrolysis oil does not separate like standard fossil fuels.

4.Components

4.1.REACTOR:

This is a stainless steel tube of length 145mm, internal diameter 37mm, outerdiameter 4lmm sealed at one end and an outlet tube at the other end. The reactor isto be placed inside the furnace for external heating with the raw material

Inside forinternal heating. The reactor is heated by electrical heating to temperature of about500oC and more.

4.2.FURNACE

The furnace provides the heat the reactor needs for pyrolysis to take place, it has a thermocouple to control the temperature.A furnace is a device used for high-temperature heating. The name derives from Greek word Fornix, which means oven.

4.3.CONDENSER:

It cools all the heated vapour coming out of the reactor. It has an inlet and outlet for cold water to run through its outer area. This is used for cooling the vapour. The gaseous hydrocarbons at a temperature of about 350oC are condensed to about 30-35oC.

In thus doing, the latent heatis given up by the substance, and will transfer to the condenser coolant. Condensers area unit generally heat exchangerswhich have numerous styles and are available in several sizes starting from rather tiny (hand-held) to terribly giant industrial-scale units utilized in plant processes.

For example, a white goods uses a condenser to urge obviate heat extracted from the inside of the unit to the skin air. Condensers area unit utilized in air-con, industrial chemical processessuch as distillation, steam power plantsand other heat-exchange systems. Use of cooling water or encompassing air because the agent is common in several condensers.

4.4.HEATING ELEMENT:

A element converts electricity into heat through the method of resistive or Joule heating. Electric current passing through the part encountersresistance, leading to heating of the part. Unlike the Peltier result this method is freelance of the direction of current flow.

4.5.COPPER TUBES:

Copper conduit is most frequently used for provide of hot and cold water, and as refrigerantline in HVACsystems. There area unit 2 basic kinds of copper conduit, soft copper and rigid copper. Copper conduit is joined mistreatment flare affiliation, compression affiliation, or solder. Copper offers a high level of corrosion resistance, however is changing into terribly expensive.

4.6.SOFT COPPER:

Soft (or ductile) copper conduit may be bent simply to travel around obstacles within the path of the conduit. While the work hardening of the drawing process used to size the tubing makes the copper hard or rigid, it is carefully annealedto make it soft again; it is therefore costlier to supply than non-annealed, rigid copper tubing. It may be joined by any of the 3 strategies used for rigid copper, and it is the only type of copper tubing suitable for flare connections. Soft copper is that the preferred alternative for refrigerant lines in split-system air conditionersandheatpumps.

4.7.Rigid copper:

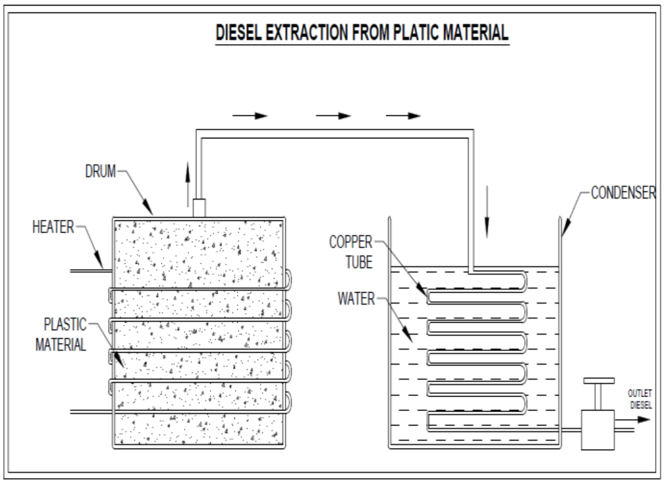
Rigid copper may be a widespread alternative for water lines. It is joined employing a sweat, roll grooved, compression or crimped/pressed connection. igid copper, rigid due to the work hardening of the drawing process, cannot be bent and must use elbow fittings to go around corners or around obstacles.

5.Working Principle

In our experiments, commercialize available shredded plastics were procured and washed before pyrolysis. One of the most favorable and effective disposing method is pyrolysis, which is environmental friendly and efficient way. Pyrolysis is the thermal degradation of solid wastes at high temperatures (300-900nC) in the absence of air (and oxygen). As the structure of merchandise and their yields may be significantly changed by catalysts, results of pyrolysis in the absence of catalyst were presented in this article Pyrolysis of waste plastics was disbursed in associate indigenously designed and fictional reactor.

The scheme of the process involved in the experiments and the photograph of the experimental set up respectively. Waste plastics had been procured form the commercial source and stored in a raw material storage unit. Raw material was then fed in the reactor and heated by means of electrical energy. The yield commenced at a temperature of 3500C. The gaseous products resulting from the pyrolysis of the plastic wastes is supplied through the copper tube. Then the burned plastic gas condensed in a water cooled condenser to liquid fuel and collected for experiments.

2D DIAGRAM



5.1PAINT

Paint is any pigmented liquid, liquid, or mastic composition that, once application to a substrate in a {very} very skinny layer, converts to a solid film. It is most ordinarily accustomed shield, color, or give texture to things. Paint are often created or purchased in several colours and in many alternative sorts, such as watercolor, synthetic, etc. Paint is usually keep, sold, and applied as a liquid, but most types dry into a solid.

5.2.BIO THINNER

The extraction of bio oil is adding thinner. This is called bio-thinner. Bio thinner is a solvent, a dilute agent and cleaner for oil-based bio products. It is a substitute for mineral turpentine. It is eco-friendly, gentle to the climate and resources. Bio thinner is free of aromatic hydrocarbons such as toluene, benzene, xylene, ketones, and ester and glycol derivates.

6.Conclusion

A strong multidiscipline team with a decent engineering base is critical for the event and refinement of advanced programming, editing techniques, diagnostic Software, algorithms for the dynamic exchange of informational different levels of hierarchy. Simulation techniques are suitable for solving some of the problems.We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work.

We ar proud that we've completed the work with the restricted time with success. The "FABRICATION OF EXTRACTION OF BIO-DIESEL FROM PLASTIC WASTE MATERIAL"is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and ability creating most use of obtainable facilities. Thus we have developed an "EXTRACTION OF BIO-DIESEL FROM PLASTIC WASTE MATERIAL" which helps to know how to achieve extraction of bio fuel from plastics. By victimization additional techniques, they will be changed and developed per the applications.

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