Claims

[Claim 1]

A heat recovery boiler system control device comprising:

an acquisition unit that acquires a first measurement value indicating measurement data of an ultrasonic sensor and a second measurement value indicating measurement data of a two-electrode sensor;

an estimation unit that estimates an amount of wall thinning of a probe and melting of adhered ash of the probe, using a model obtained by machine learning a database in which at least one of the first measurement value and the second measurement value is accumulated;

a determination unit that determines an operation command for a process with respect to the wall thinning and the adhered ash, based on an estimation result of the estimation unit; and

an operation control unit that controls an operation of at least one of a water spraying device and an ash removal device, as the process with respect to the wall thinning and the adhered ash, based on a determination result of the determination unit,

in a case where the amount of wall thinning of the probe estimated by the estimation unit is equal to or larger than a predetermined value, the determination unit determines to operate a water spraying device or an ash removal device, which corresponds to the probe and is provided on an upstream side of a gas flow, and

in a case where the estimation unit estimates that the adhered ash of the probe has melted, the determination unit determines to operate a water spraying device or an ash removal device, which is provided on an upstream side of a gas flow with respect to the probe.

[Claim 2]

The heat recovery boiler system control device according to Claim 1, wherein

in a case where the estimation unit estimated that the adhered ash has melted in a plurality of the probes, the determination unit determines to lower an operation temperature of a combustion furnace, and

the heat recovery boiler system control device further comprises: an operation control unit that controls an operation of the combustion furnace, based on the determination result of the determination unit.

[Claim 3]

The heat recovery boiler system control device according to Claim 1, wherein

the determination unit detects a molten status of the adhered ash by an ON or OFF response, evaluates a molten salt corrosion risk time from an integral of the number of times the adhered ash melted and a melting time of the adhered ash, and determines an operation of the ash removal device or the water spraying device using an evaluation result.

[Claim 4]

The heat recovery boiler system control device according to Claim 1, wherein

the determination unit detects a wall thinning amount of a heat transfer tube and an increase status of a melting amount of the adhered ash, estimates a corrosion progress degree of an entire heat recovery facility based on a detection result, and determines an operation of the ash removal device or the water spraying device based on the corrosion progress degree.

[Claim 5]

A heat recovery boiler system control method comprising:

a step of acquiring a first measurement value indicating measurement data of an ultrasonic sensor and a second measurement value indicating measurement data of a two-electrode sensor;

a step of estimating an amount of wall thinning of a probe and melting of adhered ash of the probe, using a model obtained by machine learning a database in which at least one of the first measurement value and the second measurement value is accumulated;

a step of determining an operation command for a process with respect to the wall thinning and the adhered ash, based on an estimation result; and

a step of controlling an operation of at least one of a water spraying device and an ash removal device, as the process with respect to the wall thinning and the adhered ash, based on a determination result,

the step of determining includes,

in a case where the amount of wall thinning of the probe estimated at the step of estimating is equal to or larger than a predetermined value, determining to operate a water

spraying device or an ash removal device, which corresponds to the probe and is provided on an upstream side of a gas flow, and

in a case where it is estimated at the step of estimating that the adhered ash of the probe has melted, determining to operate a water spraying device or an ash removal device, which is provided on an upstream side of a gas flow with respect to the probe.

[Claim 6]

A program causing a computer to execute:

a step of acquiring a first measurement value indicating measurement data of an ultrasonic sensor and a second measurement value indicating measurement data of a two-electrode sensor;

a step of estimating an amount of wall thinning of a probe and melting of adhered ash of the probe, using a model obtained by machine learning a database in which at least one of the first measurement value and the second measurement value is accumulated;

a step of determining an operation command for a process with respect to the wall thinning and the adhered ash, based on an estimation result; and

a step of controlling an operation of at least one of a water spraying device and an ash removal device, as the process with respect to the wall thinning and the adhered ash, based on a determination result,

the step of determining includes,

in a case where the amount of wall thinning of the probe estimated at the step of estimating is equal to or larger than a predetermined value, determining to operate a water spraying device or an ash removal device, which corresponds to the probe and is provided on an upstream side of a gas flow, and

in a case where it is estimated at the step of estimating that the adhered ash of the probe has melted, determining to operate a water spraying device or an ash removal device, which is provided on an upstream side of a gas flow with respect to the probe.