Citation List

Patent Literature

[0004] Patent document 1: Japanese laid-open patent publication No. 2001-107058

Summary

Technical Problem

[0005] Patent Document 1 describes that slaked lime and waste plastic are supplied to a rotary kiln, and chlorine derived from PVC in the waste plastic is dechlorinated while the waste plastic is pyrolyzed. However, the waste plastic may often contain not only PVC but also PET. Therefore, when the waste plastic is treated, it is necessary to treat not only PVC but also PET. In particular, PVC contains phthalate ester (a main component of PET) as a plasticizer that has been added to PVC in order to make it flexible. As a result, the treatment aimed at either PVC or PET cannot achieve the intended chemical recycling.

[0006] Therefore, the present disclosure provides a raw-material supply system and a raw-material supply method capable of improving an efficiency of chemical recycling and capable of preventing fouling and corrosion of equipment by appropriately treating PVC and PET contained in waste plastic before sending the waste plastic to a pyrolysis furnace.

Solution to Problem

[0006a] In one aspect, the disclosure refers to a raw-material supply system for pyrolyzing waste plastic containing polyvinyl chloride and polyethylene terephthalate, the raw-material supply system comprising:

a slaked-lime supply device configured to feed slaked lime to the waste plastic;

an operation controller configured to instruct the slaked-lime supply device to feed the slaked lime to the waste plastic, the slaked lime to be fed having the number of moles that is 1 to 4 times a total number of moles of the polyvinyl chloride and the polyethylene terephthalate in the waste plastic;

a melting dechlorination device configured to dechlorinate the polyvinyl chloride

and hydrolyze the polyethylene terephthalate by mixing the waste plastic and the slaked lime while heating the waste plastic and the slaked lime;

a degassing hopper coupled to the melting dechlorination device and configured to store the waste plastic that has been melted by the melting dechlorination device; and

a raw-material supply device configured to deliver the molten waste plastic from the degassing hopper to a pyrolysis furnace,

wherein the pyrolysis furnace comprises a pyrolysis furnace of a fluidized-bed furnace,

the fluidized-bed furnace includes the pyrolysis furnace and a medium regeneration furnace containing a fluidized medium that circulates between the pyrolysis furnace and the medium regeneration furnace,

the raw-material supply system further comprises a fluidized-medium transfer line configured to deliver a part of the fluidized medium from the medium regeneration furnace to the melting dechlorination device, and

the part of the fluidized medium constitutes a heat source of the melting dechlorination device.

[0007] In an example, there is provided a raw-material supply system for pyrolyzing waste plastic containing polyvinyl chloride and polyethylene terephthalate, the raw-material supply system comprising: a slaked-lime supply device configured to feed slaked lime to the waste plastic; an operation controller configured to instruct the slaked-lime supply device to feed the slaked lime to the waste plastic, the slaked lime to be fed having the number of moles that is 1 to 4 times a total number of moles of the polyvinyl chloride and the polyethylene terephthalate in the waste plastic; a melting dechlorination device configured to dechlorinate the polyvinyl chloride and hydrolyze the polyethylene terephthalate by mixing the waste plastic and the slaked lime while heating the waste

plastic and the slaked lime; a degassing hopper coupled to the melting dechlorination device and configured to store the waste plastic that has been melted by the melting dechlorination device; and a raw-material supply device configured to deliver the molten waste plastic from the degassing hopper to a pyrolysis furnace.

[0008] In an example, the raw-material supply system further comprises a weight measuring device configured to measure a weight of the waste plastic before the slaked lime is fed to the waste plastic, the operation controller being configured to adjust an amount of the slaked lime to be fed to the waste plastic based on a measured value of the weight of the waste plastic.

In an example, the raw-material supply system further comprises a cracked-oil characteristic measuring device configured to measure a characteristic of a cracked oil recovered from a pyrolysis gas discharged from the pyrolysis furnace, the operation controller being configured to adjust an amount of the slaked lime to be fed to the waste plastic based on a measured value of the characteristic of the cracked oil.

In an example, the cracked-oil characteristic measuring device is at least one of a chlorine-concentration measuring device configured to measure a concentration of chlorine in the cracked oil, an acid-concentration measuring device configured to measure a concentration of acid in the cracked oil, a pH measuring device configured to measure a pH of the cracked oil, and a pH measuring device configured to measure a pH of water separated from the cracked oil.

In an example, the raw-material supply system further comprises a water scrubber configured to condense hydrocarbon vapor generated from the heated waste plastic to recover cracked oil, the water scrubber being coupled to the degassing hopper.

