CLAIMS

1. A method for detecting a malfunction within a gas distribution system, comprising:

enabling, by a controller, gas flow through a first flow path of the gas distribution system, wherein the first flow path comprises:

a gas stick comprising a first plurality of valves upstream of at least one of a pressure sensor or a flow sensor;

a processing chamber fluidly coupled to the gas stick; and

an exhaust conduit fluidly coupled to the processing chamber and configured to exhaust gas flow from the gas distribution system;

receiving first data comprising at least one of first pressure data or first flow rate data associated with the first flow path of the gas distribution system while gas flow is enabled through the first flow path;

processing the first data to determine whether the first flow path of the gas distribution system comprises a malfunction;

responsive to determining that the first flow path comprises a malfunction, determining a relative location of the malfunction within the first flow path, with respect to the at least one pressure sensor or flow sensor within the first flow path; and

generating a report indicating whether the first flow path comprises a malfunction and a relative location of any determined malfunction.

2. The method of claim 1, wherein the gas stick of the first flow path further comprises:

a second plurality of valves downstream of the at least one pressure sensor or flow sensor.

3. The method of claim 1, further comprising:

disabling, by the controller, the gas flow through the first flow path;

enabling, by the controller, gas flow through a second flow path of the gas distribution system;

receiving second data comprising at least one of second pressure data or second flow rate data associated with the second flow path of the gas distribution system while gas flow is enabled through the second flow path;

processing the second data to determine whether the second flow path of the gas distribution system comprises a malfunction; and

responsive to determining that the second flow path comprises a malfunction, determining a relative location of the malfunction within the second flow path, with respect to at least one of a pressure sensor or a flow sensor within the second flow path;

wherein the report further indicates whether the second flow path comprises a malfunction and a relative location of any determined malfunction of the second flow path.

4. The method of claim 3, further comprising:

disabling, by the controller, the gas flow through the second flow path;

enabling, by the controller, gas flow through a third flow path of the gas distribution system;

receiving third data comprising at least one of third pressure data or third flow rate data associated with the third flow path of the gas distribution system while gas flow is enabled through the third flow path;

processing the third data to determine whether the third flow path of the gas distribution system comprises a malfunction; and

responsive to determining that the third flow path comprises a malfunction, determining a relative location of the malfunction within the third flow path, with respect to at least one of a pressure sensor or a flow sensor within the third flow path;

wherein the report further indicates whether the third flow path comprises a malfunction and a relative location of any determined malfunction of the third flow path.

5. The method of claim 4, wherein the first flow path comprises a flow path for a first gas through the gas stick, wherein the second flow path comprises a flow path for the first gas through the gas stick and a bypass conduit that circumvents the processing chamber, and wherein the third flow path comprises a flow path for a second gas through the gas stick and the processing chamber or the bypass conduit.

6. The method of claim 1, wherein the first data comprises at least one of:

chamber pressure data indicative of a pressure within a processing chamber;

exhaust conduit pressure data indicative of a pressure within an exhaust conduit;

gas stick pressure data indicative of a pressure within a portion of a gas stick comprising the at least one pressure sensor or flow sensor; or

gas stick flow rate data indicative of a flow rate within a portion of the gas stick comprising the at least one of pressure sensor or flow sensor.

7. The method of claim 1, wherein processing the first data to determine whether the first flow path of the gas distribution system comprises a malfunction, comprises:

determining a delta in chamber pressure data between a first time prior to enabling the gas flow through the first flow path and a second time after enabling the gas flow through the first flow path;

determining a delta in exhaust conduit pressure data between the first time and the second time;

determining a level of stability of a gas flow rate through the first flow path; and

determining whether the delta in the chamber pressure data, the delta in the exhaust conduit pressure data and the level of stability of the gas flow rate are within respective acceptable ranges, wherein a malfunction is identified responsive to any of the delta in the chamber pressure data, the delta in the exhaust conduit pressure data or the level of stability of the gas flow rate being outside of the respective acceptable ranges.

8. The method of claim 1, wherein processing the first data to determine whether the first flow path of the gas distribution system comprises a malfunction, comprises:

determining a delta in chamber pressure data between a first time prior to enabling the gas flow through the first flow path and a second time after disabling the gas flow through the first flow path;

determining a delta in exhaust conduit pressure data between the first time and the second time;

determining a level of stability of a gas flow rate through the first flow path; and

determining whether the delta in the chamber pressure data, the delta in the exhaust conduit pressure data and the level of stability of the gas flow rate are within respective acceptable ranges, wherein a malfunction is identified responsive to any of the delta in the chamber pressure data, the delta in the exhaust conduit pressure data or the level of stability of the gas flow rate being outside of the respective acceptable ranges.

9. The method of claim 1, wherein determining the relative location of the malfunction within the first flow path comprises:

opening one or more valves of an upstream portion of the gas stick associated with the first flow path that is upstream of the at least one pressure sensor or flow sensor, such that gas flow advances through the upstream portion of the gas stick;

closing one or more valves of a downstream portion of the gas stick associated with the first flow path that is downstream of the at least one pressure sensor or flow sensor;

receiving, as the downstream portion of the gas stick is isolated, second data indicative of a first pressure change within the upstream portion of the gas stick; and

determining that the upstream portion of the gas stick comprises the malfunction responsive to a determination that the first pressure change exceeds a first pressure change threshold.

