Claims

[Claim 1]

A control device for a combustion facility including a furnace main body defining a treatment space, a fire grate transporting an incineration object in a transport direction in the treatment space, and a wind box supplying air to the treatment space, the combustion facility control device comprising:

an image acquisition unit acquiring a treatment image showing sections resulting from partitioning the treatment space in the transport direction;

a point identification unit identifying a burnout point as a rear end in the transport direction of a flame caused by combustion of the incineration object based on the treatment image;

a first speed calculation unit calculating a first speed correction value as a correction value of a speed of the fire grate of the section based on the burnout point; ~~and~~

a speed control unit controlling the speed of the fire grate of the section based on the first speed correction value~~.~~;

a load value identification unit identifying a load value as a value indicating a load state of each of the sections based on a brightness of the treatment image;

a second speed calculation unit calculating a second speed correction value as a correction value of the speed of the fire grate of each of the sections based on a difference between a preset value and the load value; and

a second speed control unit controlling the speed of the fire grate of each of the sections based on the second speed correction value.

[Claim 2]

The combustion facility control device according to Claim 1, wherein

the sections resulting from partitioning the treatment space are a drying stage, a combustion stage, and a post-combustion stage from an upstream side in the transport direction,

the image acquisition unit acquires the treatment image showing the drying stage, the combustion stage, and the post-combustion stage,

the first speed calculation unit calculates the first speed correction value of each of the drying stage, the combustion stage, and the post-combustion stage, and

the speed control unit controls the speeds of the fire grates of the drying stage, the combustion stage, and the post-combustion stage based on the respective first speed correction values.

[Claim 3]

The combustion facility control device according to Claim 1 or 2, further comprising:

a first air amount calculation unit calculating a first air amount correction value as a correction value of the amount of air supplied to each of the sections based on the burnout point; and

an air amount control unit controlling the amount of the air supplied to each of the sections by the wind box based on the first air amount correction value.

~~[Claim 4]~~

~~The combustion facility control device according to any one of Claims 1 to 3, further comprising:~~

~~a load value identification unit identifying a load value as a value indicating a load state of each of the sections based on at least one of a brightness of the treatment image, a moisture amount of the incineration object, and a lower heating value of the incineration object;~~

~~a second speed calculation unit calculating a second speed correction value as a correction value of the speed of the fire grate of each of the sections based on a difference between a preset value and the load value; and~~

~~a second speed control unit controlling the speed of the fire grate of each of the sections based on the second speed correction value.~~

~~[Claim 5]~~[Claim 4]

The combustion facility control device according to ~~Claim 4~~Claim 3, further comprising:

a second air amount calculation unit calculating a second air amount correction value as a correction value of the amount of air supplied to each of the sections by the wind box based on the difference between the preset value and the load value; and

a second air amount control unit controlling the amount of the air supplied to each of the sections by the wind box based on the second air amount correction value.

~~[Claim 6]~~[Claim 5]

The combustion facility control device according to ~~any one of Claims 1 to 5~~Claim 1 or 2, wherein the combustion facility further includes a secondary air line supplying air from above the fire grate, and the combustion facility control device further comprises:

an amount identification unit identifying the amount of the incineration object that has flowed into the section based on the treatment image;

an amount determination unit determining whether or not the identified amount is equal to or more than a preset value; and

a secondary air control unit controlling the amount of the air supplied by the secondary air line based on a content of the determination.

~~[Claim 7]~~[Claim 6]

The combustion facility control device according to Claim 1 or 2, further comprising:

a model storage unit storing a trained model trained by supervised learning using a data set of an input sample including the burnout point and the speed of the fire grate of each of the sections and an output sample including a steam flow rate attributable to drying in the incineration object;

a candidate generation unit generating candidates for the speeds of the fire grates of the sections; and

a flow rate calculation unit performing steam flow rate calculation by inputting the burnout point and the candidate for the speed of the fire grate of each of the sections to the trained model,

wherein the first speed calculation unit calculates the first speed correction value based on the candidate as one of the speed candidates generated by the candidate generation unit in which a difference between a measured steam flow rate value and a value of the steam flow rate calculated by the flow rate calculation unit is small.

~~[Claim 8]~~[Claim 7]

The combustion facility control device according to ~~any one of Claims 1 to 5~~Claim 1 or 2, further comprising:

a secondary air line supplying secondary air from above the fire grate;

a flame identification unit identifying a position of the flame based on the treatment image;

a temperature identification unit identifying a temperature of the incineration object in the section based on the treatment image;

a secondary air calculation unit calculating the amount of the secondary air and a supply angle of the air at which a difference between the temperature and a preset value is minimum based on the position of the flame; and

a second secondary air control unit controlling the secondary air line based on the calculated amount and supply angle.

~~[Claim 9]~~[Claim 8]

A method for controlling a control device for a combustion facility including a furnace main body defining a treatment space, a fire grate transporting an incineration object in a transport direction in the treatment space, and a wind box supplying air to the treatment space, the combustion facility control method comprising:

a step of acquiring a treatment image showing sections resulting from partitioning the treatment space in the transport direction;

a step of identifying a burnout point as a rear end in the transport direction of a flame caused by combustion of the incineration object based on the treatment image;

a step of calculating a first speed correction value as a correction value of a speed of the fire grate of the section based on the burnout point; ~~and~~

a step of controlling the speed of the fire grate of the section based on the first speed correction value~~.~~;

a step of identifying a load value as a value indicating a load state of each of the sections based on a brightness of the treatment image;

a step of calculating a second speed correction value as a correction value of the speed of the fire grate of each of the sections based on a difference between a preset value and the load value; and

a step of controlling the speed of the fire grate of each of the sections based on the second speed correction value.

~~[Claim 10]~~[Claim 9]

A program for causing a computer of a control device for a combustion facility including a furnace main body defining a treatment space, a fire grate transporting an

incineration object in a transport direction in the treatment space, and a wind box supplying air to the treatment space to execute:

a step of acquiring a treatment image showing sections resulting from partitioning the treatment space in the transport direction;

a step of identifying a burnout point as a rear end in the transport direction of a flame caused by combustion of the incineration object based on the treatment image;

a step of calculating a first speed correction value as a correction value of a speed of the fire grate of the section based on the burnout point; ~~and~~

a step of controlling the speed of the fire grate of the section based on the first speed correction value~~.~~;

a step of identifying a load value as a value indicating a load state of each of the sections based on a brightness of the treatment image;

a step of calculating a second speed correction value as a correction value of the speed of the fire grate of each of the sections based on a difference between a preset value and the load value; and

a step of controlling the speed of the fire grate of each of the sections based on the second speed correction value.