CLAIMS

[Claim 1] An abnormality diagnosis system for a water treatment plant, which performs diagnosis for an abnormality of the water treatment plant which is a monitoring target, the abnormality diagnosis system comprising:

a measurement value collection unit which collects a plurality of kinds of measurement values in a water treatment process performed by the water treatment plant;

a measurement value storage unit in which the measurement values collected by the measurement value collection unit are accumulated;

an abnormality detection unit which determines whether or not an abnormality has occurred in the water treatment plant, on the basis of an abnormality degree calculated from the measurement values;

a contribution factor calculation unit which calculates, for each of the measurement values, a contribution degree indicating a degree of an influence caused to variation in the abnormality degree;

an abnormality mode determination information storage unit which stores abnormality mode determination information indicating a relationship between the abnormality degree and an abnormality mode;

an abnormality mode determination unit which, in a case where it is determined that the abnormality has

occurred, compares the abnormality degree calculated by the abnormality detection unit with the abnormality mode determination information, to determine the abnormality mode of the occurring abnormality; and

a diagnosis result display unit which displays a result of the determination, wherein

the abnormality mode is associated with a severity for the water treatment plant, and

the abnormality mode determination unit narrows down the abnormality modes on the basis of the contribution degrees, before the determination based on comparison between the abnormality degree and the abnormality mode determination information.

[Claim 2] The abnormality diagnosis system for the water treatment plant according to claim 1, wherein

the contribution factor calculation unit specifies, as a cause possibility factor, the measurement value ranked high in an order of magnitudes of the contribution degrees, and

the abnormality mode determination unit narrows down the abnormality modes on the basis of the contribution degrees and the cause possibility factor.

[Claim 3] The abnormality diagnosis system for the water

treatment plant according to claim 1 or 2, further comprising a determination information generation unit which generates and updates the abnormality mode determination information on the basis of a relationship between the abnormality degree acquired in actual operation and the severity of the abnormality having the acquired abnormality degree.

[Claim 4] The abnormality diagnosis system for the water treatment plant according to claim 1 or 2, further comprising:

a past abnormality storage unit in which data of the measurement values when abnormalities occurred in past are accumulated;

a past abnormality degree calculation unit which calculates the abnormality degree as a past abnormality degree from the measurement values accumulated in the past abnormality storage unit; and

a past abnormality clustering unit which performs clustering through machine learning for the past abnormality degree, to associate the past abnormality degree and the abnormality mode with each other, thus generating determination clustering information, wherein

the abnormality mode determination unit determines the abnormality mode of the abnormality occurring at present, using the determination clustering information generated in

advance, as the abnormality mode determination information.

[Claim 5] The abnormality diagnosis system for the water treatment plant according to claim 4, further comprising a water quality simulator unit which virtually reproduces an abnormality that actually occurred or an abnormality that can occur, wherein

the past abnormality degree calculation unit calculates the past abnormality degree using data of the abnormality virtually reproduced by the water quality simulator unit and the measurement values accumulated in the past abnormality storage unit.

[Claim 6] The abnormality diagnosis system for the water treatment plant according to claim 4, wherein

in generation of the determination clustering information, the measurement values when the abnormalities occurred in the past, of which a time in a day or a season in a year is the same as a time or a season at present, are used.

[Claim 8] An abnormality diagnosis system for a water treatment plant, which performs diagnosis for an abnormality of the water treatment plant which is a monitoring target, the abnormality diagnosis system comprising:

a measurement value collection unit which collects a plurality of kinds of measurement values in a water treatment process performed by the water treatment plant;

a measurement value storage unit in which the measurement values collected by the measurement value collection unit are accumulated;

an abnormality detection unit which determines whether or not an abnormality has occurred in the water treatment plant, on the basis of an abnormality degree calculated from the measurement values;

an abnormality mode determination information storage unit which stores abnormality mode determination information indicating a relationship between the abnormality degree and an abnormality mode;

an abnormality mode determination unit which, in a case where it is determined that the abnormality has occurred, compares the abnormality degree calculated by the abnormality detection unit with the abnormality mode determination information, to determine the abnormality mode of the occurring abnormality;

a diagnosis result display unit which displays a result of the determination;

a past abnormality storage unit in which data of the measurement values when abnormalities occurred in past are accumulated;

a water quality simulator unit which virtually reproduces an abnormality that actually occurred or an abnormality that can occur;

a past abnormality degree calculation unit which calculates the abnormality degree as a past abnormality degree using data of the abnormality virtually reproduced by the water quality simulator unit and the measurement values accumulated in the past abnormality storage unit; and

a past abnormality clustering unit which performs clustering through machine learning for the past abnormality degree, to associate the past abnormality degree and the abnormality mode with each other, thus generating determination clustering information, wherein

the abnormality mode is associated with a severity for the water treatment plant, and

the abnormality mode determination unit determines the abnormality mode of the abnormality occurring at present, using the determination clustering information generated in advance, as the abnormality mode determination information.

