WASTE TIRE RECYCLING SYSTEM

TECHNICAL FIELD

[1] The present invention relates to a system for recycling waste tires enabling to extract various energy sources from the waste tires by pyrolyzing the waste tires through a heating method using carrier gas, and more particularly, to a system for recycling waste tires enabling to improve convenience in operation by providing carrier gas containing various gases from outside.

BACKGROUND ART

[2] Recently, the demand for tires is rapidly increasing according to the increasing of the demand for vehicles, and therefore the amount of the waste tires is also increased.

[3] As well known, the waste tires are mainly composited high polymer compounds, and their caloric value is about 34MJ/kg which is higher than 29MJ/kg of a standard caloric value. Further, the general composition of tires is 43.5wt% of styrene-butadiene copolymer, 32.6wt% of carbon black, 21.7wt% of oil, and 2.2wt% of additives such as sulfur and zinc oxide except for iron cores and nylon.

[4] The Ministry of Environment prohibits the usage of the waste tires as fuel since they produce various environment pollutions such as sulfur oxides, non-burned hydrocarbon, and sooty smoke when burned.

[5] Therefore, a method to use the waste tires except for burning is researched. The waste tires are recycled as footpath blocks, recycled tires, recycled rubber, art fishing banks, and buffers of any structure, but their appliance is limited. Also, scrapped materials and pollutions are produced when the recycled products are manufactured,

and environmental pollution will be caused when they are scrapped.

[6] Meanwhile, a method to produce fuel without recycling the waste tires is tried. In producing fuel, a pyrolyzing furnace is used to pyrolyze the waste tires, and the method is divided a direct heating method and an indirect heating method according to the heating method of the pyrolyzing furnace.

[7] The direct heating method has a risk for explosion since a flame produced when the waste tires are heated is chemically reacted with the oxygen contained in air in the furnace. Also, the oil produced by the direct heating method contains moist and glass carbon, which causes the quality of the oil to be worse.

[8] The indirect heating method has no risk for explosion different from the above the direct heating method, but it has lower thermal efficiency and uses most of the oil obtained as a by-product as fuel, which causes the recycling system of the waste tires to be lowered in economy aspect and causes difficulty to treat carbon obtained as a by-product.

[9] To solve the above problems, the present applicant filed a system for recycling waste tires which is registered in Korean Patent No. 10-0628890.

[10] The system for recycling waste filed by the present applicant comprises a pyrolyzing means for pyrolyzing waste tires using carbon dioxide (CO2) or nitrogen (N2) as a carrier gas in a pyrolyzing furnace by means of the direct heating method; a first carbon treating means for separating carbon and iron cores by pulverizing the remains in the pyrolyzing furnace; an oil heaping means for separating oil by cooling condensing exhaust gas separated in the pyrolyzing furnace; a second carbon treating means for producing electricity and cooling water by operating a steam turbine and a suction typed refrigerator after producing high pressed steam using high temperature exhaust gas produced by incinerating the carbon separated by the first carbon treating

means; and an exhaust gas treating means for discharging pollution-free air after cleaning the exhaust gas which is exhausted from the second carbon treating means and for separating a portion of carbon dioxide (CO2) or nitrogen (N2) from the discharged air and collecting it.

[11] The above mentioned system for recycling waste tires uses the pyrolyzing furnace having the direct heating method which uses carrier gas, and therefore it prevents explosion of the pyrolyzing furnace and it can extract high pure oil which does not contains moisture and glass carbon.

[12] However, the system for recycling waste tires of the present applicant required an additional apparatus for providing and discharging carrier gas because carbon dioxide (CO2) or nitrogen (N2) is used as carrier gas although the pyrolysis is done by the direct heating method. Also, since it should be prepared the additional apparatus for timely providing carbon dioxide (CO2) or nitrogen (N2), the initial cost of equipment should be severely heavy and wider space to equip the apparatus should be required.

