as pyrolysis products from the treatment object.

Citation List

Patent Literature

[0005] Patent document 1: Japanese Patent No. 6933577

Summary

Technical Problem

[0006] However, the cracked oil recovered by the pyrolysis of the treatment object contains a large amount of oxygen atoms, and therefore the cracked oil is poor in quality as a chemical feedstock or fuel, making it difficult to use the cracked oil as a basic chemical product or use the cracked oil in engines or high-efficiency power generation equipment. In particular, bio-oil generated by the pyrolysis of biomass has a high oxygen-atom content rate, and a calorific value of the bio-oil is less than half that of petroleum-based fuel oil. Furthermore, water and acid-by-products corrode equipment, and can cause fouling of the equipment and catalyst due to increased coke production.

[0007] Therefore, the present disclosure provides a pyrolysis treatment system and a pyrolysis treatment method that can recover high-quality oil from an oxygen-atom-containing treatment object, such as biomass.

Solution to Problem

[0008] In an aspect, there is a pyrolysis treatment system for treating a treatment object containing oxygen atoms, comprising: a fluidized-bed furnace having a pyrolysis furnace configured to generate pyrolysis gas by pyrolyzing the treatment object, and a medium regeneration furnace configured to combust residue of the pyrolyzed treatment object; a condenser configured to condense oil component and moisture contained in the pyrolysis gas to recover oil-water mixture and light gas separately; a gas separator configured to recover reducing gas from the light gas; a reducing-gas transfer line configured to transfer the reducing gas, recovered by the gas separator, to the pyrolysis furnace; and a fuel line configured to transfer the light gas, from which the reducing gas has been separated, to the medium regeneration furnace.

[0009] In an example, the fluidized-bed furnace is an internal circulating fluidized-bed gasification system in which fluidized medium circulates between the pyrolysis furnace and the medium regeneration furnace.

In an example, the pyrolysis treatment system further comprises a solid-gas separator disposed between the pyrolysis furnace and the condenser, the solid-gas separator being configured to separate particles from the pyrolysis gas discharged from the pyrolysis furnace.

In an example, the condenser includes an oil scrubber and a water scrubber.

In an example, the pyrolysis treatment system further comprises an oil-water separator configured to divide the oil-water mixture, discharged from the water scrubber, into oil and water.

In an example, the pyrolysis treatment system further comprises a hydrocracker configured to perform hydrogenation on the oil recovered from the oil-water mixture.

[0010] In an aspect, there is provided a pyrolysis treatment method for treating a treatment object containing oxygen atoms, comprising: pyrolyzing the treatment object in a pyrolysis furnace of a fluidized-bed furnace to generate pyrolysis gas; condensing oil component and moisture contained in the pyrolysis gas by a condenser to recover oil-water mixture and light gas separately; recovering reducing gas from the light gas by a gas separator; transferring the reducing gas, recovered by the gas separator, to the pyrolysis furnace to cause hydrogen, contained in the reducing gas, to perform hydrogenation of the treatment object containing oxygen atoms and the pyrolysis gas in the pyrolysis furnace; and delivering, as fuel, the light gas from which the reducing gas has been separated to a medium regeneration furnace of the fluidized-bed furnace to combust residue of the pyrolyzed treatment object.

[0011] In an example, the fluidized-bed furnace is an internal circulating fluidized-bed gasification system in which fluidized medium circulates between the pyrolysis furnace and the medium regeneration furnace.

In an example, the pyrolysis treatment method further comprises separating particles from the pyrolysis gas discharged from the pyrolysis furnace by a solid-gas separator disposed between the pyrolysis furnace and the condenser.

In an example, the condenser includes an oil scrubber and a water scrubber.

In an example, the pyrolysis treatment method further comprises dividing the oil-water mixture, discharged from the water scrubber, into oil and water.

Advantageous Effects

[0012] The gas separator separates the reducing gas containing hydrogen from the pyrolysis gas. The reducing gas is delivered to the pyrolysis furnace. The hydrogen contained in the reducing gas reacts with the oxygen atoms contained in the pyrolysis gas in the pyrolysis furnace, thereby causing the hydrogenation of the pyrolysis gas. The moisture produced by the hydrogenation is condensed in the condenser. The liquid oil and the water are separated, so that the oil can be recovered. In particular, the high heat of the pyrolysis gas can be used directly for the hydrogenation in the pyrolysis furnace.

Brief Description of Drawings

[0013]

[FIG. 1] FIG. 1 is a block diagram showing an embodiment of a pyrolysis treatment system;

[FIG. 2] FIG. 2 is a block diagram showing another embodiment of a pyrolysis treatment system;

[FIG. 3] FIG. 3 is a block diagram showing yet another embodiment of a pyrolysis treatment system;

[FIG. 4] FIG. 4 is a block diagram showing yet another embodiment of a pyrolysis treatment system; and

[FIG. 5] FIG. 5 is a block diagram showing yet another embodiment of a pyrolysis treatment system.

Description of Embodiments

[0014] Hereinafter, embodiments of the present invention will be described with