CLAIMS

What is claimed is:

1. An air contactor comprising:

an airflow generator to generate an airflow;

a liquid distribution system operable to distribute liquid that is contacted by the airflow;

a sensor configured to detect an air variable of the airflow;

a controller operably connected to the liquid distribution system and the sensor, the controller configured to:

determine an operating variable of at least one of the airflow generator and the liquid distribution system; and

determine a drift condition of the air contactor based at least in part upon the air variable of the airflow and the operating variable of the at least one of the airflow generator and the liquid distribution system.

2. The air contactor of claim 1 wherein the drift condition includes an abnormal drift condition of the air contactor; and

wherein the controller is configured to determine the abnormal drift condition in response to:

the air variable being sufficiently different than an expected air variable; and/or

the operating variable being sufficiently different than an expected operating variable.

3. The air contactor of claim 1 wherein the drift condition includes a drift rate of the air contactor.

4. The air contactor of claim 1 wherein the drift condition includes an abnormal drift condition of the air contactor;

wherein the controller is configured to determine a drift rate of the air contactor; and

wherein the controller is configured to determine the abnormal drift condition in response to the drift rate of the air contactor being an abnormal drift rate.

5. The air contactor of claim 1 wherein the drift condition includes an abnormal change in the drift of the air contactor.

6. The air contactor of claim 1 wherein the air variable comprises an upstream air variable and a downstream air variable;

wherein the sensor comprises:

an upstream sensor configured to detect the upstream air variable of the airflow upstream of the airflow contacting the liquid; and

a downstream sensor configured to detect the downstream air variable of the airflow downstream of the airflow contacting the liquid.

7. The air contactor of claim 6 wherein the drift condition includes an abnormal drift condition; and

wherein the controller is configured to determine the drift condition based at least in part upon the downstream air variable being abnormal relative to the upstream air variable.

8. The air contactor of claim 1 wherein the air variable comprises a first air variable associated with a first operating condition of the air contactor and a second air variable associated with a second operating condition of the air contactor;

wherein the operating variable comprises a first operating variable associated with the first operating condition and a second operating variable associated with the second operating condition;

wherein the drift condition includes an abnormal drift condition; and

wherein the controller is configured to determine the abnormal drift condition of the air contactor in response to:

the second air variable changing abnormally from the first air variable; and/or

the second operating variable changing abnormally from the first operating variable.

9. The air contactor of claim 8 wherein the airflow generator comprises a fan assembly;

wherein the first operating condition comprises the controller being configured to operate the fan assembly at a first speed and control the liquid distribution system to distribute liquid; and

wherein the second operating condition comprises the controller being configured to operate the fan assembly at a different, second speed and control the liquid distribution system to distribute liquid.

10. The air contactor of claim 1 wherein the drift condition is an abnormal drift condition; and

wherein the controller is configured to determine the abnormal drift condition based at least in part upon a comparison of the air variable and the operating variable to a dataset of variables corresponding to normal drift conditions.

11. The air contactor of claim 1 wherein the operating variable includes a variable of the liquid; and

wherein the controller is configured to determine the drift condition based at least in part upon the air variable and the variable of the liquid.

12. The air contactor of claim 1 wherein the controller is configured to determine the drift condition using a machine learning algorithm to process the air variable and the operating variable.

13. The air contactor of claim 1 wherein the operating variable of at least one of the airflow generator and the liquid distribution system comprises a first variable of the airflow generator and a second variable of the liquid distribution system.

14. The air contactor of claim 1 wherein the airflow generator includes a fan assembly operable to generate the airflow; and

wherein the operating variable comprises a fan assembly operating variable.

15. The air contactor of claim 1 wherein the air sensor comprises a particulate matter sensor; and

wherein the air variable comprises a particulate variable indicative of particulate matter in the airflow.

16. The air contactor of claim 15 wherein the particulate matter sensor comprises:

a first particulate matter sensor configured to detect particles of a first size; and

a second particulate matter sensor configured to detect particles of a smaller, second size; and

wherein the particulate variable comprises:

a first particulate variable indicative of particulate matter in the airflow having the first size; and

a second particulate variable indicative of particulate matter in the airflow having the second size.

17. The air contactor of claim 1 wherein the sensor comprises a particulate matter sensor, a relative humidity sensor, and a temperature sensor; and

wherein the air variable comprises a particulate matter variable, a relative humidity variable, and an air temperature variable.

18. The air contactor of claim 1 wherein the airflow generator comprises a fan assembly;

wherein the operating variable of at least one of the airflow generator and the liquid distribution system includes:

a fan speed of the fan assembly; and

an operating condition of the liquid distribution system.

19. The air contactor of claim 1 wherein the operating variable of at least one of the airflow generator and the liquid distribution system includes:

an operating condition of the liquid distribution system; and

a variable of the liquid.

20. The air contactor of claim 1 wherein the sensor comprises:

a passageway to receive a portion of the airflow; and

a particulate sensor to detect a particulate variable of the portion of the airflow.

21. The air contactor of claim 1 wherein the sensor comprises:

a passageway to receive a portion of the airflow;

an airflow sensor to detect the air variable of the portion of the airflow in the passageway; and

a heater, cooler, or both in the passageway upstream of the airflow sensor.

22. The air contactor of claim 1 wherein the controller is configured to adjust operation of at least one of the airflow generator and the liquid distribution system in response to the determination of the drift condition.

23. The air contactor of claim 1 further comprising a pad, fill, and/or an indirect heat exchanger; and

wherein the liquid distribution system is operable to distribute the liquid onto the pad, fill and/or indirect heat exchanger.

24. The air contactor of claim 1 wherein the liquid is an air pollutant capture solution.

25. The air contactor of claim 1 wherein the air contactor is a hyperbolic cooling tower;

wherein the airflow generator is a shell of the hyperbolic cooling tower; and

wherein the operating variable is an operating variable of the liquid distribution system.

26. The air contactor of claim 1 wherein the operating variable of at least one of the air generator and the liquid distribution system comprises a plurality of variables of the liquid distribution system, the plurality of variables including:

a first variable indicative of whether a pump of the liquid distribution system is operating; and

a second variable indicative of a conductivity of the liquid.