[13] Also, in the system for recycling waste tires, the carrier gas composed of carbon dioxide (CO2) or nitrogen (N2) contains oxygen since exterior air (oxygen) enters into a pyrolyzing furnace together with the entrance of waste tires during initial operation, and this oxygen is required to be discharged by continually providing carrier gas because the oxygen gets the quality of the extracted oil to be deteriorated. This discharge process requires lots amount of carrier gas for long time and long time to normally operate the system, which cause economical efficiency and operation efficiency to be decreased.

[14] To solve this problem, the present invention filed 「System for recycling waste tires」 with Korean Patent Application No. 10-2008-93763.

[15] The system for recycling waste tires includes a pyrolyzing furnace which pyrolyzes the waste tires by a direct heating method using a carrier gas and an oil collecting means which cooling condenses the high temperature steam produced in the pyrolyzing furnace and collects oil and,

[16] it comprises a carrier gas circulating line which passes the pyrolyzing furnace and an oil collecting means and recycles to the pyrolyzing furnace, and a carrier gas recycling provider connected to the carrier gas circulating line, provided with sensors for measuring the temperature in the pyrolyzing furnace and the pressure in the carrier gas circulating line, collecting and reserving non-condensed gas produced in the pyrolyzing furnace, and selectively providing it to the pyrolyzing furnace to use it as the carrier gas.

[17] The conventional system can be economically operated since it does not require additional carrier gas by using the non-condensed gas produced during the burning of waste tires as carrier gas.

[18] However, the conventional system should be additionally provided with the non-condensed gas produced by other systems since it has yet produced the non-condensed gas at initial operation, which causes inconvenience and inefficiency in use.

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[19] The present invention is created to solve a problem of the above-mentioned prior art, and accordingly one object of the present invention is to provide a system for recycling waste tires enabling to guarantee convenience in initial operation thereof by providing with various carrier gases from outside and to enhance reliability in

operation thereof by easily providing with new carrier gas when the non-condensed gas produced during the burning of waste tires is not sufficient as carrier gas.

TECHNICAL SOLUTION

[20] In order to achieve the above-described object, the present invention provides a system for recycling waste tires including a pyrolyzing furnace which pyrolyzes the waste tires by a direct heating method using a carrier gas, an oil collecting means which cooling condenses the high temperature steam produced in the pyrolyzing furnace and collects oil, and a carrier gas circulating line which passes the pyrolyzing furnace and an oil collecting means and recycles to the pyrolyzing furnace, and the system comprises a carrier gas provider which is connected to one end of the carrier gas circulating line (cl) and selectively provides carrier gas through the control of a valve, and it is provided with an element which is filled with carrier gas consist of methane, ethane, propane, butane, pentane, hexane, ammonia based gas or composition thereof.

[21] In the system according to the present invention, the carrier gas provider is composed of a carrier gas tank which is connected to the carrier gas circulating line (cl) and which is filled with the carrier gas therein; an oxygen detector which detects oxygen present in the carrier gas circulating line (cl); and an oxygen burner which is connected to the oxygen detector, receives the detected information, and selectively removes the oxygen in the carrier gas circulating line (cl) by burning

[22] The system according to the present invention further comprises: a carrier gas circulating provider which is connected to the carrier gas circulating line (cl), provided with a sensor for measuring the temperature in the pyrolyzing furnace and the pressure in the carrier gas circulating line (cl), collects and reserves the non-condensed gas

produced in the pyrolyzing furnace and selectively circulates it to the pyrolyzing furnace.

[23] In the system according to the present invention, the carrier gas circulating provider is pipe-connected to the carrier gas provider, selectively receives carrier gas and provides the carrier gas in the carrier gas circulating line (cl).

[24] In the system according to the present invention, the carrier gas circulating provider includes a pressure measurer which measures the pressure in the carrier gas circulating line (cl) and a temperature measurer which measures the temperature in the pyrolyzing furnace, as a sensing element.

