CLAIMS

[Claim 1]

A substrate processing system comprising:

a substrate processing apparatus configured to process a substrate while directly or indirectly supplying a processing liquid from a processing-liquid supply nozzle onto the substrate, the processing-liquid supply nozzle being coupled to a processing-liquid supply line;

a distribution line that couples the processing-liquid supply line to a processing-liquid supply source; and

a flushing device configured to clean the distribution line and the processing-liquid supply line, the flushing device including:

a cleaning-liquid supply line coupled to the distribution line;

a drain mechanism configured to direct a cleaning liquid, supplied into the processing-liquid supply line through the distribution line, to a liquid disposal area;

a supply switching valve attached to the distribution line and the cleaning-liquid supply line, the supply switching valve being configured to allow only the processing liquid or the cleaning liquid to flow into the distribution line; and

an operation controller configured to control operations of the drain mechanism and the supply switching valve,

wherein the distribution line and the supply switching valve are located outside the substrate processing apparatus, and

wherein the drain mechanism comprises a drain line which branches off from the processing-liquid supply line and extends to the liquid disposal area, and a drain switching valve attached to the processing-liquid supply line and the drain line, the drain switching valve being configured to direct the cleaning liquid, flowing in the processing-liquid supply line, to the drain line.

[Claim 2]

The substrate processing system according to claim 1, wherein the drain switching valve is located right upstream of the processing-liquid supply nozzle.

[Claim 3]

A substrate processing system comprising:

a substrate processing apparatus configured to process a substrate while directly or indirectly supplying a processing liquid from a processing-liquid supply nozzle onto the substrate, the processing-liquid supply nozzle being coupled to a processing-liquid supply line;

a distribution line that couples the processing-liquid supply line to a processing-liquid supply source; and

a flushing device configured to clean the distribution line and the processing-liquid supply line, the flushing device including:

a cleaning-liquid supply line coupled to the distribution line;

a drain mechanism configured to direct a cleaning liquid, supplied into the processing-liquid supply line through the distribution line, to a liquid disposal area;

a supply switching valve attached to the distribution line and the cleaning-liquid supply line, the supply switching valve being configured to allow only the processing liquid or the cleaning liquid to flow into the distribution line; and

an operation controller configured to control operations of the drain mechanism and the supply switching valve,

wherein the distribution line and the supply switching valve are located outside the substrate processing apparatus, and wherein the drain mechanism comprises a nozzle moving mechanism configured to move the processing-liquid supply nozzle from a predetermined position for processing the substrate to a position above the liquid disposal area.

[Claim 4]

The substrate processing system according to claim 1, wherein the operation controller is configured to operate the supply switching valve before processing of the substrate to pass the cleaning liquid into the processing-liquid supply line.

[Claim 5]

The substrate processing system according to claim 1, wherein the operation controller is configured to operate the supply switching valve and the drain mechanism to direct the cleaning liquid to the liquid disposal area while passing the cleaning liquid into the processing-liquid supply line when an operation time of the substrate processing apparatus has reached a predetermined time.

[Claim 6]

The substrate processing system according to claim 1, further comprising:

a particle measuring device configured to count particles contained in the processing liquid per unit volume.

[Claim 7]

The substrate processing system according to claim 6, wherein the operation controller is configured to emit an alarm or stop an operation of the substrate processing apparatus if the number of particles has reached a predetermined threshold value.

[Claim 8]

The substrate processing system according to claim 6, wherein the operation controller is configured to operate the supply switching valve to cause the cleaning liquid to flow through the distribution line into the processing-liquid supply line and operate the drain mechanism to direct the cleaning liquid, supplied in the processing-liquid supply line, to the liquid disposal area, if the number of particles has reached a predetermined threshold value.

[Claim 9]

The substrate processing system according to claim 6, further comprising:

a filter for capturing the particles contained in the processing liquid, the particle measuring device being located downstream of the filter.

[Claim 10]

The substrate processing system according to claim 9, wherein the operation controller is configured to emit an alarm prompting a replacement of the filter if the number of particles has reached a predetermined threshold value.

[Claim 11]

A substrate processing system comprising:

a substrate processing apparatus configured to process a substrate while directly or indirectly supplying a processing liquid from a processing-liquid supply nozzle onto the substrate, the processing-liquid supply nozzle being coupled to a processing-liquid supply line;

a distribution line that couples the processing-liquid supply line to a processing-liquid

supply source;

a film-thickness measuring device configured to measure a film thickness of the substrate; and

a flushing device configured to clean the distribution line and the processing-liquid supply line, the flushing device including:

a cleaning-liquid supply line coupled to the distribution line;

a drain mechanism configured to direct a cleaning liquid, supplied into the processing-liquid supply line through the distribution line, to a liquid disposal area;

a supply switching valve attached to the distribution line and the cleaning-liquid supply line, the supply switching valve being configured to allow only the processing liquid or the cleaning liquid to flow into the distribution line; and

an operation controller configured to control operations of the drain mechanism and the supply switching valve,

wherein the distribution line and the supply switching valve are located outside the substrate processing apparatus, and

wherein the operation controller is configured to operate the supply switching valve to cause the cleaning liquid to flow through the distribution line into the processing-liquid

supply line and operate the drain mechanism to direct the cleaning liquid, supplied in the processing-liquid supply line, to the liquid disposal area, if a measurement value of the film thickness is out of a predetermined allowable range.

