DESCRIPTION

TITLE OF INVENTION:

WARM ULTRAPURE WATER PRODUCTION DEVICE

Technical Field

[0001] The present invention relates to an ultrapure water production device, and particularly to a warm ultrapure water production device that heats ultrapure water from a subsystem (secondary pure water production device) with a heat exchanger and supplies the same to a use point as warm ultrapure water.

Background Art

[0002] Ultrapure water used as semiconductor cleaning water is produced by treating raw water (industrial water, city water, well water, etc.) with an ultrapure water production device that has a pretreatment system, a primary pure water production device, and a subsystem (secondary pure water production device).

[0003] The pretreatment system including coagulation, pressure flotation (sedimentation), filtration (membrane filtration) devices, and the like removes suspended solids and colloidal substances from raw water. Furthermore, in this process, polymeric organic substances, hydrophobic organic substances, and the like may be removed.

[0004] The primary pure water device includes a heat exchanger, a reverse osmosis membrane treatment device (RO device), an ion exchange device (mixed bed, 4-bed 5-tower, etc.), a deaeration device, and the like. A primary pure water production device removes ions and organic components from raw water. It is noted that the higher the temperature of water, the lower the viscosity and the higher the permeability of the RO membrane. For this reason, a heat exchanger is provided to the pre-stage of the reverse osmosis membrane treatment

cooling tower or the like is passed through the heat source fluid path of the fourth heat exchanger 30 via a valve 30a. A temperature sensor 31 is provided in the pipe 8b, and the amount of cold water supplied to the fourth heat exchanger 30 is controlled so that the water temperature detected by the temperature sensor 31 is the prescribed temperature.

[0037] In the warm ultrapure water production device in FIG. 1, in the case that the maximum amount of ultrapure water used at the use point 14 is W (ton/Hr), the actual amount of ultrapure water used at the use point 14 fluctuates in the range of 0 to 100% of W. Normally, ultrapure water is supplied to the use point 14 in an amount larger than W, for example, 120 to 200% of W, 180% in this embodiment, and unused ultrapure water is discharged to the pipe 7.

[0038] Further, in the UF membrane separation device 12, about 10% of the W is discharged to the pipe 15 as concentrated water (non-membrane permeated water), and the remainder is fed to the use point 14.

[0039] Thus, the subsystem 4 produces ultrapure water with an amount of water that is about 190% (180+10=190%) of W, and sends the same to the pipe 5.

[0040] As mentioned above, ultrapure water is supplied to the use point 14 at a flowrate of 180% of W, and since the actual amount of ultrapure water used at the use point 14 fluctuates between 0 and 100% of W, the flowrate of the returned ultrapure water flowing from the use point 14 to the pipe 7 fluctuates in the range of 80 to 180% of W. Since 10%×W non-membrane permeated water from the UF membrane separation device 12 flows into the pipe 7 via the pipe 15, the flowrate of ultrapure water flowing into the storage tank 16 from the pipe 7 fluctuates in the range of 90 to 190% of W.

[0041] In this embodiment, the water flowrate from the storage tank 16 to the heat source fluid path of the first heat exchanger 6 is 190% of W. Since the inflow flowrate from the pipe 7 to the storage tank 16 fluctuates between 90 and 190% of W, when the inflow flowrate is a% below 190%, heated primary pure water is supplied from the pipe 22 to the storage tank 16 at a flowrate of (190-a)%×W. At this time, the opening degrees of the valves 21a and 23 are controlled so that

CLAIMS

[Claim 1]

A warm ultrapure water production device, comprising:

an ultrapure water production portion, provided with a primary pure water production device and a secondary pure water production device;

an ultrapure water supply pipeline, supplying ultrapure water from the ultrapure water production portion to a use point;

a first heat exchanger provided in the ultrapure water supply pipeline, through which returned water that is not used at the use point is supplied as heat source water to a heat source fluid path via a returned water line;

returned water returning pipe, returning the returned water that has passed through the heat source fluid path of the first heat exchanger to the ultrapure water production portion; and

a heating means, further heating ultrapure water heated by the first heat exchanger,

wherein a warm pure water supply mechanism that supplies warm pure water in a midway of the returned water line is provided in a warm ultrapure water production device in which ultrapure water heated by the heating means is supplied to the use point.

[Claim 2]

The warm ultrapure water production device according to claim 1, wherein a storage tank is provided in the returned water line, and the storage tank is provided with the warm pure water supply mechanism.

[Claim 3]

The warm ultrapure water production device according to claim 1 or 2, wherein the heating means is a second heat exchanger using steam or warm water as a heat source.

[Claim 4]

The warm ultrapure water production device according to any one of claims 1 to 3, wherein the warm pure water supply mechanism comprises a pure water supply pipeline communicating

with a pure water supply source and a third heat exchanger provided in the pure water supply pipeline.

[Claim 5]

The warm ultrapure water production device according to any one of claims 2 to 4, further comprising a temperature sensor that measures a temperature of water stored in the storage tank and a control means that controls the warm pure water supply mechanism so that a temperature detected by the temperature sensor is a prescribed temperature.

[Claim 6]

The warm ultrapure water production device according to claim 5, wherein the control means controls a supply amount of warm pure water supplied from the warm pure water supply mechanism so that a water level of the water stored in the storage tank falls within a prescribed range.

[Claim 7]

The warm ultrapure water production device according to claim 5 or 6, further comprising: a water feeding means that feeds the water stored in the storage tank at a fixed flowrate to the heat source fluid path of the first heat exchanger.

[Claim 8]

The warm ultrapure water production device according to any one of claims 1 to 7, wherein the returned water returning pipe from the heat source fluid path of the first heat exchanger is provided with a cooling means that cools returned water.