Technical Problem

[0005]

However, the measurement method using flame analysis described in PTL 1 has problems in which a concentration of fine salt particles (KCl or the like) contained in the exhaust gas before being collected by the dust collector cannot be appropriately measured since the concentration of the alkaline metal components contained in the exhaust gas after being collected by the dust collector is measured. In addition, in the measurement method using flame analysis described in PTL 1, since it is necessary to form plasma flame in a flue in which a combustion gas flows and to cause some of the combustion gas to emit light in the plasma flame, there are many technical uncertainties, and there is a possibility of measurement becoming difficult.

[0006]

Embodiments of the present invention monitor a content of fine salt particles in an exhaust gas of a boiler with a relatively simple method and to appropriately estimate a content of an alkaline metal or chlorine in a fuel.

Solution to Problem

[0007]

According to an aspect of the present invention, there is provided a monitoring method for a boiler that is a method of monitoring an operation state of the boiler, the monitoring method including an exhaust gas collection process of collecting an exhaust gas generated by combustion of a fuel input into a combustion furnace of the boiler and an estimation process of estimating a content of an alkaline metal and/or chlorine in the fuel based on a content of a fine salt particle in the exhaust gas collected in the exhaust gas collection process.

[0008]

In addition, according to another aspect of the present invention, there is provided a monitoring device for a boiler that is a device monitoring an operation state of the boiler, the monitoring device including an exhaust gas collection portion that collects an exhaust gas generated by combustion of a fuel input into a combustion furnace of the boiler and an estimation unit that estimates a content of an alkaline metal and/or chlorine in the fuel based on a content of a fine salt particle in the exhaust gas collected by the exhaust gas collection portion.

[0009]

When such a method and such a configuration are adopted, the exhaust gas generated by combustion of the

Advantageous Effects of Invention

[0024]

With embodiments of the present invention, it is possible to monitor the content of fine salt particle in the exhaust gas of the boiler with a relatively simple method and to appropriately estimate the content of the alkaline metal or the chlorine in the fuel.

Brief Description of Drawings

[0025]

Fig. 1 is a schematic diagram showing an overall configuration of a boiler according to an embodiment of the present invention.

Fig. 2 is a graph showing an example of correlation information used in content estimation in the embodiment of the present invention (a graph showing correlation between a measured value from an alkaline metal ion monitor and a content of an alkaline metal in a fuel).

Fig. 3 is a graph showing an example of correlation information used in content estimation in the embodiment of the present invention (a graph showing correlation between a measured value from a chlorine detector pipe and a content of chlorine in the fuel).

Fig. 4 is a flowchart for describing a monitoring method for a boiler, a controlling method for a boiler, and

separated out from the exhaust gas G returns to a lower portion of a combustion furnace2, a bag filter 10 that filters and collects dust contained in the exhaust gas G which has passed through the heat recovery portion 6, a central processing device 100 that comprehensively controls various types of configurations of the CFB boiler 1, and the like.

[0029]

The combustion furnace 2 is an external circulation type fluidized layer combustion furnace. Various types of fuels (for example, biomass fuels such as rice hulls and empty fruit bunches (EFB), wood chips, tires, RPF, and the like) are input into the combustion furnace 2 via a fuel charging port (not shown). Among these, biomass fuels such as rice hulls and EFBs are low-grade fuels containing a large amount of alkaline components such as potassium (K) and sodium (Na). In addition, a fluid medium of which a main component is quartz particles is input into the combustion furnace 2 via the fuel charging port, air is supplied into the fluid medium from a lower portion, and the fluid medium flows to form a fluidized bed (hereinafter, referred to as a “bed”) F. The formation of the bed F promotes combustion of the fuel. The fluid medium contains bottom ash BA formed as particles as components in the biomass fuel adhere by being condensed, melted, and

an example of an adjustment process in the present invention).

[0064]

In the monitoring method for a boiler according to the embodiment described hereinbefore, an exhaust gas generated by combustion of a fuel input into the combustion furnace 2 of the CFB boiler 1 can be collected, and contents of an alkaline metal and chlorine in the fuel can be estimated based on a content of fine salt particles in the collected exhaust gas. Then, based on the estimated contents of the alkaline metal and the chlorine in the fuel, a load on the CFB boiler 1 (an in-furnace temperature, a vapor temperature, or the like) or the like can be controlled, or an amount, a composition, or the like of the fuel can be changed. In particular, in the exhaust gas collection process S1 in the present embodiment, since the exhaust gas on the upstream side of the bag filter 10 of the CFB boiler 1 is collected, the content of the fine salt particles (KCl or the like) in the exhaust gas before being collected by the bag filter 10 can be monitored, and the contents of the alkaline metal and the chlorine in the fuel can be appropriately estimated.

[0065]

In addition, in the controlling method for a boiler according to the embodiment described hereinbefore, based

contents of an alkaline metal and chlorine in the fuel can be estimated based on a content of fine salt particles in the collected exhaust gas. Then, based on the estimated contents of the alkaline metal and the chlorine in the fuel, a load on the CFB boiler 1 (an in-furnace temperature, a vapor temperature, or the like) or the like can be controlled, or an amount, a composition, or the like of the fuel can be changed. In particular, in the exhaust gas collection process S1 in the present embodiment, since the exhaust gas on the upstream side of the bag filter 10 of the CFB boiler 1 is collected, the content of the fine salt particles (KCl or the like) in the exhaust gas before being collected by the bag filter 10 can be monitored, and the contents of the alkaline metal and the chlorine in the fuel can be appropriately estimated.

[0076]

In addition, in the controlling device for a boiler (the monitoring device for a boiler 20 and the control unit 30) according to the embodiment described hereinbefore, based on contents of an alkaline metal and chlorine in a fuel, which are estimated from a content of fine salt particles in an exhaust gas generated by combustion of the fuel input into the combustion furnace of the CFB boiler 1, a load on the CFB boiler 1 (an in-furnace temperature, a vapor temperature, or the like) or a maintenance operation