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ABSTRACT



A process of producing fuel like liquid and apparatus for producing the fuel like liquid is disclosed. The process of producing fuel like liquid utilise decomposition of low density polyethylenes at an elevated temperature in the presence of natural agent derived from coconut. The apparatus designed to perform said decomposition process is able to collect fuel like liquid product in gaseous as well as liquid form.

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CLAIMS:

We claim,

1. A process of producing fuel like liquid by processing waste low density polyethylene at a high temperature in the presence of natural agent acting as deteriorating agent to produce fuel like liquid.
2. The process of producing fuel like liquid as claimed in claim 1 wherein natural agent catalysing pyrolysis is jute fibre dust.
3. The process of producing fuel like liquid as claimed in claim 1 wherein process comprising steps: a) collecting waste low density polyethylene and high density polyethylene; b) cleaning the said collected low density polyethylene and high density polyethylene with distilled water and then drying them completely; c) shredding said low density polyethylene and high density polyethylene into uniform small pieces; d) washing jute fibre dust with distilled water and drying it under the sun for one week until dried completely; e) adding mixture of low density polyethylene, high density polyethylene and dried jute fibre in a ratio 1:3:1 to the pyrolysis chamber and closing the lid; f) setting the temperature high upto 400 degree celcius to observe pyrolysis; g) collecting fuel like liquid from the opening.
4. The process of producing fuel like liquid as claimed in claim 1 wherein at least 60 percent of fuel like liquid is produced from the input material in one hour.
5. The process of producing fuel like liquid as claimed in claim 1 wherein products of pyrolysis of waste low density polyethylene and high density polyethylene can be collected in gaseous form and solid (like tar) from seperatly and can be recycled.
6. An apparatus for producing fuel like liquid comprising: pyrolysis chamber covered by air tight lid, heating source to provide elevated temperature, temperature controller, collector to collect liquid product, collecting tube to facilitate passage of gaseous products.
7. The apparatus for producing fuel like liquid as claimed in claim 6 wherein, temperature of pyrolysis can be controlled through j type micro-controller.

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THE FOLLOWING SPECIFICATION PARTICULARLY DESCRIBES THE INVENTION AND THE MANNER IN WHICH IT IS TO BE PERFORMED

FIELD OF THE INVENTION

The present invention relates to an improved process of producing fuel like liquid and the apparatus for the same. More specifically, the present invention relates to an improved process of producing fuel like liquid in the presence of a natural agent derived from coconut to decompose waste plastic and polymers to produce fuel for further use in producing energy.

BACKGROUND AND THE PRIOR ART

Considerable volumes of plastic waste are produced worldwide. Much of the waste plastic ends up in landfills and takes many years to degrade if they ever degrade. Waste plastic is problematic from an environmental point of view and the degradation of the landscape by landfills is undesirable.

Plastic materials are however made of essentially useful compounds that can be used to generate energy.

Processes are known in the art for processing plastic waste materials by thermo-chemical breakdown of plastic wastes by combustion, gasification or pyrolysis.

Pyrolysis is the preferred method of performing thermo-chemical break down of waste plastic materials. The production of light olefins (ethylene, propylene and butenes) from various hydrocarbon feedstocks utilizes the technique of pyrolysis, or steam cracking. Pyrolysis involves heating the feedstock sufficiently to cause thermal decomposition of the larger molecules. By varying conditions of a reactor, the composition of the products obtained may be adjusted to meet product needs. A disadvantage of pyrolysis is that the process is traditionally energy intensive owing to the endothermic nature of the physical and chemical processes involved. More specifically, significant energy is required to melt the polymer and to increase the temperature to facilitate the desired chemical reactions. In addition, catalysts may be essential to achieve the desired level of chemical cracking.

In a pyrolysis process fuel is pyrolyzed, the gaseous compounds formed in the reaction are separated from carbonization residue, and they are condensed into pyrolysis oil, which may be used, for example, as fuel or it may be processed further into different chemicals.

U.S. Pat. No. 3,822,218 to Whittaker relates to the addition of a carbonaceous binder to a rubber prior to the destructive distillation thereof.

