substances with a size of several millimeters and having a high sludge concentration is directly injected into the ejector, the viscosity of the excess sludge increases due to the flocs, and the excess sludge is subjected to resistance when flowing through the ejector narrow portion. Thus, the flow speed of the sludge decreases at the narrow portion, resulting in a problem that bubbles of injected ozone gas are not made into a fine size. In order to increase the flow speed of the excess sludge at the ejector narrow portion and generate fine ozone gas bubbles, it is necessary to increase the pressure of a pump for injecting the excess sludge into the ejector. However, if the pump pressure is increased, motive power for ozone treatment is increased, thus causing a problem of increasing the load of ozone treatment.

[0007] Embodiments of the present disclosure provide a sewage treatment device that allows fine ozone gas bubbles to be generated in an ejector without increasing the load of ozone treatment.

SOLUTION TO THE PROBLEMS

[0008]

According to an aspect of the present disclosure, there is provided a sewage treatment device for performing treatment on sewage to obtain treated water, the sewage treatment device including: an excess sludge tank which stores excess sludge and/or concentrated excess sludge generated in the treatment, as stored sludge; an ozone gas generator which generates ozone gas; a mixing unit which mixes a low-viscosity

solution and the stored sludge supplied from the excess sludge tank, to generate mixed sludge, the low-viscosity solution being a solution having a lower viscosity than the stored sludge; an ejector which generates ozone-treated sludge by injecting the ozone gas into the mixed sludge flowing out from the mixing unit; an ozone-treated sludge tank which stores the ozone-treated sludge flowing out from the ejector; and a control device, wherein the mixing unit and the ozone-treated sludge tank are connected via an ozone-treated sludge circulation pipe, and the ozone-treated sludge is supplied as the low-viscosity solution to the mixing unit, the mixing unit and the ejector are connected via a mixed sludge supply pipe, and the control device controls a flow rate of the stored sludge to be supplied from the excess sludge tank to the mixing unit and/or a flow rate of the ozone-treated sludge to be supplied from the ozone-treated sludge tank to the mixing unit, on the basis of measured values of a pressure gauge and a flowmeter provided to the mixed sludge supply pipe.

EFFECT OF THE INVENTION

[0009] The sewage treatment device according to embodiments of the present disclosure can generate fine ozone gas bubbles in an ejector without increasing the load of ozone treatment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] [FIG. 1] FIG. 1 is a schematic view showing an

CLAIMS

[1] A sewage treatment device for performing treatment on sewage to obtain treated water, the sewage treatment device comprising:

an excess sludge tank which stores excess sludge and/or concentrated excess sludge generated in the treatment, as stored sludge;

an ozone gas generator which generates ozone gas;

a mixing unit which mixes a low-viscosity solution and the stored sludge supplied from the excess sludge tank, to generate mixed sludge, the low-viscosity solution being a solution having a lower viscosity than the stored sludge;

an ejector which generates ozone-treated sludge by injecting the ozone gas into the mixed sludge flowing out from the mixing unit;

an ozone-treated sludge tank which stores the ozone-treated sludge flowing out from the ejector; and

a control device, wherein

the mixing unit and the ozone-treated sludge tank are connected via an ozone-treated sludge circulation pipe, and the ozone-treated sludge is supplied as the low-viscosity solution to the mixing unit,

the mixing unit and the ejector are connected via a mixed sludge supply pipe, and

the control device controls a flow rate of the stored

sludge to be supplied from the excess sludge tank to the mixing unit and/or a flow rate of the ozone-treated sludge to be supplied from the ozone-treated sludge tank to the mixing unit, on the basis of measured values of a pressure gauge and a flowmeter provided to the mixed sludge supply pipe.

[2] The sewage treatment device according to claim 1, wherein

the mixing unit is a mixing tank which generates the mixed sludge by stirring or circulating the stored sludge and the low-viscosity solution.

[3] The sewage treatment device according to claim 1, wherein

the mixing unit is a mixer which generates the mixed sludge from the stored sludge and the low-viscosity solution by using a mechanical mechanism.

[4] The sewage treatment device according to claim 3, wherein

the mixer is a static mixer.

[5] The sewage treatment device according to any one of claims 1 to 4, wherein

the excess sludge stored in the excess sludge tank is excess sludge extracted from an aeration tank which treats the

sewage into the excess sludge through an activated sludge process and/or a settling tank which separates the treated water from the excess sludge extracted from the aeration tank, and

the concentrated excess sludge stored in the excess sludge tank is concentrated excess sludge extracted from a concentrating machine which concentrates the excess sludge extracted from the settling tank in a dewatering treatment device which performs volume reduction treatment of reducing an amount of the excess sludge.

[6] The sewage treatment device according to claim 5, wherein

the aeration tank and the ozone-treated sludge tank are connected via an ozone-treated sludge flow-out pipe for putting the ozone-treated sludge into the aeration tank.

[7] The sewage treatment device according to claim 5, wherein

an anaerobic digestion tank which treats the concentrated excess sludge by digestion sludge in the dewatering treatment device, and the ozone-treated sludge tank, are connected via an ozone-treated sludge flow-out pipe for putting the ozone-treated sludge into the anaerobic digestion tank.

[8] The sewage treatment device according to claim 7, wherein

the anaerobic digestion tank and the ozone-treated sludge tank are connected via a digestion sludge circulation pipe, and

the low-viscosity solution to be supplied to the mixing unit is the digestion sludge extracted from the anaerobic digestion tank to the ozone-treated sludge tank.

[9] A sewage treatment method comprising the steps of:

mixing a low-viscosity solution, and stored sludge formed from excess sludge and/or concentrated excess sludge generated in treatment on sewage, to generate mixed sludge;

injecting ozone gas bubbles generated from ozone gas, into the mixed sludge; and

modifying the excess sludge and/or the concentrated excess sludge contained in the mixed sludge by the ozone gas bubbles, to generate ozone-treated sludge, wherein

the low-viscosity solution is a solution having a lower viscosity than the stored sludge,

the ozone-treated sludge is supplied as the low-viscosity solution, and

a flow rate of the stored sludge and/or a flow rate of the ozone-treated sludge are controlled on the basis of measured values of a pressure gauge and a flowmeter.