[25] In the system according to the present invention, the carrier gas circulating provider includes a non-condensed gas reserving tank connected to the condensed gas circulating line (cl) and selectively reserving the non-condensed gas, and control valves connected to a pipe which connects the non-condensed gas reserving tank to the condensed gas circulating line (cl) and they selectively provide the non-condensed gas to the non-condensed gas reserving tank or provide the non-condensed gas in the non-condensed gas reserving tank to the condensed gas circulating line (cl).

[26] In the system according to the present invention, the carrier gas circulating provider provides the non-condensed gas flowing in the condensed gas circulating line (cl) in the non-condensed gas reserving tank when the pressure in the condensed gas circulating line (cl) is over 100mmAq and the temperature in the pyrolyzing furnace is over 200℃.

[27] In the system according to the present invention, the condensed gas circulating line (cl) is installed with an oxygen removing heater having a heating element which is selectively heated by an electric source to completely burn the oxygen contained in the condensed gas.

[28] The preferred embodiments of the present invention will be described with reference to the accompanying drawings. The terms or words used in the present specification and claims are not supposed to limit to simple meanings in dictionary, but are supposed to be interpreted to an extent that inventors choose them for the best descriptions in proper forms and to be interpreted with the best match with the technical concept of the present invention.

Advantageous Effects

[29] According to the system for recycling waste tires can enhance convenience in initial operation by providing with various carrier gases during initial operation thereof.

[30] In the system which the condensed gas produced during the burning of waste tires is used as carrier gas, when the non-condensed gas is not well produced or when the quality of the produced non-condensed gas is greatly bad, other carrier gas containing methane, ethane, propane, butane, pentane, hexane, ammonia etc. is continually provided, which allows the operation of the system to be stable and reliable.

BRIEF DESCRIPTION OF THE DRAWINGS

[31] FIG. 1 is a block view schematically illustrating a structure of a conventional system for recycling waste tires;

[32] FIG. 2 is a block view schematically illustrating a structure of a system for recycling waste tires according to one preferred embodiment of the present invention;

[33] FIG. 3 is a block view schematically illustrating a structure of a system for recycling waste tires according to another preferred embodiment of the present invention; and

[34] FIG. 4 is a view schematically illustrating a structure of a system for recycling

waste tires according to a preferred embodiment of the present invention.

[35] <Descriptions of major elements in the drawings>

[36] 1: furnace 2: pulverizer

[37] 3: chain conveyer 4: carbon reservoir

[38] 5: iron core reservoir 6: condenser

[39] 7: oil tank 8: cyclone

[40] 9: third separating tank 10: carbon furnace

[41] 11: first heat exchanger 12: second heat exchanger

[42] 13: steam turbine 14: absorber typed refrigerator

[43] 15: high pressure pump 16: cleaning top

[44] 17: gas separating apparatus 18: gas recycling blower

[45] 20: carrier gas circulating provider 50: carrier gas provider

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[46] The above and other objects and advantages of the present invention will become readily apparent by reference to the following detailed description.

[47] Hereinafter, a system for recycling waste tires according to preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[48] Note that the same components or parts are shown to have same reference numbers in the drawings. In describing the present invention, any related known function or structures are not described in detail so as to not vague the gist of the present invention.

[49] FIG. 2 is a block view schematically illustrating a structure of a system for recycling waste tires according to a preferred embodiment of the present invention.

[50] Firstly, the main elements of the present invention are explained as follows.

[51] Reference numeral (1) is a pyrolyzing furnace (1) for pyrolyzing waste tires by a direct heating method using gas such as carbon dioxide (CO2) or nitrogen (N2) as a carrier gas. The pyrolyzing furnace (1) is provided with an inlet through which the waste tires are entered on one side of the upper portion thereof. On the one side is provided with an outlet through which high temperature steam produced by the pyrolysis is circulated and an air outlet through which air is discharged during an initial operation. On the lower portion is provided with a discharging port through which remains produced after the pyrolysis is discharged.

