a first pressure measuring means (4) provided in the sublimation gas piping (5) (or equally in the first and second branch pipes (3A, 3B);

a first branch valve (2A) provided between the first solid material vessel (1A) and the first pressure measuring means (4) (or in the first branch pipe (3A));

a second branch valve (2B) provided between the second solid material vessel (1B) and the first pressure measuring means (4) (or in the second branch pipe (3B));

a second valve (10) provided between the first pressure measuring means (4) and the buffer tank (13);

a third valve (15) provided in the introduction pipe (14);

a second pressure measuring means (11) provided between the second valve (10) and the third valve (15) (or equally provided directly in the buffer tank (13)); and

a first residual quantity calculation unit (121) for calculating a residual quantity of the solid material from a consumption amount of the sublimation gas fed from the buffer tank (13) to the subsequent process.

The first sublimation gas supply system may further comprise a second residual quantity calculation unit (122) for calculating the residual quantity of the solid material from a mass of the sublimation gas fed from the first and second solid material vessels to the buffer tank (13).

The first sublimation gas supply system may further comprise a first switching determination unit (131) for determining a switching timing and an abnormality from the residual quantity of the solid material inside the first and second solid material vessels.

[0010]

The first residual quantity calculation unit (121):

may calculate a consumption amount ($Consumption_{-1}$) of the sublimation gas fed from the buffer tank (13) from: a first differential pressure ΔP_1 between a pressure (P_{open}) inside the buffer tank (13) before opening of the third valve (15) in a state in which the sublimation gas is stored in the buffer tank (13), and a pressure (P_{close}) inside the buffer tank (13) when the third valve has been closed after the sublimation gas has been fed from the buffer tank (13) to the subsequent process, the volume (V_{buffer}) of the buffer tank (13), the density (d) of the sublimation gas, and a first correction factor (C_1); and may calculate a first residual quantity (W_{r1}) of the solid material accommodated in the solid material vessel by subtracting the total quantity of the calculated first consumption

a second pressure measuring means (11) provided between the second valve (10) and the third valve (15) (or equally provided directly in the buffer tank (13)); and

a first residual quantity calculation unit (121) for calculating a residual quantity of the solid material from a consumption amount of the sublimation gas fed from the buffer tank (13) to the subsequent process.

The first sublimation gas supply system may further comprise a second residual quantity calculation unit (122) for calculating the residual quantity of the solid material from a mass of the sublimation gas fed from the first and second solid material vessels to the buffer tank (13).

The second sublimation gas supply system may further comprise a second switching determination unit (132) for determining a switching timing and an abnormality from the residual quantity of the solid material inside the first and second solid material vessels.

The second switching determination unit (132):

when the sublimation gas is fed from either solid material vessel to the buffer tank (13), if the pressure inside the buffer tank (13) does not exceed a first threshold (Th_1) within a preset period, may determine whether or not a pressure value inside the solid material vessel has decreased from a pressure value when the second valve (10) was open (e.g., a predetermined value or more, within values in a predetermined range, or a pressure of 10% or greater or 20% or greater), or may determine whether or not the pressure value inside the solid material vessel exceeds a second threshold (Th_2), and if the pressure value inside the solid material vessel has not decreased from the pressure value when the valve (10) was open or the pressure value inside the solid material vessel exceeds the second threshold (Th_2), may determine that there is an abnormality in a branch pipe or the sublimation gas piping (5) downstream of the solid material vessel, and if the pressure value inside the solid material vessel has decreased from the pressure value when the second valve (10) was open or the pressure value inside the solid material vessel does not exceed the second threshold (Th_2), may determine that there should be a switch to a different solid material vessel from the abovementioned solid material vessel.