U.S. Pat. No. 3,823,223 to Liska relates to a destructive distillation of synthetic rubber scrap to produce a char which, when ground, can be used in reinforcement of rubbers.

U.S. Pat. No. 4,123,332 to Rotter also relates to a process and apparatus for treating carbonizable materials such as tires. Various end products are produced.

U.S. Pat. No. 3,085,038 relates to a process for recovering cellulose from vegetable materials via hydrolysis.

U.S. Pat. Nos. 3,864,097 and 3,864,096 relate to a process for converting cellulose into an oil with a catalyst and at temperatures of between 200.degree. C. to 375.degree. C.

U.S. Pat. No. 3,910,775 to Jackman discloses an apparatus and method for converting refuse, sewage, and industrial wastes into fuel substances. The waste material is converted to briquettes which can be burned as a fuel.

U.S. Pat. No. 3,923,472, to Martinez relates to a process for converting thermoplastic synthetic fibers into an oil suitable for use as a fuel. The fibers are first saturated in an oil-bearing liquid and then heated to a temperature which changes the mixture into a liquid state.

U.S. Pat. No. 3,926,582 to Powell relates to the pyrolytic treatment of solid waste materials including a heterogeneous mixture of organic and inorganic wastes of all known types. The process, however, is conducted in an oxygen-rich gas.

U.S. Pat. No. 3,933,577 to Penque employs the step of sonically pulping municipal waste in the presence of water and certain alkaline compounds.

U.S. Pat. No. 3,947,256, to Tsukagoshi relates to applying simultaneous compression and shearing action on polymers until they are in a fluid state. The fluid can be equalized as a fuel.

U.S. Pat. No. 3,961,913, to Brenneman discloses a process for treating organic waste materials with acids at elevated temperatures to form a solid fuel material.

U.S. Pat. No. 3,996,022 to Larsen relates to a process for converting waste solid rubber scrap into useful liquid, solid and gaseous products. The process is conducted in the presence of certain salts at temperatures of between 300.degree. C. and 500.degree. C.

U.S. Pat. No. 4,063,903, to Beningson relates to an apparatus for disposal of solid wastes by converting them to a fuel and some amount of sterile land fill materials. Various steps are applied such as shredding, magnetic separating, separating fines, applying acids, heating and drying.

U.S. Pat. No. 4,095,956 to Holmes relates to a system for processing municipal wastes, wherein the waste is separated into a combustible fraction which is bailed and can subsequently be burned.

U.S. Pat. No. 4,145,188, to Espenscheid solubilizes municipal refuse and other solid organic wastes in a highly aromatic refined petroleum solvent to produce a homogeneous heavy oil or bitumen composition.

U.S. Pat. No. 4,164,396 to Jones relates to producing a fuel from waste refuse material by combining solid fibrous materials with liquid combustible materials.

U.S. Pat. No. 4,325,329, to Taylor relates to producing alcohol and mixing it with gasoline on board a vehicle.

U.S. Pat. No. 4,028,068 to Kiener relates to a process and apparatus for the production of combustible gas.

U.S. Pat. No. 4,344,770 to Capener relates to a method and apparatus for converting solid organic materials such as garbage, sewage, sludge and cellulosic products into a

fuel oil and gas. Pyrolysis of the waste material is reported to produce certain oil fractions which can be used as fuels as in the firing of a boiler.

U.K. Patent No. 1,481,352 discloses a method of thermal decomposition of hydrocarbons by, at least partially, indirect contact of hydrocarbons with a hot gas. The gas is let off after heat exchange separately from the gaseous products formed during decomposition. Tires are heated in a tube by hot gases flowing through a jacket around the tube. In another embodiment the tube has a grid region into which a combustion gas is fed to aid carbonization by direct gas heating/combustion at the grid carbon interface. Steam or CO.sub.2 may be fed to the grid to form water gas or reduce gas to aid combustion. As such, there is no substantial absence of oxygen.

U.S. Pat. No. 4,746,406 to Timmann discloses a process for the pyrolytic reprocessing of plastic, rubber, or other hydrocarbon materials in which the resultant pyrolysis gas is brought into a cooling stage and reduced to a temperature just above the freezing point of water and to a pressure of approximately 0.8 to 1.4 bar of overpressure. The resultant condensate is then separated and heated to a normal storage temperature and the super atmospheric pressure on the condensate reduced to atmospheric pressure. The gas released therefrom comprises a C1 to C4 mixture of hydrocarbon compounds and is supplied to the pyrolysis process as a special process gas. A substantial increase in the proportion of aromatic compounds in the pyrolysis gas is reported.