[Claim 12]

A substrate processing system comprising:

a substrate processing apparatus configured to process a substrate while directly or indirectly supplying a processing liquid from a processing-liquid supply nozzle onto the substrate, the processing-liquid supply nozzle being coupled to a processing-liquid supply line;

a distribution line that couples the processing-liquid supply line to a processing-liquid supply source;

a substrate inspection device configured to detect a defect of the substrate; and

a flushing device configured to clean the distribution line and the processing-liquid supply line, the flushing device including:

a cleaning-liquid supply line coupled to the distribution line;

a drain mechanism configured to direct a cleaning liquid, supplied into the processing-liquid supply line through the distribution line, to a liquid disposal area;

a supply switching valve attached to the distribution line and the cleaning-liquid supply line, the supply switching valve being configured to allow only the processing liquid or the cleaning liquid to flow into the distribution line; and

an operation controller configured to control operations of the drain mechanism and the supply switching valve,

wherein the distribution line and the supply switching valve are located outside the substrate processing apparatus, and

wherein the operation controller is configured to operate the supply switching valve to cause the cleaning liquid to flow through the distribution line into the processing-liquid supply line and operate the drain mechanism to direct the cleaning liquid, supplied in the processing-liquid supply line, to the liquid disposal area, if the number of detected defects has

reached a predetermined threshold value.

[Claim 13]

A substrate processing method comprising:

coupling a drain line, which branches off from a processing-liquid supply line and extends to a liquid disposal area, to an upstream passage of the processing-liquid supply line while closing a downstream passage of the processing-liquid supply line by operating a drain switching valve attached to the processing-liquid supply line and the drain line;

cleaning a distribution line and the processing-liquid supply line by flushing a cleaning liquid through the distribution line into the processing-liquid supply line which is installed in a substrate processing apparatus, while directing the cleaning liquid, which has been supplied into the processing-liquid supply line, to the liquid disposal area through the drain line;

providing fluid communication between the upstream passage and the downstream passage of the processing-liquid supply line while closing the drain line; and

processing a substrate in the substrate processing apparatus while supplying directly or indirectly a processing liquid onto the substrate through the processing-liquid supply line.

[Claim 14]

The substrate processing method according to claim 13, further comprising:

washing out a processing liquid remaining in the distribution line and directing the processing liquid to the liquid disposal area by supplying a fresh processing liquid into the distribution line.

[Claim 15]

The substrate processing method according to claim 13, further comprising:

measuring the number of particles contained in the processing liquid per unit volume.

[Claim 16]

The substrate processing method according to claim 15, wherein if the number of particles has reached a predetermined threshold value, emitting an alarm or stopping an operation of the substrate processing apparatus.

[Claim 17]

The substrate processing method according to claim 15, further comprising:

if the number of particles has reached a predetermined threshold value, performing again the process of cleaning the distribution line and the processing-liquid supply line by flushing the cleaning liquid through the distribution line into the processing-liquid supply line while directing the cleaning liquid to the liquid disposal area.

[Claim 18]

The substrate processing method according to claim 15, further comprising:

if the number of particles has reached a predetermined threshold value, emitting an alarm for prompting an replacement of a filter attached to the distribution line or the processing-liquid supply line.

[Claim 19]

A substrate processing method comprising:

cleaning a distribution line and a processing-liquid supply line by flushing a cleaning liquid through the distribution line into the processing-liquid supply line which is installed in a substrate processing apparatus, while directing the cleaning liquid, which has been supplied into the processing-liquid supply line, to a liquid disposal area;

processing a substrate in the substrate processing apparatus while supplying directly

or indirectly a processing liquid onto the substrate through the processing-liquid supply line;

measuring a film thickness of the substrate; and

if a measurement value of the film thickness is out of a predetermined allowable range, performing again the process of cleaning the distribution line and the processing-

liquid supply line by flushing the cleaning liquid through the distribution line into the processing-liquid supply line while directing the cleaning liquid to the liquid disposal area.

[Claim 20]

A substrate processing method comprising:

cleaning a distribution line and a processing-liquid supply line by flushing a cleaning liquid through the distribution line into the processing-liquid supply line which is installed in a substrate processing apparatus, while directing the cleaning liquid, which has been supplied into the processing-liquid supply line, to a liquid disposal area;

processing a substrate in the substrate processing apparatus while supplying directly or indirectly a processing liquid onto the substrate through the processing-liquid supply line;

detecting a defect of the substrate; and

if the number of detected defects has reached a predetermined threshold value, performing again the process of cleaning the distribution line and the processing-liquid supply line by flushing the cleaning liquid through the distribution line into the processing-liquid supply line while directing the cleaning liquid to the liquid disposal area.

[Claim 21]

The substrate processing method according to claim 13, wherein when an operation time of the substrate processing apparatus has reached a predetermined time, performing the process of cleaning the distribution line and the processing-liquid supply line by flushing the cleaning liquid through the distribution line into the processing-liquid supply line while directing the cleaning liquid, supplied into the processing-liquid supply line, to the liquid disposal area.

[Claim 22]

The substrate processing system according to claim 1, wherein the drain switching valve is located right downstream of a coupling member for coupling the processing-liquid supply line and the distribution line to each other.

[Claim 23]

The substrate processing system according to claim 1, wherein the drain mechanism is located inside the substrate processing apparatus.