[0014]

A third sublimation gas supply system may comprise:

at least two solid material vessels (1A, 1B, 1C) in which a solid material is accommodated;

sublimation gas piping (5) which is formed by merging of branch pipes (3A, 3B, 3C) leading out from each of the solid material vessels;

at least one buffer tank (13A, 13B) connected to the sublimation gas piping (5);

at least one introduction pipe (14A, 14B) for introducing the sublimation gas from the at least one buffer tank (13A, 13B) to at least one subsequent process (chambers RA, RB);

a first pressure measuring means (4 (4A, 4B, 4C)) provided in the sublimation gas piping (5) (or equally provided in each of the branch pipes (3A, 3B, 3C));

a first valve provided between the solid material vessels (1A, 1B, 1C) and the first pressure measuring means (4) (or branch valves (2A, 2B, 2C) provided in each branch pipe);

at least one second valve (10A, 10B) provided between the first pressure measuring means (4) and the at least one buffer tank (13A, 13B) (or in each branch pipe (15A, 15B) branching from the sublimation gas piping (5) to each buffer tank);

at least one third valve (15A, 15B) provided in the introduction pipe (14A, 14B);

a second pressure measuring means (11A, 11B) provided between the second valve (10A, 10B) and the third valve (15A, 15B) (or equally provided directly in the buffer tank (13A, 13B)); and

a first residual quantity calculation unit (121) for calculating a residual quantity of the solid material from a consumption amount of the sublimation gas fed from the buffer tank (13A, 13B) to the subsequent process (chambers RA, RB).

The third sublimation gas supply system may further comprise a second residual quantity calculation unit (122) for calculating the residual quantity of the solid material from a mass of the sublimation gas fed from the solid material vessel to the buffer tank (13A, 13B).

The third sublimation gas supply system may further comprise a first switching determination unit (131) for determining a switching timing and an abnormality from the residual quantity of the solid material inside the solid material vessel.

Furthermore, when the pressure measuring means (4A, 4B, 4C) are provided in each of the solid material vessels (1A, 1B, 1C) and the branch valves (2A, 2B, 2C) are provided in the branch pipes (3A, 3B, 3C), the third sublimation gas supply system may comprise a second switching determination unit (132) for determining a switching timing

and an abnormality from the residual quantity of the solid material inside the solid material vessels.

[0015]

The first, second and third sublimation gas supply systems may be incorporated into an ALD apparatus, a CVD apparatus, and an etching apparatus, etc.

[0016]

A sublimation supply method comprises:

a supply step in which a sublimation gas is supplied from a buffer tank to a subsequent process;

a supply stop step in which the supply of the sublimation gas from the buffer tank to the subsequent process is stopped; and

a sublimation gas refill step in which the buffer tank is refilled with the sublimation gas during the supply stop step.

The sublimation gas refill step comprises:

a first residual quantity calculation step in which a residual quantity of the solid material is calculated from a consumption amount of the sublimation gas fed from the buffer tank to the subsequent process;

a second residual quantity calculation step in which the residual quantity of the solid material is calculated from a mass of the sublimation gas fed from a solid material vessel to the buffer tank; and/or

a switching determination step in which a switching timing and an abnormality are determined from the residual quantity of the solid material inside the solid material vessel.

In the first residual quantity calculation step:

a first consumption amount ($Consumption_{-1}$) of the sublimation gas fed from the buffer tank (13) may be calculated from: a first differential pressure ΔP_1 with a pressure (P_{close}) inside the buffer tank (13) before opening of the third valve (15) for feeding to the subsequent process in a state in which the sublimation gas is stored in the buffer tank (13), the volume (V_{buffer}) of the buffer tank (13), the density (d) of the sublimation gas, and a first correction factor (C_1); and a first residual quantity (W_{r1}) of the solid material accommodated in the solid material vessel may be calculated by subtracting the total quantity of the calculated first consumption amount ($Consumption_{-1}$) from an initial weight (W_0) of the solid material accommodated in the solid material vessel currently supplying the sublimation gas to the buffer tank.

In “a pressure (P_{close}) inside the buffer tank (13) before opening of the third valve (15)”, the phrase “before opening of the third valve

may be determined that there should be a switch to a different solid material vessel from the abovementioned solid material vessel.

