Claims

1. A fire detection and warning system, comprising:

kitchen exhaust hood connected to an exhaust fan configured to ventilate convective heat and cooking fumes released by one or more cooking appliances installed under the kitchen exhaust hood, the kitchen exhaust hood having a plenum;

a fire suppression system operatively connected to the hood and positioned above the one or more cooking appliances, the fire suppression system being configured to be triggered by one or more fusible links with a predefined melting temperature to discharge a fire suppressing agent;

at least one temperature sensor installed inside the plenum of the kitchen exhaust hood;

a control module operatively connected to the at least one temperature sensor and receiving signals indicating a temperature measurement by the at least one temperature sensor, wherein

the control module is configured to generate a fire warning signal in response to a fume temperature T measured by the at least one temperature sensor reaching a predefined temperature threshold T_{set} for a predefined period of time T_{dur}, and

the temperature threshold T_{set} and the time duration T_{dur} are selected based on a melting temperature rating of at least one of the one or more fusible links.

2. The fire detection and warning system according to claim 1, further comprising:

the one or more cooking appliances installed under the kitchen exhaust hood.

3. The fire detection and warning system according to claim 1, comprising:

two temperature sensors positioned at opposite ends of the plenum of the kitchen exhaust hood on two sides of an exhaust collar.

4. The fire detection and warning system according to claim 1, wherein

the at least one temperature sensor is positioned directly above a cooking appliance with a highest heat signature or fire risk.

5. The fire detection and warning system according to claim 1, wherein

the predefined temperature setpoint is below a predefined fusible link temperature.

6. The fire detection and warning system according to claim 1, wherein

the control module is configured to record the temperature sensor reading output for an extended period of time, wherein the extended period of time is 5 days, 1 week, 2 weeks, 4 weeks, one month, two months, three months, four months, five months, or six months.

7. The fire detection and warning system according to claim 6, wherein

the control module is further configured to update the temperature threshold T_{set} to a lower value that represents a highest temperature value measured during the extended period of time, in response to the control module determining that the predefined temperature threshold T_{set} had not been exceeded during the extended period of time.

8. The fire detection and warning system according to claim 6, wherein

the control module is configured to update the temperature T_{set} to T_{max}-dT, where T_{max} is the maximum recorded temperature and dT is a predefined temperature range limit.

9. The fire detection and warning system according to claim 1, further comprising:

one or more thermal imaging sensors located under the kitchen exhaust hood and configured to monitor surface temperature of the cooking appliances under the hood and provide output signals to the control module,

wherein the control module determines whether to output a fire warning based on the temperature signals from the temperature sensors and based on the output signals provided by the one or more thermal imaging sensors.

10. The system of claim 9, wherein the system is configured to record an appliance a heat signature HS including the surface temperature and a pixel area for an extended period of time of at least 30 days and establish a typical HS pattern.

11. The system of claim 7, wherein the system is configured to use a heat signature pattern to establish a historical baseline and detect any anomalies that may cause potential fire.

12. The system of claim 7, wherein the system is configured to use image recognition algorithms to establish a baseline signature and anomalies.

13. The system of claim 10, wherein the system is further configured to record T and HS during a fire event and establish a fire signature as a combination of T and HS recorded in time.

14. The system of claim 13, wherein the system is further configured to calculate a fire risk factor using deviation of the current values of T and HS from those representing a fire signature.

15. The system of claim 1, wherein space temperature sensor Tr is used to offset T reading where fluctuation of Tr during the year exceeds 5°F.

16. A method of identifying a fire risk condition, comprising:

providing a kitchen exhaust hood with a plenum and an exhaust duct connected to the plenum, the kitchen exhaust hood having a fire suppression system with fusible links installed;

positioning at least one temperature sensor inside the plenum to measure a temperature inside the plenum;

providing a control module operatively connected to the at least one temperature sensor;

receiving at the control module a signal representing the measured temperature inside the plenum from the at least one temperature sensor;

comparing the temperature inside the plenum with a preset temperature threshold Tset; and

outputting a warning signal from the control module in response to a result of the comparing indicating that the temperature inside the plenum has exceeded the predefined temperature threshold Tset for a predefined duration of time Tdur,

wherein the predefined temperature threshold Tset and the predefined duration of time Tdur are selected based on a melting temperature rating of the fusible links.

17. The method according to claim 16, wherein

the temperature sensor is positioned no farther than a distance D from the at least one of the fusible links with a melting temperature Tm indicated by the melting temperature rating, and

the result of the comparing indicates the fire risk condition when the distance D is 5 cm or less and the measured temperature is within 5 degrees Fahrenheit of Tm for the predefined duration of time Td.