U.S. Pat. No. 5,082,534 to Breu discloses a rotary, continuous pyrolytic conversion system which converts solid hydrocarbon containing feedstock into gases, liquid hydrocarbons and char.

U.S. Pat. No. 5,230,777 to Jarrell discloses a method and apparatus for producing fuel and carbon black from rubber. The method and apparatus produce a liquid fuel that is low in sulfur content, gaseous hydrocarbons, and solid carbonaceous materials from used rubber tires. Rubber is heated under negative pressures in the presence of a minimal amount of oxygen. The methods and apparatus of the present invention are said to produce little air emissions and conserve energy.

However, none of these patents or other references suggest process of utilizing a fairly sufficient amount of waste low density polyethylenes (LDPE) and high density

polyethylenes (HDPE) in the presence of natural agent derived from coconut to produce fuel like liquid. Furthermore, present invention is novel in various aspects like pyrolysis is operating at a wider temperature range, specially designed condenser is utilised and a unit for temperature control is also given which is located outside the pyrolysis unit. Furthermore, in the present invention, end product of pyrolysis i.e. fuel like liquid is obtained at a faster rate.

OBJECTIVES OF THE INVENTION

It is an object of the invention to utilise waste plastics and polymers to produce fuel like liquid.

It is another object of the present invention to provide improved and faster mechanism of pyrolysis to converts waste plastic into fuel like liquid.

It is yet another object of the present invention to perform pyrolysis of the waste plastics & polymers in the presence of a natural agent.

It is still another object of the present invention to address the foregoing problems of deprivation of natural resources and to provide alternate source of fuel.

It is further object of the present invention to decompose plastic waste using natural agent aiding to clean environment.

SUMMARY OF THE INVENTION

In the preferred embodiments of the present invention, chemical production processes is utilised. The chemical production processes generally include providing waste low density polyethylenes (LDPE) and high density polyethylenes (HDPE) to form fuel like liquid.

One or more embodiments include the said process, wherein natural agent is utilised in the presence of which pyrolysis of waste plastic takes place.

One or more embodiments include the said process, wherein the chemical production process comprises a hydrogen production process.

One or more embodiments include the said process, wherein the chemical production process comprises an aromatics production process.

One or more embodiments include the said process, wherein the chemical production process comprises a liquid fuels production process.

Other objects, together with the foregoing, are attained in the embodiment of the invention described in the accompanying description and illustrated in the accompanying drawings, in which:

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 represents polymerisation reaction.

Fig. 2 represents chemical reaction of pyrolysis to produce fuel like liquid.

Fig. 3 represents pyrolysis apparatus with various components attached.

Fig. 4 represents actual pyrolysis apparatus developed.

DETAILED DESCRIPTION OF THE INVENTION

Pyrolysis is the thermal breakdown of organic materials such as plastic, which occurs at elevated temperature range of 300 – 800 °C in the oxygenless environment. As the result of pyrolysis of plastic polymer in the oxygen less environment, the low molecular weight hydrocarbon fragments get produced and these hydrocarbon fragments are recovered in the form of solid, liquid and gas. These recovered liquid fractions of hydrocarbon also possess some heating value and could be used as a fuel for vehicles and industrial motors.

Plastic is an organic polymer which derived from hydrocarbons. A number of low molecular weight hydrocarbon monomer units get combined to form a high molecular weight polymeric chain which is called the 'Plastic' and the process of formation of polymer is called 'Polymerization' as illustrated in Fig. 1. Pyrolysis of plastic waste involves thermal breakdown of plastic at the temperature range of 350- 800 °C in the absence of Oxygen as illustrated in Fig. 2.