[0017]

A residual quantity measuring method for measuring a residual quantity of a solid material inside a solid material vessel comprises,

during sublimation gas refilling in which the buffer tank is refilled with a sublimation gas:

a first residual quantity calculation step in which a residual quantity of the solid material is calculated from a consumption amount of the sublimation gas fed from the buffer tank to the subsequent process;

a second residual quantity calculation step in which the residual quantity of the solid material is calculated from a mass of the sublimation gas fed from a solid material vessel to the buffer tank; and/or

a switching determination step in which a switching timing and an abnormality are determined from the residual quantity of the solid material inside the solid material vessel.

[0018]

An information processing device may comprise:

at least one processor; and

a memory for storing commands for executing a residual quantity measuring method for measuring the residual quantity of the solid material inside the solid material vessel, or the abovementioned sublimation gas supply method, and

the processor may implement the residual quantity measuring method.

[0019]

A residual quantity measuring or sublimation gas supply program constitutes:

a program for executing a residual quantity measuring method for measuring the residual quantity of the solid material inside the solid material vessel, or the abovementioned sublimation gas supply method, by means of the at least one processor.

A computer-readable recording medium for storing computer instructions constitutes:

a computer-readable recording medium for storing commands for executing a residual quantity measuring method for measuring the residual quantity of the solid material inside the solid material vessel, or the abovementioned sublimation gas supply method.

[0020]

The first and second residual quantity calculation units, and the first and second switching determination units may be configured by an

second solid material vessels 1A, 1B; a buffer tank 13 connected to the sublimation gas piping 5; and an introduction pipe 14 for introducing a sublimation gas from the buffer tank 13 to a subsequent process (e.g., a chamber). The following are also provided: heating portions (electrical jackets) for heating the solid material vessels 1A, 1B; a heating portion (e.g., an electrical jacket) for heating the buffer tank 13; and means (e.g., a hot air heater or an electrical jacket) for heating or thermally insulating the sublimation gas piping 5, the introduction pipe 14, and the branch pipes 3A, 3B.

[0026]

The first sublimation gas supply system 1 comprises: a first pressure measuring means 4 provided in the sublimation gas piping 5; a first branch valve 2A provided in the first branch pipe 3A; a second branch valve 2B provided in the second branch valve 3B; a second valve 10 provided between the first pressure measuring means 4 and the buffer tank 13; a third valve 15 provided in the introduction pipe 14; and a second pressure measuring means 11 provided between the second valve 10 and the buffer tank 30.

[0027]

The first sublimation gas supply system 1 comprises: a first residual quantity calculation unit 121 for calculating a residual quantity of the solid material from a consumption amount of the sublimation gas fed from the buffer tank 13 to the subsequent process; and a switching determination unit 131 for determining a switching timing and an abnormality from the residual quantity of the solid material inside the first and second solid material vessels.

A different embodiment further comprises a second residual quantity calculation unit 122 for calculating the residual quantity of the solid material from a mass of the sublimation gas from the first and second solid material vessels to the buffer tank 13.

[0028]

The first residual quantity calculation unit 121 calculates a consumption amount ($Consumption_{-1}$) of the sublimation gas fed from the buffer tank 13 from: a first differential pressure ΔP_1 between a pressure P_{open} inside the buffer tank 13 before opening of the third valve 15 (For example, “before opening of the third valve 15” means immediately before opening of the third valve 15. It should be noted that “immediately before” means before the sublimation gas supply system receives a signal from the subsequent process and sends an opening signal to the third valve 15 of a sublimation gas supply apparatus.) in a state in which the sublimation gas is stored in the buffer tank 13, and a pressure P_{close} inside the buffer tank 13 when the

means, the sublimation gas is fed from the second solid material vessel 1B to the buffer tank 13.

The first solid material vessel 1A is replaced with a new solid material vessel while sublimation gas is being refilled from the second solid material vessel 1B. Continuous supply is possible by repeating the steps above.

Furthermore, in S6-1, the latest second residual quantity W_{r2} which will be described later may be used for the latest first residual quantity W_{r1}, or an average value or a weighted average value of both thereof may be used.