[52] Reference numeral (2) is a pulverizer (2) for pyrolyzing the remains and provided on the lower portion of the discharging port of the pyrolyzing furnace (1). Reference numeral (3) is a chain conveyer (3) for separating the pulverized carbon and iron cores, and reference numeral (4) is a carbon reservoir (4) for reserving the separated carbon and iron cores respectively. Reference numeral (5) is an iron core reservoir (5).

[53] Reference numeral (6) is a condenser (6) for cooling condensing the high temperature air discharged through the outlet of the pyrolyzing furnace (1). Reference numeral (7) is an oil tank (7) for collecting oil separated during the cooling condensing, and reference numeral (8) is a cyclone (8) for collecting oil which is not collected during the cooling condensing and moves like gas together with carrier gas.

[54] Reference numeral (9) is a third separating tank (9) for collecting oil mist which is not collected by the cyclone (8) by directly contacting liquefied oil.

[55] Reference numeral (10) is a carbon furnace (10) in which the carbon reserved in the carbon reservoir (4) is moved and incinerated its self-heating, and reference numeral (11) is a first heat exchanger (11) for providing high temperature carrier gas to the pyrolyzing furnace (1) after receiving high temperature exhaust gas produced in the carbon furnace (10) and then heating the cooled carrier gas in high temperature.

Reference numeral (12) is a second heat exchanger (12) for making high pressured steam using the exhaust gas passed through the first heat exchanger (11), and reference numeral (13) is a steam turbine (13) for producing electricity using the high pressured steam.

[56] Reference numeral (14) is an absorber typed refrigerator (14) for condensing the lower pressured steam (about 5Kg/cm2) discharged from the steam turbine (13) by producing cooling water, and reference numeral (15) is a high pressure pump (15) for pumping the condensed water and recycling it to the second heat exchanger (12).

[57] Reference numeral (16) is a cleaning top (16) for cleaning the exhaust gas which is discharged from the second heat exchanger (12), and reference numeral (18) is a gas recycling blower (18).

[58] FIG. 3 is a block view schematically illustrating a structure of a system for recycling waste tires according to another preferred embodiment of the present invention, and FIG. 4 is a view schematically illustrating a structure of a system for recycling waste tires according to a preferred embodiment of the present invention. As shown, the system further comprises a carrier gas circulating provider (20) which collects the non-condensed gas naturally produced during the burning of waste tires and circulates it as carrier gas.

[59] The carrier gas circulating provider (20) of this embodiment enhances economical efficiency and yield to extract oil by using gas mist naturally produced during the burning of waste tires as carrier gas.

[60] The operation for every elements of the above mentioned system will be explained as follows with reference to the system which repeatedly uses the non-condensed gas as carrier gas in FIGs. 3 and 4.

[61] The pyrolyzing furnace 1 is an element to pyrolyze waste tires by a direct heating

method using non-condensed gas provided from a carrier gas circulating provider (20) as a carrier gas, and it is provided with an inlet through which the waste tires are entered, an outlet through which high temperature steam produced by the pyrolysis is discharged, and a discharging port through which remains produced by the pyrolysis is discharged. The gas in the pyrolyzing furnace (1) is outwardly discharged by inlet of the carrier gas, and a circulating outlet is opened after the air is completely discharged, which allows the non-condensed gas produced during the burning of the waste tires to be circulated. Herein, the carrier gas circulating line is (cl) in FIG. 2. That is, the heated steam produced during the burning of the waste tires which is injected in the pyrolyzing furnace (1) passes through the condenser (6), the cyclone (8), the third separating tank (9), the blower (18) and the first heat exchanger (11), and finally it is recycled to the pyrolyzing furnace (1).

[62] A treating means for treating the remains produced after pyrolysis includes the pulverizer (2) composed of a pair of rollers and for pulverizing the remains entered between the pair of rollers, the chain conveyer (3) for separating the pulverized carbon and iron cores during conveyer movement, and the carbon reservoir (4) and the iron core reservoir (5) for reserving the separated carbon and iron cores respectively.

