CLAIMS

1. A waste treatment facility for recovering granular plastic from waste containing biomass and plastic, comprising:

a biomass reduction device configured to perform a biomass reduction process on the waste for reducing a content of the biomass in the waste;

a plastic hydrothermal treatment device configured to perform a plastic hydrothermal treatment on plastic waste which is the waste that has been subjected to the biomass reduction process; and

a plastic recovery device for recovering the granular plastic from the plastic waste that has been subjected to the plastic hydrothermal treatment.

2. The waste treatment facility according to claim 1,

wherein the biomass reduction device includes:

a biomass hydrothermal treatment device configured to perform a biomass hydrothermal treatment on the waste at a treatment temperature lower than a treatment temperature of the plastic hydrothermal treatment; and

a biomass recovery device configured to recover granular biomass from the waste that has been subjected to the biomass hydrothermal treatment.

3. The waste treatment facility according to claim 2,

wherein the biomass hydrothermal treatment device is configured to dry the waste that has been subjected to the biomass hydrothermal treatment by using steam supplied to the biomass hydrothermal treatment device as a heat source.

4. The waste treatment facility according to any one of claims 1 to 3, further comprising a controller for controlling the biomass reduction device until a biomass proportion, which is a proportion occupied by the biomass in the waste, falls within a predetermined target range.

5. The waste treatment facility according to claim 4,

wherein the controller includes:

a first acquisition unit for acquiring first data defining a first relationship between a biomass ratio, which is a proportion of the biomass in the plastic waste when supplied to the plastic hydrothermal treatment device, and a particle size of the plastic in the plastic waste that has been subjected to the plastic hydrothermal treatment; and

a target range setting unit for setting the target range based on the first data.

6. The waste treatment facility according to claim 5,

wherein the first data defines a plurality of patterns of the first relationship according to a biomass concentration, which is a proportion of the biomass with respect to moisture in the plastic waste when supplied to the plastic hydrothermal treatment device.

7. The waste treatment facility according to claim 5 or 6,

wherein the first data defines a plurality of patterns of the first relationship according to a proportion of lignin in the biomass in the plastic waste when supplied to the plastic hydrothermal treatment device.

8. The waste treatment facility according to any one of claims 1 to 7, further comprising a first measuring device for measuring a residual biomass ratio, which is a proportion occupied by the biomass remaining in the plastic waste.

9. The waste treatment facility according to claim 8,

wherein the first measuring device includes:

a camera for capturing an image of the plastic waste;

a specifying device for specifying, in a captured image of the camera, a non-biomass region showing non-biomass in the plastic waste and a biomass region showing the biomass in

the plastic waste; and

a calculation device for calculating the residual biomass ratio based on a ratio between the biomass region and the non-biomass region and a specific gravity of each of the biomass and the non-biomass.

10. The waste treatment facility according to claim 9,

wherein the camera is configured to generate spectrum data indicating an intensity of light in a predetermined wavelength band, and

wherein the specifying device has:

an intensity acquisition unit for acquiring, in the spectrum data, a first intensity, a second intensity, a third intensity, and a fourth intensity respectively corresponding to a first wavelength, a second wavelength, a third wavelength, and a fourth wavelength; and

an identification unit for identifying whether the plastic waste captured in the image is the biomass or the plastic based on a first ratio, which is a ratio between the first intensity and the second intensity, and a second ratio, which is a ratio between the third intensity and the fourth intensity.

11. A waste treatment facility for recovering granular plastic from waste containing biomass and plastic, comprising:

a second measuring device for measuring a biomass ratio, which is a proportion occupied by the biomass in the waste;

a plastic hydrothermal treatment device configured to perform a plastic hydrothermal treatment on the waste having the biomass ratio equal to or less than an upper limit value of a specified range; and

a plastic recovery device for recovering the granular plastic from the waste that has been subjected to the plastic hydrothermal treatment.

12. The waste treatment facility according to claim 11, further comprising:

a biomass adding device for adding a ratio adjusting biomass to the waste having the biomass ratio lower than a lower limit value of the specified range; and

a controller for controlling the biomass adding device until the biomass ratio falls within the specified range,

wherein the plastic hydrothermal treatment device is configured to perform the plastic hydrothermal treatment on the waste to which the ratio adjusting biomass has been added.

13. The waste treatment facility according to claim 12,

wherein the controller includes:

a first acquisition unit for acquiring first data defining a first relationship between the biomass ratio when supplied to the plastic hydrothermal treatment device and a particle size of the plastic in the waste that has been subjected to the plastic hydrothermal treatment; and

a specified range setting unit for setting the specified range based on the first data.

14. The waste treatment facility according to claim 13,

wherein the first data defines a plurality of patterns of the first relationship according to a biomass concentration, which is a proportion of the biomass with respect to moisture in the waste when supplied to the plastic hydrothermal treatment device.