[0037]

(Different residual quantity measuring method)

In a different residual quantity measuring method, the residual quantity is calculated while focusing on mass transfer of the sublimation gas from the solid material vessels to the buffer tank 13. Fig. 2B shows an operating flow.

(S100) The first branch valve 2A is opened, and the second valve 10 is closed. The second solid material vessel 1B is prepared for switching, and the second branch valve 2B is closed. The third valve 15 is closed. Here, the sublimation gas may or may not be accommodated inside the buffer tank 13.

(S101) The pressure (P_{close_1}) inside the buffer tank 13 is measured with the third valve 15 in a closed state.

(S102) The second valve 10 is opened. The buffer tank 13 is refilled with the sublimation gas from the first solid material vessel 1A.

(S103) The pressure inside the buffer tank 13 reaches the first threshold Th_1 (measured by the second pressure measuring means 11). The second valve 10 is closed and refilling is stopped.

(S104) The pressure $P_{_full}$ is measured by the second pressure measuring means 11.

(S105) The second differential pressure ΔP_2 is calculated ($\Delta P_2 = P_{_full}) - (P_{close_1})$).

(S106) The second consumption amount (Consumption$_{_2}$) of the sublimation gas fed from the buffer tank 13 is calculated from the volume V_{buffer} of the buffer tank 13, the second differential pressure ΔP_2, the density d of the sublimation gas, and the second correction factor C_2.

$$\text{Consumption}_{_2}\ [\text{kg}] = V_{buffer}\ [\text{m}^3] \times \Delta P_2\ [\text{Pa}] \,/\, 0.1013\ [\text{MPa}] \times d\ [\text{kg}\,/\,\text{m}^3] \times C_2 \qquad (4)$$

The second correction factor C_2 may be omitted. The second correction factor C_2 is a factor obtained from verified data after

installation of the equipment, and may be selected from a range of 0.8-1.2, for example.

(S107) The second consumption amount (Consumption$_2$) calculated in S106 is subtracted from the initial weight W_0 of the solid material accommodated in the first solid material vessel 1A. By this means, it is possible to obtain the second residual quantity W_{r2} of the solid material accommodated in the first solid material vessel 1A from the mass transfer to the buffer tank 13.

Second residual quantity W_{r2} [kg] = initial weight W_0 - Consumption$_2$ [kg]

(5)

(S108) The second valve 10 is closed, after which the third valve 15 is opened. By this means, the sublimation gas is fed from the buffer tank 13 to the subsequent process. When the supply to the subsequent process is stopped, S101-S108 are repeated during the downtime.

(S109-1) It is determined whether or not the supply to the subsequent process is stopped.

(S109-2) If the supply is stopped, the third valve 15 is closed.

S101-S108 are repeated during the downtime.

When the subsequent second residual quantity W_{r2} is obtained in S107, the second residual quantity W_{r2} obtained immediately before is used instead of the initial weight W_0.

Second residual quantity W_{r2} [kg] = immediately preceding second residual quantity (W_{r2}) - Consumption$_2$ [kg]

The residual quantity calculation is repeated in the manner described above and is equivalent to the following equation.

Second residual quantity W_{r2} [kg] = initial weight W_0 - ΣConsumption$_2$ [kg]

[0038]

A method for determining a switching timing and an abnormality from the residual quantity of the solid material inside the solid material vessel will be described next.

(S200) In S102, if the pressure inside the buffer tank 13 does not exceed the first threshold Th_1 (pressure measured by the second pressure measuring means 11>first threshold Th_1) within the preset period (within downtime), it is determined whether or not the pressure value inside the first solid material vessel 1A (measured by the first pressure measuring means 4) has decreased from the pressure value when the second valve 10 was open (during S102) (e.g., a predetermined value or more, within values in a predetermined range, or a pressure of 10% or greater or 20% or greater) (i.e., the pressure measured by the first pressure measuring means 4 when the second valve 10 was

CLAIMS

[Claim 1]

