CLAIMS:

1. A hybrid evaporative cooler system comprising:

an evaporative cooler located in an airstream;

a cooling coil located in the airstream downstream of the evaporative cooler and configured to receive a process fluid from a source; and

a controller configured to operate the hybrid evaporative cooler system in a wet mode, in which the evaporative cooler is activated to receive a working fluid and to condition at least one of the working fluid and the airstream and in which the cooling coil cools the process fluid using the airstream, and configured to operate the evaporative cooler system in a dry mode in which the evaporative cooler is deactivated and in which the cooling coil cools the process fluid using the airstream, the controller further configured to:

receive a leaving process fluid temperature set point;

determine a minimum supply fluid temperature deliverable by the cooling coil in the dry mode based on a coil performance model; and

operate the hybrid evaporative cooler system in the dry mode on condition that the leaving process fluid temperature set point is greater than the minimum supply fluid temperature.

2. The hybrid evaporative cooler system of claim 1, further comprising:

a process fluid inlet temperature sensor configured to transmit an inlet temperature signal to the controller based on a process fluid inlet temperature;

wherein the minimum supply fluid temperature is determined based on the inlet temperature sensor signal.

3. The hybrid evaporative cooler system of claim 2, further comprising:

a process fluid outlet temperature sensor configured to transmit an outlet temperature signal to the controller based on a process fluid outlet temperature;

wherein the minimum supply fluid temperature is determined based on the inlet temperature signal and the outlet temperature signal.

4. The hybrid evaporative cooler system of claim 3, further comprising:

a process fluid flow sensor configured to transmit a flow signal to the controller based on a process fluid flow rate;

wherein the minimum supply fluid temperature is determined based on the inlet temperature signal, the outlet temperature signal, and the flow signal.

5. The hybrid evaporative cooler system of claim 4, further comprising:

a temperature sensor configured to transmit an air temperature signal to the controller based on an inlet air temperature;

wherein the minimum supply fluid temperature is determined based on the inlet temperature signal, the outlet temperature signal, the air temperature signal, and the flow signal.

6. The hybrid evaporative cooler system of claim 2, further comprising:

a process fluid flow sensor configured to transmit a flow signal to the controller based on a process fluid flow rate;

wherein the minimum supply fluid temperature is determined based on the inlet temperature signal and the flow signal.

7. The hybrid evaporative cooler system of claim 1, wherein the coil performance model is based on a theoretical performance of the cooling coil.

8. The hybrid evaporative cooler system of claim 7, wherein the coil performance model uses one or more of a process fluid inlet temperature signal, a process fluid outlet temperature signal, an air temperature signal, and a process ~~water~~ fluid flow rate signal.

9. The hybrid evaporative cooler system of claim 1, wherein the coil performance model is based on an empirical performance of the cooling coil.

10. The hybrid evaporative cooler system of claim 7, wherein the coil performance model uses one or more of a process fluid inlet temperature signal, a process fluid outlet temperature signal, an air temperature signal, and a process fluid flow rate signal.

11. The hybrid evaporative cooler system of claim 1, wherein the controller is configured to update the coil performance model based on performance data collected over time to account for degradation in performance of the cooling coil.

12. A method of controlling a hybrid evaporative cooler system, the method comprising:

cooling a process fluid from a source using a cooling coil located in an airstream downstream of an evaporative cooler, the evaporative cooler operable together with the cooling coil in a wet mode; and

receiving a leaving process fluid temperature set point;

determining a minimum supply fluid temperature deliverable by the cooling coil in a dry mode where the evaporative cooler is deactivated based on a coil performance model; and

operating the hybrid evaporative cooler system in the dry mode when the leaving process fluid temperature set point is greater than the minimum supply fluid temperature.

13. The method of claim 12, further comprising:

receiving an inlet temperature signal produced by a fluid inlet temperature sensor based on a process fluid inlet temperature;

wherein determining the minimum supply fluid temperature deliverable by the cooling coil in the dry mode is based on the inlet temperature signal.

14. The method of claim 13, further comprising:

receiving an outlet temperature signal produced by a fluid outlet temperature sensor based on a process fluid outlet temperature;

wherein determining the minimum supply fluid temperature deliverable by the cooling coil in the dry mode is based on the inlet temperature signal and the outlet temperature signal.

15. The method of claim 14, further comprising:

receiving a flow signal produced by a process fluid flow sensor based on a process fluid flow rate;

wherein determining the minimum supply fluid temperature deliverable by the cooling coil in the dry mode is based on the inlet temperature signal, the outlet temperature signal, and the flow signal.

16. The method of claim 15, further comprising:

receiving an air temperature signal produced by a temperature sensor based on an inlet air temperature;

wherein determining the minimum supply fluid temperature deliverable by the cooling coil in the dry mode is based on the inlet temperature signal, the outlet temperature signal, the air temperature signal, and the flow signal.

17. The method of claim 12, further comprising:

receiving a flow signal produced by a process fluid flow sensor based on a process fluid flow rate;

wherein determining the minimum supply fluid temperature deliverable by the cooling coil in the dry mode is based on the inlet temperature signal and the flow signal.

18. The method of claim 12, wherein the coil performance model is based on a theoretical performance of the cooling coil.

19. The method of claim 12, wherein the coil performance model is based on an empirical performance of the cooling coil.

20. A hybrid evaporative cooler system comprising:

an evaporative cooler located in an airstream;

a cooling coil located in the airstream downstream of the evaporative cooler and configured to receive a process fluid from a source; and

a controller configured to enable and disable the evaporative cooler and the cooling coil, the controller further configured to:

receive a leaving process fluid temperature set point;

determine a minimum supply fluid temperature deliverable by the cooling coil on condition that the evaporative cooler is off based on a coil performance model; and

disable the evaporative cooler on condition that the leaving process fluid temperature set point is greater than the minimum supply fluid temperature.

21. The hybrid evaporative cooler system of claim 20, further comprising:

a process fluid inlet temperature sensor configured to transmit an inlet temperature signal to the controller based on a process fluid inlet temperature;

wherein the minimum supply fluid temperature is determined based on the inlet temperature sensor.

22. The hybrid evaporative cooler system of claim 21, further comprising:

a process fluid outlet temperature sensor configured to transmit an outlet temperature signal to the controller based on a process fluid outlet temperature;

wherein the minimum supply fluid temperature is determined based on the inlet temperature signal and the outlet temperature signal.

23. The hybrid evaporative cooler system of claim 20, further comprising:

an air flow sensor configured to transmit an air flow signal to the controller based on a flow rate of air through the hybrid evaporative cooler system;

wherein the minimum supply fluid temperature is determined based on the air flow signal.

24. The hybrid evaporative cooler system of claim 1, wherein the controller is configured to update the coil performance model based on a machine learning model using performance data collected over time to account for degradation in performance of the cooling coil.