[63] An oil collecting means is an element to separately extract the high temperature steam produced in the pyrolyzing furnace (1), and it includes a condenser (6) for cooling condensing the high temperature steam, an oil tank (7) for reserving oil which is firstly separated by cooling condensing of the condenser (6), a cyclone (8) for secondly collecting oil mist in gas condition with powerful whirlpool and transferring it to the oil tank (7), and a third separating tank (9) for collecting the remained oil which is not collected by the cyclone (8) by directly contacting it to liquefied oil.

[64] A carbon treating mean includes a carbon furnace (10) for producing high

temperature exhaust gas by burning carbon provided from the carbon reservoir (4), a first and second heat exchangers (11) and (12) for heating the exhaust gas, a steam turbine (13) for generating electricity by receiving the high pressure steam produced in the second heat exchanger (12), an absorber typed refrigerator (14) for producing condensed water by receiving the low pressure steam, and a high pressure pump (15) for recycling the condensed water to the second heat exchanger (12).

[65] The carrier gas circulating provider (20) is installed to be connected to the carrier gas circulating line (cl). Herein, the carrier gas circulating line (cl) indicates a path which passes the pyrolyzing furnace (1) and the oil collecting means and recycles to the pyrolyzing furnace (1), and it is shown as “cl”. The carrier gas circulating provider 20 installed on the carrier gas circulating line (cl) is provided with a sensor for measuring the temperature in the pyrolyzing furnace (1) and the pressure in the carrier gas circulating line (cl), and it collects and reserves the condensed gas produced in the pyrolyzing furnace 1 and selectively circulates it to the pyrolyzing furnace (1).

[66] Meanwhile, the carrier gas circulating provider (20) is a sensing element, and it includes a pressure measurer (21) for measuring the pressure in the carrier gas circulating line (cl) and a temperature measurer (23) for measuring the temperature in the pyrolyzing furnace (1). The pressure measurer (21) and the temperature measurer (23) can be embodied by means of well known analog or digital typed sensor and therefore it is not explained in detail.

[67] Further, the carrier gas circulating provider (20) further includes a non-condensed gas reserving tank (27) connected to the carrier gas circulating line (cl) and selectively reserving the non-condensed gas, and control valves (25, 29) connected to a pipe which connects the non-condensed gas reserving tank (27) to the carrier gas circulating line (cl) and they selectively provide the non-condensed gas to the non-

condensed gas reserving tank (27) or transfer the non-condensed gas reserved in the non-condensed gas reserving tank (27) to the carrier gas circulating line (cl) and finally provide it in the pyrolyzing furnace (1).

[68] In the present invention, when the pressure measurer (21) which is installed on the carrier gas circulating line (cl) and measures the pressure in the path measures over set value of 100mmAq and the temperature measurer (23) which measures the temperature in the pyrolyzing furnace (1) measures over set value of 200℃, it is deemed that non-condensed gas is produced in the pyrolyzing furnace (1). At this time, as shown in FIG. 3, the control valve (25) is opened such that the carrier gas circulating line (cl) and the non-condensed gas reserving tank (27) are connected from each other. And, a compressor (not shown) is operated such that the non-condensed gas flowing in the carrier gas circulating line (cl) is provided in the non-condensed gas reserving tank (27). Conversely, when the pressure measurer (21) and the temperature measurer (23) are below the set values, the control valve (25) is closed and the control valve (29) is opened such that the non-condensed gas reserved in the non-condensed gas reserving tank (27) is transferred to the carrier gas circulating line (cl) and finally it is provided in the pyrolyzing furnace (1).

[69] This structure is almost identical with that of the system before filed by the present invention.

[70] As shown in FIG. 2, the present invention further provides a carrier gas provider (50) for providing the carrier gas composed of methane, ethane, propane, butane, pentane, hexane, ammonia or composition thereof to the carrier gas circulating line (cl) as carrier gas at the initial operation. Also, as shown in FIGs. 3 and 4, the present invention further provides a carrier gas provider (50) for auxiliary providing carrier gas when the non-condensed gas is not stably produced in the system.