[Claim 9] An abnormality diagnosis method for a water treatment plant, which performs diagnosis for an abnormality of the water treatment plant which is a monitoring target, the abnormality diagnosis method comprising:

a measurement value collection step of collecting a

plurality of kinds of measurement values in a water treatment process performed by the water treatment plant;

a measurement value accumulation step of accumulating the measurement values collected in the measurement value collection step;

an abnormality detection step of determining whether or not an abnormality has occurred in the water treatment plant, on the basis of an abnormality degree calculated from the measurement values;

a contribution factor calculation step of calculating, for each of the measurement values, a contribution degree indicating a degree of an influence caused to variation in the abnormality degree;

an abnormality mode determination step of, in a case where it is determined that the abnormality has occurred, comparing the abnormality degree calculated in the abnormality detection step with abnormality mode determination information indicating a relationship between the abnormality degree and an abnormality mode, to determine the abnormality mode of the occurring abnormality; and

a diagnosis result display step of displaying a result of the determination, wherein

the abnormality mode is associated with a severity for the water treatment plant, and

in the abnormality mode determination step, the

abnormality modes are narrowed down on the basis of the contribution degrees, before the determination based on comparison between the abnormality degree and the abnormality mode determination information.

[Claim 10] The abnormality diagnosis method for the water treatment plant according to claim 9, wherein

in the contribution factor calculation step, the measurement value ranked high in an order of magnitudes of the contribution degrees is specified as a cause possibility factor, and

in the abnormality mode determination step, the abnormality modes are narrowed down on the basis of the contribution degrees and the cause possibility factor.

[Claim 11] The abnormality diagnosis method for the water treatment plant according to claim 9 or 10, further comprising generating and updating the abnormality mode determination information on the basis of a relationship between the abnormality degree acquired in actual operation and the severity of the abnormality having the acquired abnormality degree.

[Claim 12] The abnormality diagnosis method for the water treatment plant according to claim 9 or 10, further

comprising:

a past abnormality data accumulation step of accumulating data of the measurement values when abnormalities occurred in past;

a past abnormality degree calculation step of calculating the abnormality degree as a past abnormality degree from the measurement values accumulated in the past abnormality data accumulation step; and

a past abnormality clustering step of performing clustering through machine learning for the past abnormality degree, to associate the past abnormality degree and the abnormality mode with each other, thus generating determination clustering information, wherein

in the abnormality mode determination step, the abnormality mode of the abnormality occurring at present is determined, using the determination clustering information generated in advance, as the abnormality mode determination information.

[Claim 13] The abnormality diagnosis method for the water treatment plant according to claim 12, further comprising a water quality simulation step of virtually reproducing an abnormality that actually occurred or an abnormality that can occur, wherein

in the past abnormality degree calculation step,

the past abnormality degree is calculated using a simulation result of the water quality simulation step and the measurement values accumulated in the past abnormality data accumulation step.

[Claim 14] The abnormality diagnosis method for the water treatment plant according to claim 12, wherein

in generation of the determination clustering information, the measurement values when the abnormalities occurred in the past, of which a time in a day or a season in a year is the same as a time or a season at present, are used.

[Claim 15] The abnormality diagnosis method for the water treatment plant according to claim 13, wherein

in generation of the determination clustering information, the measurement values when the abnormalities occurred in the past, of which a time in a day or a season in a year is the same as a time or a season at present, are used.

[Claim 16] An abnormality diagnosis method for a water treatment plant, which performs diagnosis for an abnormality of the water treatment plant which is a monitoring target, the abnormality diagnosis method comprising:

a measurement value collection step of collecting a plurality of kinds of measurement values in a water treatment process performed by the water treatment plant;

a measurement value accumulation step of accumulating the measurement values collected in the measurement value collection step;

an abnormality detection step of determining whether or not an abnormality has occurred in the water treatment plant, on the basis of an abnormality degree calculated from the measurement values;

an abnormality mode determination step of, in a case where it is determined that the abnormality has occurred, comparing the abnormality degree calculated in the abnormality detection step with abnormality mode determination information indicating a relationship between the abnormality degree and an abnormality mode, to determine the abnormality mode of the occurring abnormality;

a diagnosis result display step of displaying a result of the determination;

a past abnormality data accumulation step of accumulating data of the measurement values when abnormalities occurred in past;

a water quality simulation step of virtually reproducing an abnormality that actually occurred or an abnormality that can occur;

a past abnormality degree calculation step of calculating the abnormality degree as a past abnormality degree using a simulation result of the water quality simulation step and the measurement values accumulated in the past abnormality data accumulation step; and

a past abnormality clustering step of performing clustering through machine learning for the past abnormality degree, to associate the past abnormality degree and the abnormality mode with each other, thus generating determination clustering information, wherein

the abnormality mode is associated with a severity for the water treatment plant, and

in the abnormality mode determination step, the abnormality mode of the abnormality occurring at present is determined, using the determination clustering information generated in advance, as the abnormality mode determination information.