CLAIMS

[Claim 1] A cooling system for cooling multiple processing chambers for use in semiconductor manufacturing process, comprising:

at least one heat-exchanging unit configured to generate a cooling liquid for cooling the multiple processing chambers arranged in a clean room and supply the cooling liquid to the multiple processing chambers;

a cooling apparatus configured to cool an antifreeze liquid;

an antifreeze-liquid circulation line extending between the heat-exchanging unit and the cooling apparatus; and

an antifreeze-liquid pump configured to circulate the antifreeze liquid in the antifreeze-liquid circulation line,

wherein the heat-exchanging unit includes:

a cooling-liquid pump configured to circulate the cooling liquid through the multiple processing chambers;

a heat exchanger configured to perform heat exchange between the cooling liquid and the antifreeze liquid; and

a cooling-side buffer tank arranged upstream of the heat exchanger in a circulating direction of the cooling liquid.

[Claim 2] The cooling system according to claim 1, wherein the cooling apparatus includes:

a first refrigeration apparatus configured to circulate a first refrigerant for performing heat exchange with the antifreeze liquid;

a second refrigeration apparatus configured to circulate a second refrigerant for performing heat exchange with the first refrigerant; and

an intermediate-medium circulation line configured to circulate an intermediate medium between the first refrigeration apparatus and the second refrigeration apparatus.

[Claim 3] The cooling system according to claim 1, wherein the cooling apparatus comprises a refrigeration machine including a dual refrigeration cycle.

[Claim 4] The cooling system according to claim 1, wherein the heat-exchanging unit is arranged in a sub-fab area located under the clean room.

[Claim 5] The cooling system according to claim 2, wherein

the first refrigeration apparatus is arranged in a sub-fab area located under the clean room, and

the second refrigeration apparatus is arranged outside the clean room and the sub-fab area.

[Claim 6] The cooling system according to claim 5, wherein

the first refrigeration apparatus comprises a turbo refrigeration machine including a compressor configured to compress refrigerant gas, and

the compressor includes:

an impeller;

a rotor rotatable together with the impeller; and

a magnetic bearing configured to rotatably support the rotor in a non-contact manner.

[Claim 7] The cooling system according to claim 1, wherein

the cooling apparatus comprises a turbo refrigeration machine including a compressor configured to compress refrigerant gas, and

the compressor includes:

an impeller;

a rotor rotatable together with the impeller; and

a magnetic bearing configured to rotatably support the rotor in a non-

contact manner.

[Claim 8] The cooling system according to claim 1, wherein the cooling apparatus is arranged outside the clean room and a sub-fab area located under the clean room.

[Claim 9] The cooling system according to claim 1, wherein the heat-exchanging unit is removable from the cooling system.

[Claim 10] The cooling system according to claim 1, wherein the at least one heat-exchanging unit comprises multiple heat-exchanging units, and the number of multiple heat-exchanging units is the same as the number of multiple processing chambers.

[Claim 11] The cooling system according to claim 1, wherein the at least one heat-exchanging unit comprises multiple heat-exchanging units, and the number of multiple heat-exchanging units is less than the number of multiple processing chambers.

[Claim 12] The cooling system according to claim 1, wherein the at least one heat-exchanging unit comprises a single heat-exchanging unit.

[Claim 13] The cooling system according to claim 1, further comprising:

at least one heating unit configured to generate a heating liquid for heating the multiple processing chambers and supply the heating liquid to the multiple processing chambers,

wherein the heating unit includes:

a heating apparatus configured to heat the heating liquid;

a heating-liquid pump configured to circulate the heating liquid through the multiple processing chambers; and

a heating-side buffer tank arranged upstream of the heating apparatus in

a circulating direction of the heating liquid.

[Claim 14] The cooling system according to claim 13, wherein the heating unit is removable from the cooling system.

[Claim 15] The cooling system according to claim 13, wherein the at least one heating unit comprises multiple heating units, and the number of multiple heating units is the same as the number of multiple processing chambers.

[Claim 16] The cooling system according to claim 13, wherein the at least one heating unit comprises multiple heating units, and the number of multiple heating units is less than the number of multiple processing chambers.

[Claim 17] The cooling system according to claim 13, wherein the at least one heating unit comprises a single heating unit.

[Claim 18] A semiconductor manufacturing system comprising:

semiconductor manufacturing equipment having multiple processing chambers for performing a semiconductor manufacturing process;

a temperature regulator configured to regulate temperature of the multiple processing chambers;

a cooling-liquid line extending between the temperature regulator and a heat-exchanging unit;

a temperature-regulating-liquid line extending between the temperature regulator and the multiple processing chambers; and

the cooling system according to any one of claims 1 to 12 for cooling the multiple processing chambers.