CLAIMS

1. A system for foreline diagnostics and control, comprising:

a foreline coupled to an exhaust of a processing chamber;

a first sensor positioned to measure deposition build-up in the foreline; and

a build-up monitor coupled to the first sensor, the build-up monitor comprising a trained machine learning (ML) model and configured to generate an output indicating deposition build-up and trigger a corrective action when the indicated deposition build-up is at or above a build-up threshold, wherein the trained ML model is trained via a process comprising:

receiving first sensor training data from a database comprising first sensor data from prior operation of a semiconductor processing chamber;

classifying the first sensor training data to differentiate between one of:

a clean surface of the foreline; and

multiple deposition thicknesses of a material deposited on the foreline; and

generating model parameters for the trained ML model based on the classifying.

2. The system of Claim 1, the first sensor comprising one of:

an ultrasonic transducer;

a piezoelectric sensor;

a pressure sensor; and

a position sensor for a pressure control valve.

3. The system of Claim 1, wherein the build-up monitor comprises an open loop control.

4. The system of Claim 1, wherein the build-up monitor is coupled to a plurality of sensors.

5. The system of Claim 1, wherein the corrective action comprises one of:

generating an alert to a user;

stopping operation of the semiconductor processing chamber; and

causing the semiconductor processing chamber to begin a clean operation.

6. The system of Claim 5, wherein the trained ML model is further configured to monitor a change in temperature of the foreline during a clean operation.

7. A computer-readable medium comprising instructions for executing a method for foreline deposition diagnostics, the method comprising:

receiving sensor data from at least one of a plurality of sensors;

providing the sensor data to a build-up monitor comprising a trained machine learning (ML) model configured to generate an output indicating deposition build-up; and

generating a corrective action based on the output when the sensor data is indicated to be at or above a build-up threshold, wherein the trained ML model is trained via a process comprising:

receiving sensor training data from a database comprising sensor data from prior operation of a semiconductor processing chamber;

classifying the sensor training data to differentiate between one of:

a clean surface of the foreline; and

multiple deposition thicknesses of a material deposited on the foreline; and

generating model parameters for the trained ML model based on the classifying.

8. The computer-readable medium of Claim 7, wherein the plurality of sensors comprises one of an ultrasonic transducer and a piezoelectric sensor.

9. The computer-readable medium of Claim 7, wherein the plurality of sensors comprises a pressure sensor and a pressure control valve.

10. The computer-readable medium of Claim 9, wherein the pressure sensor is positioned adjacent to the pressure control valve.

11. The computer-readable medium of Claim 7, wherein the plurality of sensors are positioned between a pump and a chamber exhaust.

12. The computer-readable medium of Claim 7, wherein the corrective action is at least partially generated by an open loop control configured to monitor the sensor data.

13. The computer-readable medium of Claim 7, wherein the trained ML model comprises one of a supervised model and an unsupervised model.

14. A method for monitoring deposition build-up in a foreline of a processing system, comprising:

receiving sensor data from one or more sensors coupled to a foreline of a processing system;

processing the sensor data with a trained ML model to estimate a build-up; and

triggering a corrective action corresponding to the estimated build-up of the trained ML model, wherein the trained ML model is trained via a process comprising:

receiving sensor training data comprising sensor data from prior operation of one or more processing systems;

classifying the sensor training data to differentiate between one of:

a clean surface of the foreline; and

multiple deposition thicknesses of a material deposited on the foreline; and

generating model parameters for the trained ML model based on the classifying.

15. The method of Claim 14, wherein the trained ML model is further trained to detect a change in temperature of the foreline.

16. The method of Claim 14, wherein the one or more sensors comprise one or more of:

an ultrasonic transducer;

a piezoelectric sensor;

a pressure sensor; and

a position sensor for a pressure control valve.

17. The method of Claim 14, wherein the corrective action comprises one of:

stopping operation of the processing system;

initiating a clean operation; and

alerting a user.