A sublimation supply method comprising:

a supply step in which a sublimation gas is supplied from a buffer tank to a subsequent process;

a supply stop step in which the supply of the sublimation gas from the buffer tank to the subsequent process is stopped; and

a sublimation gas refill step in which the buffer tank is refilled with the sublimation gas during the supply stop step,

The sublimation gas refill step comprises:

a first residual quantity calculation step in which a residual quantity of the solid material is calculated from a consumption amount of the sublimation gas fed from the buffer tank to the subsequent process;

a second residual quantity calculation step in which the residual quantity of the solid material is calculated from a mass of the sublimation gas fed from a solid material vessel to the buffer tank; and/or

a switching determination step in which a switching timing and an abnormality are determined from the residual quantity of the solid material inside the solid material vessel.

[Claim 2]

The sublimation gas supply method as claimed in claim 1, wherein, in the first residual quantity calculation step:

a first consumption amount ($Consumption_{-1}$) of the sublimation gas fed from the buffer tank is calculated from: a first differential pressure ΔP_1 between a pressure (P_{open}) inside the buffer tank before opening of a third valve for feeding to the subsequent process in a state in which the sublimation gas is stored in the buffer tank, and a pressure (P_{close}) inside the buffer tank when the third valve has been closed after the sublimation gas has been fed from the buffer tank to the subsequent process, the volume (V_{buffer}) of the buffer tank, the density (d) of the sublimation gas, and a first correction factor (C_1); and a first residual quantity (W_{r1}) of the solid material accommodated in the solid material vessel is calculated by subtracting the total quantity of the calculated first consumption amount ($Consumption_{-1}$) from an initial weight (W_0) of the solid material accommodated in the solid material vessel currently supplying the sublimation gas to the buffer tank.

[Claim 3]
The sublimation gas supply method as claimed in claim 1 or 2, wherein, in the second residual quantity calculation step:

a second consumption amount ($Consumption_{_2}$) of the sublimation gas fed to the buffer tank is calculated from: a second differential pressure ΔP_2 between a pressure (P_{close_1}) inside the buffer tank in a state in which a third valve for feeding to the subsequent process is closed, and a pressure ($P_{_full}$) when the sublimation gas has been fed to the buffer tank from any solid material vessel and the pressure inside the buffer tank has reached a set pressure, the volume (V_{buffer}) of the buffer tank, the density (d) of the sublimation gas, and a second correction factor (C_2); and a second residual quantity (W_{r2}) of the solid material accommodated in the solid material vessel is calculated by subtracting the total quantity of the calculated second consumption amount ($Consumption_{_2}$) from an initial weight (W_0) of the solid material accommodated in the solid material vessel currently supplying the sublimation gas to the buffer tank.

[Claim 4]
The sublimation gas supply method as claimed in any one of claims 1 to 3, wherein, in the switching determination step:

when the sublimation gas is fed from any solid material vessel to the buffer tank, if the pressure inside the buffer tank does not exceed a first threshold (Th_1) within a preset period, it is determined whether or not a pressure value inside the solid material vessel has decreased from a pressure value when a second valve, which is arranged between a first pressure measuring means and a second pressure measuring means, was open, or it is determined whether or not the pressure value inside the solid material vessel exceeds a second threshold (Th_2), and if the pressure value has not decreased or exceeds the second threshold (Th_2), it is determined that there is an abnormality in sublimation gas piping downstream of the first pressure measuring means, and if the pressure value has decreased or does not exceed the second threshold (Th_2), it is determined whether or not a latest first residual quantity (W_{r1}), a latest second residual quantity (W_{r2}), or an average value or a weighted average value of both thereof is smaller than a third threshold (Th_3), and if the latest first residual quantity (W_{r1}), the latest second residual quantity (W_{r2}), or the average value or the weighted average value of both thereof is not smaller than the third threshold (Th_3), it is determined that there is an abnormality in the sublimation gas piping or any branch pipe upstream of the first pressure measuring means, and if the latest

first residual quantity (W_{r1}), the latest second residual quantity (W_{r2}), or the average value or the weighted average value of both thereof is smaller than the third threshold (Th_3), it is determined that there should be a switch to a different solid material vessel from the abovementioned solid material vessel; or