In an example, the pyrolysis furnace comprises a pyrolysis furnace of a fluidized-bed furnace, the fluidized-bed furnace includes the pyrolysis furnace and a medium regeneration furnace containing a fluidized medium that circulates between the pyrolysis furnace and the medium regeneration furnace, the raw-material supply system

further comprises a fluidized-medium transfer line configured to deliver a part of the

fluidized medium from the medium regeneration furnace to the melting dechlorination device, and the part of the fluidized medium constitutes a heat source of the melting dechlorination device.

[0008a] In another aspect, there is provided a raw material supply method for pyrolyzing waste plastic containing polyvinyl chloride and polyethylene terephthalate, the method comprising:

feeding slaked lime to the waste plastic, the slaked lime having the number of moles that is 1 to 4 times a total number of moles of the polyvinyl chloride and the polyethylene terephthalate in the waste plastic;

mixing the waste plastic and the slaked lime while heating the waste plastic and the slaked lime in a melting dechlorination device to dechlorinate the polyvinyl chloride and hydrolyze the polyethylene terephthalate; and

supplying the waste plastic that has been melted by being heated to a pyrolysis furnace,

wherein the pyrolysis furnace comprises a pyrolysis furnace of a fluidized-bed furnace,

the fluidized-bed furnace includes the pyrolysis furnace and a medium regeneration furnace containing a fluidized medium that circulates between the pyrolysis furnace and the medium regeneration furnace,

a part of the fluidized medium is delivered from the medium regeneration furnace to the melting dechlorination device, and

the part of the fluidized medium is used as a heat source of the melting dechlorination device.

[0009] In an example, there is provided a raw-material supply method for pyrolyzing waste plastic containing polyvinyl chloride and polyethylene terephthalate, the method comprising: feeding slaked lime to the waste plastic, the slaked lime having the number of moles that is 1 to 4 times a total number of moles of the polyvinyl chloride and the polyethylene terephthalate in the waste plastic; mixing the waste plastic and the slaked

lime while heating the waste plastic and the slaked lime to dechlorinate the polyvinyl chloride and hydrolyze the polyethylene terephthalate; and supplying the waste plastic that has been melted by being heated to a pyrolysis furnace.

[0010] In an example, the raw-material supply method further comprises measuring a weight of the waste plastic before the slaked lime is fed to the waste plastic, an amount of the slaked lime to be fed to the waste plastic being adjusted based on a measured value of the weight of the waste plastic.

In an example, the raw-material supply method further comprises measuring a characteristic of a cracked oil recovered from a pyrolysis gas discharged from the pyrolysis furnace, an amount of the slaked lime to be fed to the waste plastic being adjusted based on a measured value of the characteristic of the cracked oil.

In an example, the characteristic of the cracked oil is at least one of a concentration of chlorine in the cracked oil, a concentration of acid in the cracked oil, a pH of the cracked oil, and a pH of water separated from the cracked oil.

In an example, the raw-material supply method further comprises condensing hydrocarbon vapor generated from the heated waste plastic by a water scrubber to recover cracked oil.

In an example, the pyrolysis furnace comprises a pyrolysis furnace of a fluidized-bed furnace, the fluidized-bed furnace includes the pyrolysis furnace and a medium regeneration furnace containing a fluidized medium that circulates between the

pyrolysis furnace and the medium regeneration furnace, a part of the fluidized medium is delivered from the medium regeneration furnace to the melting dechlorination device, and the part of the fluidized medium is used as a heat source of the melting dechlorination device.

Advantageous Effects of Disclosure

[0011] According to the present disclosure, the following effects can be obtained.

Since the slaked lime fed to the waste plastic has the number of moles that is 1 to 4 times the total number of moles of PVC (polyvinyl chloride) and PET (polyethylene terephthalate) in the waste plastic, appropriate dechlorination treatment of PVC and appropriate hydrolysis of PET are achieved. As a result, appropriate chemical recycling of the waste plastic can be achieved in the subsequent pyrolysis furnace. Furthermore, corrosion and fouling of equipment can be suppressed (reliability improved), and an improved yield of the cracked oil (mainly benzene) can be expected.

[0012] The amount of slaked lime to be fed to the waste plastic is automatically adjusted based on the weight of the waste plastic to be treated or the characteristic of the cracked oil recovered from the pyrolysis gas generated by the pyrolysis of the waste plastic in the pyrolysis furnace. The weight of PVC and PET in the weight of the waste plastic can be determined by examining the compositions of the waste plastic in advance. The characteristic (e.g., pH) of the cracked oil recovered from the pyrolysis gas may vary depending on the amount of the slaked lime that has been fed. Therefore, an appropriate amount of slaked lime can be fed to the waste plastic based on the information.

Hydrocarbon vapor generated from the heated waste plastic is condensed by the water scrubber and recovered as cracked oil. Therefore, a yield of the cracked oil is improved.

