CLAIMS

What is claimed is:

1. A valve assembly comprising:

a valve body including a passageway through which a first gas can be transmitted through the valve assembly;

a valve flow control element movable relative to the valve body between an opened position wherein flow through the passageway is at a maximum flow, and a closed position wherein flow through the passageway is at a minimum flow, the valve flow control element is shaped so that a control gap is provided between the valve body and valve flow control element through which the first gas can flow, and the dimensions of the control gap vary depending on the position of the valve flow control element relative to the valve body; and

a gas injector arrangement for selectively injecting a second gas into the control gap when the valve assembly is used to control the flow of the first gas through the passageway.

2. A valve assembly according to claim1, wherein the valve assembly is a butterfly valve and the valve flow control element is a movable flapper.

3. A valve assembly according to claim 1, wherein the valve assembly is a pendulum valve, and the valve flow control element is a movable disk.

4. A valve assembly according to claim 1, wherein the valve assembly has a valve conductance depending on the position of the valve flow control element relative to the valve body, and the gas injector arrangement injects the second gas into the control gap so as reduce the valve conductance of the valve when the valve flow control element is at or near the closed position.

5. A valve assembly according to claim 1, wherein the second gas is at a temperature higher than the first gas so that the first and second gases mix at a temperature above the condensation temperature of the first gas.

6. A valve assembly according to claim 1, wherein gas injector arrangement includes secondary passageways within the valve flow control element for directing the second gas to the control gap.

7. A valve assembly according to claim 6, wherein the valve flow control element includes at least two plates configured and arranged so as to define at least portions of the secondary passageways of the injector arrangement.

8. A valve assembly according to claim 7, further including a spacer disposed between the two plates.

9. A valve assembly according to claim 6, wherein the arrangement include apertures in the valve flow control element for directing the second gas into the control gap.

10. A valve assembly according to claim 9, wherein the apertures in the valve flow control element are arranged so as to direct the second gas in a radially outward direction from the valve flow control element.

11. A valve assembly according to claim 9, wherein the apertures in the valve flow flow control element are arranged so as to direct the second gas in the same downstream direction as to the flow of the first gas.

12. A method of in situ cleaning a valve assembly including a valve body and valve flow control element used to control the flow of a first gas through the valve assembly, comprising:

selectively injecting a second gas into a control gap between the valve body and valve flow control element through which the first gas can flow when the valve assembly is used to control the flow of the first gas through the passageway.

13. A method according to claim 12, wherein the second gas is a gas that is nonreactive with the first gas.

14. A method according to claim 12, wherein the valve assembly is a butterfly valve and the valve flow control element is a movable flapper.

15. A method according to claim 12, wherein the valve assembly is a pendulum valve.

16. A method according to claim 12, wherein the valve assembly has a valve conductance depending on the position of the valve flow control element relative to the valve body, and selectively injecting includes injecting the second gas into the control gap so as reduce the valve conductance of the valve when the valve flow control element is at or near a closed position.

17. A method according to claim 12, wherein the second gas is at a temperature higher than the first gas so that the first and second gases mix at a temperature above the condensation temperature of the first gas.

18. A method according to claim 12, further including transmitting the gas through secondary passageways within the valve flow control element so as to direct the second gas to the control gap.

19. A method according to claim 18, wherein the valve flow control element includes at least two plates configured and arranged so as to define at least portions of the secondary passageways.

20. A method according to claim 19, further including disposing a spacer between the two plates.

21. A method according to claim 19, wherein injecting the second gas into the control gap includes directing the second gas through apertures in the valve flow control element into the control gap.

22. A valve assembly according to claim 21, wherein injecting the second gas includes directing the second gas through the apertures in a radially outward direction from the valve flow control element.

23. A method according to claim 21, wherein injecting the second gas includes directing the second gas through the apertures in the same downstream direction as to the flow of the first gas.