[71] The carrier gas provider (50) is composed of a carrier gas tank (51) which is filled with carrier gas therein and which is connected to the carrier gas circulating line (cl) through the carrier gas is circulated, an oxygen detector (52) which detects oxygen present in the carrier gas circulating line (cl) and an oxygen burner (30) which is connected to the oxygen detector (52), receives the detected information and selectively removes the oxygen in the carrier gas circulating line (cl) by burning based on the detected information.

[72] As shown in FIG. 2, the carrier gas provider (50) may be directly connected to the carrier gas circulating line (cl) through a line to provide carrier gas. Alternatively, as shown in FIGs. 3 and 4, the carrier gas provider (50) may recycle the non-condensed gas produced during the burning of waste tires as carrier gas.

[73] As shown in FIG. 2, when the carrier gas provider (50) is directly connected to the carrier gas circulating line (cl) through a line, the line which connects the carrier gas circulating provider (20) and the carrier gas provider (50) from each other can be controlled by a valve. This valve structure may be variously embodied by the well-known art, and therefore its detailed description is omitted.

[74] As shown in FIGs. 3 and 4, when the carrier gas provider (50) is connected not to the carrier gas circulating line (cl) but to the carrier gas circulating provider (20), the carrier gas provided from the carrier gas provider (50) is preferably provided in the carrier gas circulating line (cl) at a condition in which the non-condensed gas present in the non-condensed gas reserving tank (27) which reserves the non-condensed gas of the elements composed of the carrier gas circulating provider (20) is discharged. This may be variously embodied by the well-known art, and therefore its detailed description is omitted.

[75] The carrier gas provider (50) which is directly connected to the carrier gas

circulating line (cl) or connected to the carrier gas circulating provider (20) has a structure as follows.

[76] The carrier gas tank (51) is filled with gas which composed of more than one of methane, ethane, propane, butane, pentane, hexane, ammonia or composition thereof.

[77] The carrier gas tank (51) may be filled with gas which composed of more than one of methane, ethane, propane, butane, pentane, hexane, ammonia or composition thereof form outside, or it may be changed new one. Also, it may be easily connected to or disconnected from the carrier gas circulating line (cl).

[78] The oxygen detector (52) is connected to the carrier gas circulating line (cl) and detects the oxygen contained the carrier gas which is flowing in the line (cl), and it detects the oxygen when the oxygen is contained in the carrier gas and gives the detecting information to the oxygen burner (30). The oxygen detector (52) may be installed to the carrier gas circulating line (cl) with a constant distance.

[79] The oxygen burner (30) is connected to the carrier gas circulating line (cl) and removes the oxygen contained in the carrier gas by burning. The oxygen burner (30) is provided with a heating line which generates heat by receiving the exterior power when it is given the detecting information from the oxygen detector (52), and it burns the oxygen contained in the carrier gas using the heating line. In the present invention, the oxygen burner (30) is provided with a heating line, but it may be variously changed with the well-known art if the oxygen contained in the carrier gas may be well burned.

[80] The operation of the system for recycling waste tires of the present invention having the above described structure will be explained as follows.

[81] Hydrocarbon composed of methane, ethane, propane, butane, pentane, or hexane based gas has greater thermal capacity than nitrogen or carbon dioxide, and therefore it can transfer much more amount of heat when same amount of gas is sent by a blower.

Therefore, hydrocarbon can much quickly pyrolyze the waste tires in a pyrolysis furnace, and therefore it can treat much more tires than nitrogen or carbon dioxide.

[82] Amount of heat transferred of Hydrocarbon (methane, ethane, propane, butane, pentane, or hexane based gas), Nitrogen and Carbon dioxide is listed in Table 1.

[83] [Table 1]

[84]

Gas	Total amount of heat transferred
Nitrogen	100
Carbon dioxide	101
Methane based gas	114
Ethane based gas	139
Propane based gas	178
Butane based gas	245
Pentane based gas	302
Hexane based gas	359

* Amount of heat transferred by Nitrogen is 100, and other values are compared with the value of 100.