Brief Description of Drawings

[0013]

[FIG. 1] FIG. 1 is a schematic diagram illustrating an embodiment of a treatment system

CLAIMS

[Claim 1] A raw-material supply system for pyrolyzing waste plastic containing polyvinyl chloride and polyethylene terephthalate, the raw-material supply system comprising:

a slaked-lime supply device configured to feed slaked lime to the waste plastic;

an operation controller configured to instruct the slaked-lime supply device to feed the slaked lime to the waste plastic, the slaked lime to be fed having the number of moles that is 1 to 4 times a total number of moles of the polyvinyl chloride and the polyethylene terephthalate in the waste plastic;

a melting dechlorination device configured to dechlorinate the polyvinyl chloride and hydrolyze the polyethylene terephthalate by mixing the waste plastic and the slaked lime while heating the waste plastic and the slaked lime;

a degassing hopper coupled to the melting dechlorination device and configured to store the waste plastic that has been melted by the melting dechlorination device; and

a raw-material supply device configured to deliver the molten waste plastic from the degassing hopper to a pyrolysis furnace,

wherein the pyrolysis furnace comprises a pyrolysis furnace of a fluidized-bed furnace,

the fluidized-bed furnace includes the pyrolysis furnace and a medium regeneration furnace containing a fluidized medium that circulates between the pyrolysis furnace and the medium regeneration furnace,

the raw-material supply system further comprises a fluidized-medium transfer line configured to deliver a part of the fluidized medium from the medium regeneration furnace to the melting dechlorination device, and

the part of the fluidized medium constitutes a heat source of the melting dechlorination device.

[Claim 2] The raw-material supply system according to claim 1, further comprising a weight measuring device configured to measure a weight of the waste plastic before the slaked lime is fed to the waste plastic, the operation controller being configured to adjust an amount of the slaked lime to be fed to the waste plastic based on a measured value of the weight of the waste plastic.

[Claim 3] The raw-material supply system according to claim 1 further comprising a cracked-oil characteristic measuring device configured to measure a characteristic of a cracked oil recovered from a pyrolysis gas discharged from the pyrolysis furnace, the operation controller being configured to adjust an amount of the slaked lime to be fed to the waste plastic based on a measured value of the characteristic of the cracked oil.

[Claim 4] The raw-material supply system according to claim 3, wherein the cracked-oil characteristic measuring device is at least one of a chlorine-concentration measuring device configured to measure a concentration of chlorine in the cracked oil, an acid-concentration measuring device configured to measure a concentration of acid in the cracked oil, a pH measuring device configured to measure a pH of the cracked oil, and a pH measuring device configured to measure a pH of water separated from the cracked oil.

[Claim 5] The raw-material supply system according to any one of claims 1 to 4, further comprising a water scrubber configured to condense hydrocarbon vapor generated from the heated waste plastic to recover cracked oil, the water scrubber being coupled to the degassing hopper.

[Claim 6] A raw-material supply method for pyrolyzing waste plastic containing polyvinyl chloride and polyethylene terephthalate, the method comprising:

feeding slaked lime to the waste plastic, the slaked lime having the number of moles that is 1 to 4 times a total number of moles of the polyvinyl chloride and the

polyethylene terephthalate in the waste plastic;

mixing the waste plastic and the slaked lime while heating the waste plastic and the slaked lime in a melting dechlorination device to dechlorinate the polyvinyl chloride and hydrolyze the polyethylene terephthalate; and

supplying the waste plastic that has been melted by being heated to a pyrolysis furnace,

wherein the pyrolysis furnace comprises a pyrolysis furnace of a fluidized-bed furnace,

the fluidized-bed furnace includes the pyrolysis furnace and a medium regeneration furnace containing a fluidized medium that circulates between the pyrolysis furnace and the medium regeneration furnace,

a part of the fluidized medium is delivered from the medium regeneration furnace to the melting dechlorination device, and

the part of the fluidized medium is used as a heat source of the melting dechlorination device.

[Claim 7] The raw-material supply method according to claim 6, further comprising measuring a weight of the waste plastic before the slaked lime is fed to the waste plastic, an amount of the slaked lime to be fed to the waste plastic being adjusted based on a measured value of the weight of the waste plastic.

[Claim 8] The raw-material supply method according to claim 6, further comprising measuring a characteristic of a cracked oil recovered from a pyrolysis gas discharged from the pyrolysis furnace, an amount of the slaked lime to be fed to the waste plastic being adjusted based on a measured value of the characteristic of the cracked oil.

[Claim 9] The raw-material supply method according to claim 8, wherein the characteristic of the cracked oil is at least one of a concentration of chlorine in the

cracked oil, a concentration of acid in the cracked oil, a pH of the cracked oil, and a pH of water separated from the cracked oil.

[Claim 10] The raw-material supply method according to any one of claims 6 to 9, further comprising condensing hydrocarbon vapor generated from the heated waste plastic by a water scrubber to recover cracked oil.