CLAIMS:

1. A valve assembly comprising:

a valve body including a passageway through which a first gas can be transmitted through the valve assembly;

a valve flow control element movable relative to the valve body between an opened position wherein flow through the passageway is at a maximum flow, and a closed position wherein flow through the passageway is at a minimum flow, the valve flow control element is shaped so that a control gap is provided between the valve body and valve flow control element through which the first gas can flow, and the dimensions of the control gap vary depending on the position of the valve flow control element relative to the valve body; and

a gas injector arrangement for selectively injecting a second gas into the control gap when the valve assembly is used to control the flow of the first gas through the passageway, wherein the valve assembly has a valve conductance depending on the position of the valve flow control element relative to the valve body, and the gas injector arrangement injects the second gas into the control gap so as reduce the valve conductance of the valve when the valve flow control element is at or near the closed position, wherein gas injector arrangement includes secondary passageways within the valve flow control element for directing the second gas to the control gap.

2. A valve assembly according to claim 1, wherein the valve assembly is a butterfly valve and the valve flow control element is a movable flapper.

3. A valve assembly according to claim 1, wherein the valve assembly is a pendulum valve, and the valve flow control element is a movable disk.

4. A valve assembly according to claim 1, wherein the valve flow control element includes at least two plates configured and arranged so as to define at least portions of the secondary passageways of the injector arrangement.

5. A valve assembly according to claim 4, further including a spacer disposed between the two plates.

6. A valve assembly according to claim 1, wherein the arrangement include apertures in the valve flow control element for directing the second gas into the control gap.

7. A valve assembly according to claim 6, wherein the apertures in the valve flow control element are arranged so as to direct the second gas in a radially outward direction from the valve flow control element.

8. A valve assembly according to claim 6, wherein the apertures in the valve flow control element are arranged so as to direct the second gas in the same downstream direction as to the flow of the first gas.

9. A valve assembly comprising:

a valve body including a passageway through which a first gas can be transmitted through the valve assembly;

a valve flow control element movable relative to the valve body between an opened position wherein flow through the passageway is at a maximum flow, and a closed position wherein flow through the passageway is at a minimum flow, the valve flow control element is shaped so that a control gap is provided between the valve body and valve flow control element through which the first gas can flow, and the dimensions of the control gap vary depending on the position of the valve flow control element relative to the valve body; and

a gas injector arrangement for selectively injecting a second gas into the control gap when the valve assembly is used to control the flow of the first gas through the passageway, wherein the second gas is at a temperature higher than the first gas so that the first and second gases mix at a temperature above the condensation temperature of the first gas.

10. A method of in situ cleaning a valve assembly including a valve body and valve flow control element used to control the flow of a first gas through the valve assembly, comprising:

selectively injecting a second gas into a control gap between the valve body and valve flow control element through which the first gas can flow when the valve assembly is used to control the flow of the first gas through a passageway in the valve body, wherein the valve assembly has a valve conductance depending on the position of the valve flow control element relative to the valve body, and selectively injecting includes injecting the second gas into the control gap so as reduce the valve conductance of the valve when the valve flow control element is at or near a closed position; and

further including transmitting the gas through secondary passageways within the valve flow control element so as to direct the second gas to the control gap.

11. A method according to claim 10, wherein the second gas is a gas that is nonreactive with the first gas.

12. A method according to claim 10, wherein the valve assembly is a butterfly valve and the valve flow control element is a movable flapper.

13. A method according to claim 10, wherein the valve assembly is a pendulum valve.

14. A method according to claim 10, wherein the valve flow control element includes at least two plates configured and arranged so as to define at least portions of the secondary passageways.

15. A method according to claim 14, further including disposing a spacer between the two plates.

16. A method according to claim 14, wherein injecting the second gas into the control gap includes directing the second gas through apertures in the valve flow control element into the control gap.

17. A method according to claim 16, wherein injecting the second gas includes directing the second gas through the apertures in a radially outward direction from the valve flow control element.

18. A method according to claim 16, wherein injecting the second gas includes directing the second gas through the apertures in the same downstream direction as to the flow of the first gas.

19. A method of in situ cleaning a valve assembly including a valve body and valve flow control element used to control the flow of a first gas through the valve assembly, comprising:

selectively injecting a second gas into a control gap between the valve body and valve flow control element through which the first gas can flow when the valve assembly is used to control the flow of the first gas through a passageway in the valve body, wherein the second gas is at a temperature higher than the first gas so that the first and second gases mix at a temperature above the condensation temperature of the first gas.