15. The waste treatment facility according to claim 13 or 14,

wherein the first data defines a plurality of patterns of the first relationship according to a proportion of lignin in the biomass in the waste when supplied to the plastic hydrothermal treatment device.

16. The waste treatment facility according to any one of claims 7 to 15,

wherein the second measuring device includes:

a camera for capturing an image of the waste;

a specifying device for specifying, in a captured image of the camera, a non-biomass

region showing non-biomass in the waste and a biomass region showing the biomass in the waste; and

a calculation device for calculating the biomass ratio based on a ratio between the biomass region and the non-biomass region and a specific gravity of each of the biomass and the non-biomass.

17. The waste treatment facility according to claim 16,

wherein the camera is configured to generate spectrum data indicating an intensity of light in a predetermined wavelength band, and

wherein the specifying device has:

an intensity acquisition unit for acquiring, in the spectrum data, a first intensity, a second intensity, a third intensity, and a fourth intensity respectively corresponding to a first wavelength, a second wavelength, a third wavelength, and a fourth wavelength; and

an identification unit for identifying whether the waste captured in the image is the biomass or the plastic based on a first ratio, which is a ratio between the first intensity and the second intensity, and a second ratio, which is a ratio between the third intensity and the fourth intensity.

18. The waste treatment facility according to any one of claims 1 to 17,

wherein the plastic hydrothermal treatment device is configured to add an alkaline agent to the waste and perform hydrolysis with steam, and

wherein the plastic recovery device includes a washing device configured to perform a washing process on treated waste which is the waste obtained by the hydrolysis of the waste.

19. The waste treatment facility according to claim 1 or 11,

wherein the plastic hydrothermal treatment device is configured to, when a biomass ratio, which is a proportion of the biomass in the waste when supplied to the plastic hydrothermal treatment device, is lower than a reference value, add an alkaline agent to the waste and perform

hydrolysis with steam, and

wherein the plastic recovery device includes a washing device configured to perform a washing process on treated waste which is the waste obtained by the hydrolysis of the waste.

20. A resource recovery system, comprising:

the waste treatment facility according to claim 2;

a gasification furnace for gasifying the granular biomass recovered by the biomass recovery device; and

a biomass conveying device for conveying the granular biomass discharged from the biomass recovery device to the gasification furnace,

wherein the biomass conveying device is configured to shield a conveying space, in which the granular biomass is conveyed, from outside air.

21. The resource recovery system according to claim 20,

wherein the biomass conveying device further includes a heater for heating the conveying space.

22. The resource recovery system according to claim 20 or 21, further comprising a steam supply device configured to supply steam generated from water by using a gas discharged from the gasification furnace as a heat source,

wherein the steam supply device is configured to supply the steam to at least one of the plastic hydrothermal treatment device or the biomass hydrothermal treatment device.

23. The resource recovery system according to any one of claims 20 to 22,

wherein the gasification furnace is configured to gasify the granular plastic recovered by the plastic recovery device.

24. A waste treatment method for recovering granular plastic from waste containing biomass

and plastic, comprising:

a biomass reduction step of performing a biomass reduction process on the waste for reducing a content of the biomass in the waste;

a plastic hydrothermal treatment step of performing a plastic hydrothermal treatment on plastic waste which is the waste that has been subjected to the biomass reduction process; and

a plastic recovery step of recovering the granular plastic from the plastic waste that has been subjected to the plastic hydrothermal treatment.

25. The waste treatment method according to claim 24, further comprising a first measuring step of measuring a residual biomass ratio, which is a proportion occupied by the biomass remaining in the plastic waste.

26. The waste treatment method according to claim 25,

wherein when the residual biomass ratio exceeds a predetermined target range, the biomass reduction step is executed again before the plastic hydrothermal treatment step.

27. The waste treatment method according to any one of claims 24 to 26,

wherein the biomass reduction step is executed by a hydrothermal treatment device for hydrothermally treating the waste and a recovery device for recovering a specific material from the waste that has been hydrothermally treated,

wherein the waste treatment method further comprises a return step of returning the waste discharged from the recovery device to the hydrothermal treatment device, and

wherein the plastic hydrothermal treatment step and the plastic recovery step are respectively executed by the hydrothermal treatment device and the recovery device.

28. A waste treatment method for recovering granular plastic from waste containing biomass and plastic, comprising:

a second measuring step of measuring a biomass ratio, which is a proportion occupied by

the biomass in the waste;

a plastic hydrothermal treatment step of performing a plastic hydrothermal treatment on the waste having the biomass ratio equal to or less than an upper limit value of a specified range; and

a plastic recovery step of recovering the granular plastic from the waste that has been subjected to the plastic hydrothermal treatment.