when the sublimation gas is fed from any solid material vessel to the buffer tank, if the pressure inside the buffer tank does not exceed a first threshold (Th_1) within a preset period, it is determined whether or not a pressure value inside the solid material vessel has decreased from a pressure value when a second valve, which is arranged between a first pressure measuring means and a second pressure measuring means, was open, or it is determined whether or not the pressure value inside the solid material vessel exceeds a second threshold (Th_2), and if the pressure value has not decreased or exceeds the second threshold (Th_2), it is determined that there is an abnormality in a branch pipe or sublimation gas piping downstream of the solid material vessel, and if the pressure value has decreased or does not exceed the second threshold (Th_2), it is determined that there should be a switch to a different solid material vessel from the abovementioned solid material vessel.

[Claim 5]

A sublimation gas supply system comprising:

at least two solid material vessels in which a solid material is accommodated;

sublimation gas piping which is formed by merging of branch pipes leading out from each of the solid material vessels;

at least one buffer tank connected to the sublimation gas piping;

at least one introduction pipe for introducing the sublimation gas from the at least one buffer tank to at least one subsequent process;

a first pressure measuring means provided in the sublimation gas piping or each branch pipe;

a first valve provided between the solid material vessels and the first pressure measuring means, or branch valves provided in each branch pipe;

at least one second valve provided between the first pressure measuring means and the at least one buffer tank or in each branch pipe branching from the sublimation gas piping to each buffer tank;

at least one third valve provided in the introduction pipe; and

a second pressure measuring means provided between the second valve and the third valve,

wherein the sublimation gas supply system further comprises: a first residual quantity calculation unit for calculating a residual quantity of the solid material from a consumption amount of the sublimation gas fed from the buffer tank to the subsequent process;

a second residual quantity calculation unit for calculating the residual quantity of the solid material from a mass of the sublimation gas fed from the solid material vessel to the buffer tank; and/or

a first switching determination unit for determining a switching timing and an abnormality from the residual quantity of the solid material inside the solid material vessel.

[Claim 6]

A sublimation gas supply system comprising:

at least two solid material vessels in which a solid material is accommodated;

sublimation gas piping which is formed by merging of branch pipes leading out from each of the solid material vessels;

at least one buffer tank connected to the sublimation gas piping;

at least one introduction pipe for introducing the sublimation gas from the at least one buffer tank to at least one subsequent process;

a first pressure measuring means provided in each of the solid material vessels;

branch valves provided in each branch pipe running to the sublimation gas piping;

at least one second valve provided between the first pressure measuring means and the at least one buffer tank or in each branch pipe branching from the sublimation gas piping to each buffer tank;

at least one third valve provided in the introduction pipe; and

a second pressure measuring means provided between the second valve and the third valve,

wherein the sublimation gas supply system further comprises: a first residual quantity calculation unit for calculating a residual quantity of the solid material from a consumption amount of the sublimation gas fed from the buffer tank to the subsequent process;

a second residual quantity calculation unit for calculating the residual quantity of the solid material from a mass of the sublimation gas fed from the solid material vessel to the buffer tank; and/or

a second switching determination unit for determining a switching timing and an abnormality from the residual quantity of the solid material inside the solid material vessel.

[Claim 7]
The sublimation gas supply system as claimed in claim 6, wherein the first residual quantity calculation unit:
calculates a first consumption amount ($Consumption_{_1}$) of the sublimation gas fed from the buffer tank from: a first differential pressure ΔP_1 between a pressure (P_{open}) inside the buffer tank before opening of the third valve in a state in which the sublimation gas is stored in the buffer tank, and a pressure (P_{close}) inside the buffer tank when the third valve has been closed after the sublimation gas has been fed from the buffer tank to the subsequent process, the volume (V_{buffer}) of the buffer tank, the density (d) of the sublimation gas, and a first correction factor (C_1); and calculates a first residual quantity (W_{r1}) of the solid material accommodated in the solid material vessel by subtracting the total quantity of the calculated first consumption amount ($Consumption_{_1}$) from an initial weight (W_0) of the solid material accommodated in the solid material vessel currently supplying the sublimation gas to the buffer tank.