[85] According to the Table 1, when the butane based gas is used as carrier gas, the rate of pyrolysis is faster about 2.5 times than the nitrogen, which allows it to treat about 2.5 times of waste tires. Therefore, the treat capacity can be enhanced without an enlargement of the system.

[86] In a condition in which oxygen is present in the carrier gas circulating line (cl), the temperature of waste tires is over 250℃, the oxygen is firstly reacted to the rubber of the waste tires and glass carbon (C) and water are produced. This is mixed to oil

which is being extracted and deteriorates the quality of the oil and the yield to extract oil. Whereas, when hydrocarbon is used as carrier gas, the oxygen present in the system can be removed by reacting it with the hydrocarbon in the high temperature of first heat exchanger prior to the temperature of the waste tires is over 250℃.

[87] Although the preferred embodiment of the present invention have been described, it is understood that the present invention should not be limited to this preferred embodiment but various changes and modifications can be made by one skilled in the art within the sprit and scope of the present invention aimed.

What is claimed is:

1. A system for recycling waste tires including a pyrolyzing furnace which pyrolyzes the waste tires by a direct heating method using a carrier gas, an oil collecting means which cooling condenses the high temperature steam produced in the pyrolyzing furnace and collects oil, and a carrier gas circulating line which passes the pyrolyzing furnace and an oil collecting means and recycles to the pyrolyzing furnace, the system comprising:

a carrier gas provider 50 which is connected to one end of the carrier gas circulating line (cl) and selectively provides carrier gas through the control of a valve 53, and it is provided with an element which is filled with carrier gas consist of methane, ethane, propane, butane, pentane, hexane, ammonia based gas or composition thereof.

2. The system according to claim 1, wherein the carrier gas provider 50 is composed of a carrier gas tank 51 which is connected to the carrier gas circulating line (cl) and which is filled with the carrier gas therein; an oxygen detector 52 which detects oxygen present in the carrier gas circulating line (cl); and an oxygen burner 30 which is connected to the oxygen detector 52, receives the detected information, and selectively removes the oxygen in the carrier gas circulating line (cl) by burning

3. The system according to claim 1, wherein further comprising: a carrier gas circulating provider 20 which is connected to the carrier gas circulating line (cl), provided with a sensor for measuring the temperature in the pyrolyzing furnace 1 and the pressure in the carrier gas circulating line (cl), collects and reserves the non-

condensed gas produced in the pyrolyzing furnace 1 and selectively circulates it to the pyrolyzing furnace 1.

4. The system according to claim 3, wherein the carrier gas circulating provider 20 is pipe-connected to the carrier gas provider 50, selectively receives carrier gas and provides the carrier gas in the carrier gas circulating line (cl).

5. The system according to claim 3, wherein the carrier gas circulating provider 20 includes a pressure measurer 21 which measures the pressure in the carrier gas circulating line (cl) and a temperature measurer 23 which measures the temperature in the pyrolyzing furnace 1, as a sensing element.

6. The system according to claim 3, wherein the carrier gas circulating provider 20 includes a non-condensed gas reserving tank 27 connected to the condensed gas circulating line (cl) and selectively reserving the non-condensed gas, and control valves 25 and 29 connected to a pipe which connects the non-condensed gas reserving tank 27 to the condensed gas circulating line (cl) and they selectively provide the non-condensed gas to the non-condensed gas reserving tank 27 or provide the non-condensed gas in the non-condensed gas reserving tank 27 to the condensed gas circulating line (cl).

7. The system according to claim 3, wherein the carrier gas circulating provider 20 provides the non-condensed gas flowing in the condensed gas circulating line (cl) in the non-condensed gas reserving tank 27 when the pressure in the condensed gas circulating line (cl) is over 100mmAq and the temperature in the

pyrolyzing furnace 1 is over 200℃.

8. The system according to claim 1, wherein the condensed gas circulating line (cl) is installed with an oxygen removing heater 30 having a heating element which is selectively heated by an electric source to completely burn the oxygen contained in the condensed gas.