In one embodiment of the present invention, the pyrolysis unit is specially designed for the thermal degradation of waste plastic at relatively low temperature by mixing an ecofriendly agent with the shredded waste plastic as illustrated in Fig. 3. The pyrolysis chamber 11 is made up of stainless steel material with a suitable dimensions in terms of height and diameter. The pyrolysis chamber 11 is designed with air tight lid 10 which helps to maintain the Oxygen less environment inside the chamber. The pyrolysis chamber 11 is mounted on iron poles 12 that hold the overall assembly and provide requisite support.

In another embodiment of the present invention, heating source 13 provided just below the pyrolysis chamber 11, has the power of 2 KW and operates at 220-240 V as per Indian electricity supply standards. Heating source 13 can produce the temperature range from room temperature to 400 °C, which is desired for the pyrolysis of plastic. The heating source 13 has the cavity (dimensions 500 X 500 X 300 mm) which is designed to maintain the uniform temperature around the pyrolysis chamber 11.

In yet another embodiment of the present invention, there is also provided a control panel 14, consisted of 'J' type thermocouple 18 and digital temperature controller. 'J' type thermocouple to sense the temperature inside the pyrolysis chamber and digital temperature controller displays the temperature inside the chamber. Digital temperature controller also helps to set the desired temperature. The pyrolysis unit is placed on an iron cart 15 to provide easy operability to pyrolysis unit. Wheels 16 provided at the base of iron cart 15 facilitates mobility of the pyrolysis unit so that it can be taken anywhere as per the need of the operation.

In still another embodiment of the present invention, specially designed collector 19 is attached to collect only liquid product, and not to collect the gaseous product. As a result of pyrolysis, the liquid vapors and gases produced are transferred from pyrolysis chamber to the collector with the help of tubes 20. The liquid product gets settled down at the bottom and gases escaped out to the chamber containing water in water tank 17.

The present embodiments of this invention are thus to be considered in all respects as

illustrative and not restrictive; the scope of the invention being indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are intended to be embraced therein.

EXAMPLE 1:

Fig. 4 illustrates actual pyrolysis apparatus developed in-house and capable of performing pyrolysis to produce fuel like. The pyrolysis chamber shown here is made up of stainless steel material with the dimensions of 465 mm X 200 mm (height X diameter). The capacity is 10 Liters and its working capacity is 2 liters. The chamber is designed with air tight lid which helps to maintain the Oxygen less environment inside the chamber.

ADVANTAGES

The present invention provides novel process of producing fuel like liquid.

The present invention provides better means of disposing waste plastics and polymers which are considered as burden for the environment.

The present invention provides faster mechanism of producing fuel like liquid.

The present invention aids in recycling environment waste.



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CLAIMS:

We claim,

1. A process of producing fuel like liquid by processing waste low density polyethylene at a high temperature in the presence of natural agent acting as deteriorating agent to produce fuel like liquid.
2. The process of producing fuel like liquid as claimed in claim 1 wherein natural agent catalysing pyrolysis is jute fibre dust.
3. The process of producing fuel like liquid as claimed in claim 1 wherein process comprising steps: a) collecting waste low density polyethylene and high density polyethylene; b) cleaning the said collected low density polyethylene and high density polyethylene with distilled water and then drying them completely; c) shredding said low density polyethylene and high density polyethylene into uniform small pieces; d) washing jute fibre dust with distilled water and drying it under the sun for one week until dried completely; e) adding mixture of low density polyethylene, high density polyethylene and dried jute fibre in a ratio 1:3:1 to the pyrolysis chamber and closing the lid; f) setting the temperature high upto 400 degree celcius to observe pyrolysis; g) collecting fuel like liquid from the opening.
4. The process of producing fuel like liquid as claimed in claim 1 wherein at least 60 percent of fuel like liquid is produced from the input material in one hour.
5. The process of producing fuel like liquid as claimed in claim 1 wherein products of pyrolysis of waste low density polyethylene and high density polyethylene can be collected in gaseous form and solid (like tar) from seperatly and can be recycled.
6. An apparatus for producing fuel like liquid comprising: pyrolysis chamber covered by air tight lid, heating source to provide elevated temperature, temperature controller, collector to collect liquid product, collecting tube to facilitate passage of gaseous products.
7. The apparatus for producing fuel like liquid as claimed in claim 6 wherein, temperature of pyrolysis can be controlled through j type micro-controller.

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