10. The method of claim 1, wherein determining the relative location of the malfunction within the first flow path, comprises:

closing one or more valves of an upstream portion of the gas stick associated with the first flow path that is upstream of the at least one pressure sensor or flow sensor;

opening one or more valves of a downstream portion of the gas stick associated with the first flow path that is downstream of the at least one pressure sensor or flow sensor;

receiving second data indicative of a first pressure change within the downstream portion of the gas stick; and

determining that the downstream portion of the gas stick comprises the malfunction responsive to a determination that the first pressure change exceeds a first pressure change threshold.

11. The method of claim 1, wherein determining the relative location of the malfunction within the first flow path comprises determining that the malfunction is associated with one or more components of the first flow path that are downstream of the at least one pressure sensor or flow sensor, or determining that the malfunction is associated with one or more components of the first flow path that are upstream of the at least one pressure sensor or flow sensor.

12. A non-transitory computer readable storage medium comprising instructions that, when executed by a processing device, cause the processing device to perform operations comprising:

enabling, by a controller, gas flow through a first flow path of a gas distribution system, wherein the first flow path comprises:

a gas stick comprising a first plurality of valves upstream of at least one of a pressure sensor or a flow sensor;

a processing chamber fluidly coupled to the gas stick; and

an exhaust conduit fluidly coupled to the processing chamber and configured to exhaust gas flow from the gas distribution system;

receiving first data comprising at least one of first pressure data or first flow rate data associated with the first flow path of the gas distribution system while gas flow is enabled through the first flow path;

processing the first data to determine whether the first flow path of the gas distribution system comprises a malfunction;

responsive to determining that the first flow path comprises a malfunction, determining a relative location of the malfunction within the first flow path, with respect to the at least one pressure sensor or flow sensor within the first flow path; and

generating a report indicating whether the first flow path comprises a malfunction and a relative location of any determined malfunction.

13. The non-transitory computer readable storage medium of claim 12, wherein the gas stick of the first flow path further comprises:

a second plurality of valves downstream of the at least one pressure sensor or flow sensor.

14. The non-transitory computer readable storage medium of claim 12, wherein the operations performed by the processing device further comprise:

disabling, by the controller, the gas flow through the first flow path;

enabling, by the controller, gas flow through a second flow path of the gas distribution system;

receiving second data comprising at least one of second pressure data or second flow rate data associated with the second flow path of the gas distribution system while gas flow is enabled through the second flow path;

processing the second data to determine whether the second flow path of the gas distribution system comprises a malfunction; and

responsive to determining that the second flow path comprises a malfunction, determining a relative location of the malfunction within the second flow path, with respect to at least one of a pressure sensor or a flow sensor within the second flow path;

wherein the report further indicates whether the second flow path comprises a malfunction and a relative location of any determined malfunction of the second flow path.

15. The non-transitory computer readable storage medium of claim 14, wherein the operations performed by the processing device further comprise:

disabling, by the controller, the gas flow through the second flow path;

enabling, by the controller, gas flow through a third flow path of the gas distribution system;

receiving third data comprising at least one of third pressure data or third flow rate data associated with the third flow path of the gas distribution system while gas flow is enabled through the third flow path;

processing the third data to determine whether the third flow path of the gas distribution system comprises a malfunction; and

responsive to determining that the third flow path comprises a malfunction, determining a relative location of the malfunction within the third flow path, with respect to at least one of a pressure sensor or a flow sensor within the third flow path;

wherein the report further indicates whether the third flow path comprises a malfunction and a relative location of any determined malfunction of the third flow path.

16. The non-transitory computer readable storage medium of claim 15, wherein the first flow path comprises a flow path for a first gas through the gas stick, wherein the second flow path comprises a flow path for the first gas through the gas stick and a bypass conduit that circumvents the processing chamber, and wherein the third flow path comprises a flow path for a second gas through the gas stick and the processing chamber or the bypass conduit.

17. A system comprising:

a memory device; and

a processing device communicatively coupled to the memory device, wherein the processing device is configured to:

enable gas flow through a first flow path of a gas distribution system, wherein the first flow path comprises:

a gas stick comprising a first plurality of valves upstream of at least one of a pressure sensor or a flow sensor;

a processing chamber fluidly coupled to the gas stick; and

an exhaust conduit fluidly coupled to the processing chamber and configured to exhaust gas flow from the gas distribution system;

receive first data comprising at least one of first pressure data or first flow rate data associated with the first flow path of the gas distribution system while gas flow is enabled through the first flow path;

process the first data to determine whether the first flow path of the gas distribution system comprises a malfunction;

responsive to determining that the first flow path comprises a malfunction, determine a relative location of the malfunction within the first flow path, with respect to the at least one pressure sensor or flow sensor within the first flow path; and

generate a report indicating whether the first flow path comprises a malfunction and a relative location of any determined malfunction.

18. The system of claim 17, wherein the gas stick of the first flow path further comprises:

a second plurality of valves downstream of the at least one pressure sensor or flow sensor.

19. The system of claim 17, wherein the processing device is further configured to:

disable the gas flow through the first flow path;

enable gas flow through a second flow path of the gas distribution system;

receive second data comprising at least one of second pressure data or second flow rate data associated with the second flow path of the gas distribution system while gas flow is enabled through the second flow path;

process the second data to determine whether the second flow path of the gas distribution system comprises a malfunction; and

responsive to determining that the second flow path comprises a malfunction, determine a relative location of the malfunction within the second flow path, with respect to at least one pressure sensor or flow sensor within the second flow path;

wherein the report further indicates whether the second flow path comprises a malfunction and a relative location of any determined malfunction of the second flow path.