HIGH ENERGY GAS FLOW TYRE PYROLYSIS USING RF INDUCTIVE PLASMA IN COMBINATION WITH LF INDUCTION HEATING

Keywords: Plasma, induction heating, in flight processing, fluidized bath, Tyre recycling, tyre pyrolysis, waste to energy process

Field Of Invention:

[0001] The present invention relates to a use of our technology of RF Inductive Plasma in combination with LF Induction Heating, which controls both the atmosphere and temperature of the pyrolysis process to convert waste tyres to energy.

Background Of The Invention:

[0002] Cities and industries around the world are searching for an answer to their waste tyre management problems. The solution being presented provides a compelling solution to reversing full landfill sites and diverting the continuing annual growth of waste tyres to a useful product.

[0003] The majority of plasma pyrolysis systems today use plasma arc technology. Plasma arc technology uses two electrodes, usually consumable carbon, that when electricity is passed through them produce an incredibly hot arc plasma between the two electrodes. These electrodes require frequent replacement and arc based plasma systems have limited design and configuration parameters. Additionally, the existing tyre recycling methods raises various health, environmental and hazardous waste issues, some are more serious than others.

[0004] Our company has developed an innovative pyrolysis technology that solves many of the issues involved with previous methods and eliminates the need for scrap tyre land fills. RF Inductive Plasma in combination with LF Induction Heating (RIPIH) is the solution.

[0005] The use of RF Inductive Plasma in combination with LF Induction Heating (RIPIH) is a technology, which controls both the atmosphere and temperature of the pyrolysis process (see Figure 1. below). Emissions control becomes a simple industry standard process and the output becomes useful products.

Summary Of The Invention:

[0006] RF torch plasma is a flexible pyrolysis technique because the hot plasma field is formed by passing gas through an RF induction coil. This allows different gasses to be used to control the end result and also eliminates the need to shut down the reactor to replace electrodes.

[0007] Induction heating is designed to provide high temperature to a conduit tube attached to the RF Plasma outlet. The induction heating is accomplished using this conduit tube as the heat sink. The tube then radiates and convectively heats the passing gasses, liquids and solids.

[0008] The different gas compositions from the tyre pyrolysis, unlike the solid fraction, are not only affected by the reaction temperature but also by the process dwell times, type of plasma gas and type of carrier gas. This variability of inputs provides the ability to produce a range of quantities of the output constituents.

[0009] This proposal includes an RF plasma torch inline with an LF Induction heater. The LF Induction Heater will have an angle. This will create a fluidized bath and will allow the variation of the rubber particle dwell time. This added dwell time breaks down any heavy oils leaving the Plasma torch in long chain hydrocarbon gasses that are used to increase the heating value of the syngas.

Brief Description of the Drawings:

[0010] The present invention will now be fully described with reference to the following drawings:

[0011] FIGURE 1 - illustrates the Process Flow Diagram of High Energy Flow Tyre Pyrolysis

Detailed Description of the Drawing:

[0012] In the following description, details are provided to describe the embodiments in accordance with the present invention.

[0013] The technology used in accordance with the present invention uses RF Inductive Plasma in combination with LF Induction Heating, which controls both the atmosphere and temperature of the pyrolysis process to convert waste tyres to energy.

[0014] FIGURE 1, an illustration of the Process Flow Diagram of High Energy Flow tyre Pyrolysis that is used in the present invention. The gas 1 is being feed to 2 to maintain a constant flow and supply of rubber powder into the end of 4, whereas, the gas 3 is feed indirectly into 4 to create the flame. Reaction will take place in 5 via RF Inductive Plasma and in combination with LF Induction Heating, will produce syngas as the gas output product and carbon black/Heavy oil as the solid output products. The gas output product, which is syngas, is collected at 6 and converted into energy via engine generator or gas turbines.