

Preventing condensation



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- What causes condensation?
- How can conditions of condensation be anticipated?
- What can be done to prevent condensation?

Unwanted condensation on products or equipment can have consequences. Steel and other metals stored in warehouses can corrode or suffer surface damage as a result of condensation. Condensation on packaged beverage containers can damage labels or cardboard packaging materials. Water-cooled equipment, such as blow molding machinery, can form condensation on critical surfaces that impair product quality or the productivity of the equipment. How can we get a grip on this potential problem?

What causes condensation?

Condensation will form on any object when the temperature of the object is at or below the dew point temperature of the air surrounding the object. Dew point temperature is defined simply as the temperature at which water vapor, when cooled, will begin to condense to the liquid phase, so it is the most useful humidity parameter when dealing with condensation problems. Dew point, relative humidity, and temperature are all related. The following table shows some typical temperature and humidity values and their corresponding dew point temperatures:

Temperature °C (°F)%	Relative Humidity	Dew Point °C (°F)
27 (80)	75%	22 (71)
27 (80)	45%	13 (56)
16 (60)	75%	11 (52)
16 (60)	45%	4 (39)
2 (35)	75%	-2 (28)
2 (35)	45%	-9 (16)

Consider conditions of condensation, for example, a room or warehouse where the air is 27°C (80°F) and the relative humidity is 75%. In this room, any object with a temperature of 22°C (71°F) or lower will become covered by condensation.

How can conditions of condensation be anticipated? The easiest way to anticipate condensing conditions is to measure the dew point temperature in the area of interest. This can be done simply with a portable indicator, or a fixed transmitter can be used to track dew point temperature full-time. The second piece of information required is the temperature of the object that is to be protected from condensation. In all cases, as the dew point temperature reaches the object's temperature, condensation on the object is imminent. The best way to capture an object's temperature is dependent on the specific application. For example, water-cooled machinery may already provide a display or output of coolant temperature (and therefore, a close approximation of the temperature of the object that is being cooled). For steel stored in a warehouse, it may be necessary to attach a surface temperature probe to the steel.





What can be done to prevent condensation?

Condensation can be prevented by:

1. increasing the temperature of the object to be protected keeping it above dew point temperature.
2. reducing the dew point temperature of the air around the object, for example, by implementing an air-drying system.

The solution is dependent on the specific application. In the case of steel in a warehouse, it is impractical to heat a large mass of steel in order to prevent condensation. It may be more appropriate to install air conditioning to reduce the dew point temperature of the air in the warehouse when necessary. In liquid cooled equipment, it may be possible to raise the temperature setting of the cooling liquid in order to keep the ambient temperature above dew point. Whichever strategy is chosen, it is essential to have timely and accurate knowledge of the dew point temperature.



How can Vaisala help?

Vaisala offers instruments that are well suited for ambient humidity and temperature measurement.

1. For a portable indicator, the Vaisala HUMICAP® Hand-Held Humidity Meter HM70 is the best.
2. For a fixed instrument, consider the Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT330 which can be configured to meet your specific needs.
3. Use our free humidity calculator for temperature, relative humidity and dew point conversions.
www.vaisala.com/humiditycalculator



Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT330

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