[Claim 8]
The sublimation gas supply system as claimed in claim 6 or 7, wherein the second residual quantity calculation unit:
calculates a second consumption amount ($Consumption_{_2}$) of the sublimation gas fed to the buffer tank from: a second differential pressure ΔP_2 between a pressure (P_{close_1}) inside the buffer tank in a state in which the third valve is closed, and a pressure ($P_{_full}$) when the sublimation gas has been fed to the buffer tank from any solid material vessel and the pressure inside the buffer tank has reached a set pressure, the volume (V_{buffer}) of the buffer tank, the density (d) of the sublimation gas, and a second correction factor (C_2); and calculates a second residual quantity (W_{r2}) of the solid material accommodated in the solid material vessel by subtracting the total quantity of the calculated second consumption amount ($Consumption_{_2}$) from an initial weight (W_0) of the solid material accommodated in the solid material vessel currently supplying the sublimation gas to the buffer tank.

[Claim 9]
The sublimation gas supply system as claimed in claim 6, wherein the first switching determination unit:
when the sublimation gas is fed from any solid material vessel to the buffer tank, if the pressure inside the buffer tank does not exceed a first threshold (Th_1) within a preset period, determines

whether or not a pressure value inside the solid material vessel has decreased from a pressure value when a second valve, which is arranged between a first pressure measuring means and a second pressure measuring means, was open, or determines whether or not the pressure value inside the solid material vessel exceeds a second threshold (Th_2), and if the pressure value has not decreased or exceeds the second threshold (Th_2), determines that there is an abnormality in sublimation gas piping downstream of the first pressure measuring means, and if the pressure value has decreased or does not exceed the second threshold (Th_2), determines whether or not a latest first residual quantity (W_{r1}), a latest second residual quantity (W_{r2}), or an average value or a weighted average value of both thereof is smaller than a third threshold (Th_3), and if the latest first residual quantity (W_{r1}), the latest second residual quantity (W_{r2}), or the average value or the weighted average value of both thereof is not smaller than the third threshold (Th_3), determines that there is an abnormality in the sublimation gas piping or any branch pipe upstream of the first pressure measuring means, and if the latest first residual quantity (W_{r1}), the latest second residual quantity (W_{r2}), or the average value or the weighted average value of both thereof is smaller than the third threshold (Th_3), determines that there should be a switch to a different solid material vessel from the abovementioned solid material vessel.

[Claim 10]

The sublimation gas supply system as claimed in claim 7, wherein the second switching determination unit:

when the sublimation gas is fed from any solid material vessel to the buffer tank, if the pressure inside the buffer tank does not exceed a first threshold (Th_1) within a preset period, it is determined whether or not a pressure value inside the solid material vessel has decreased from a pressure value when a second valve, which is arranged between a first pressure measuring means and a second pressure measuring means, was open, or it is determined whether or not the pressure value inside the solid material vessel exceeds a second threshold (Th_2), and if the pressure value has not decreased or exceeds the second threshold (Th_2), it is determined that there is an abnormality in a branch pipe or sublimation gas piping downstream of the solid material vessel, and if the pressure value has decreased or does not exceed the second threshold (Th_2), it is determined that there should be a switch to a different solid material vessel from the abovementioned solid material vessel.

[Claim 11]

A residual quantity measuring method for measuring a residual quantity of a solid material inside a solid material vessel, the residual quantity measuring method comprises,

when a buffer tank is refilled with a sublimation gas:

a first residual quantity calculation step in which a residual quantity of the solid material is calculated from a consumption amount of the sublimation gas fed from the buffer tank to the subsequent process;

a second residual quantity calculation step in which the residual quantity of the solid material is calculated from a mass of the sublimation gas fed from a solid material vessel to the buffer tank; and/or

a switching determination step in which a switching timing and an abnormality are determined from the residual quantity of the solid material inside the solid material vessel.