Technical Brief

TEMPERATURE

The Whys and Hows of Temperature Measurement

Let's talk briefly about why temperature needs to be measured and how it's accomplished.

THE WHYS

Temperature is the most measured variable because it plays a key role in so many processes, from production of food to electrical power generation. While temperature may need to be measured for any number of reasons, these are at the top of the list.

Verification and validation:
Understanding the temperature of a process or machine is a fundamental indicator in validating the operating condition.
For example in food and pharmaceutical production, the batch temperature must be closely monitored to ensure the process is being properly managed. Temperature data logged over time is frequently used to verify that food products have been maintained within safe temperature limits.

Machines often use temperature to verify conditions are normal. Think of the car, where one of the main instruments used is the temperature gauge. If the temperature starts to rise, it's an indication that there could be a major issue with the engine. The same applies to industrial machines where the area of interest might be the bearing temperature of a large motor. Logged temperatures of a machine operating over time can point to trends that are useful for predicting failures.

Control:
The other main use of measured temperature is an input to control a device. The most common example is when heating or cooling products or environments. Similar to the thermostat you have in your home, the heating or cooling device needs to know when to turn on and off. It uses the measured temperature as the input to feed back the current temperature. Industry temperature measurements can be used as an input to control any number of devices such as heaters, pumps, valves and fans.

Impact of bad or incorrect measurement:
When inaccurate temperature measurements are used in processes it can have a major impact on the results. Here are some examples:

- Safety – Processes that rely on temperature control to maintain safe temperatures, such as in dairy and meat production can unknowingly be exposing customers to hazards, because measured temperatures were inaccurate.
- Time and Cost – Loss of a batch of product due to off-normal temperature conditions can have costly implications.For example, even slight variations due to inaccurate temperatures in the beer brewing process can have major impacts on the quality and consistency of the batch, requiring that the batch be dumped and a new one started.

THE HOWS

There are a wide range of devices used to measure temperature but they all are used to measure in the following manner.

Direct vs Remote
Direct measurements tend to be more local, where a device such as a bimetal or digital thermometer is used to monitor processes by a user visually.
Remote devices such as RTD assemblies are commonly used to measure temperature at a remote location and transmit data to a central place to control equipment. These devices may or may not have a local indication.

Continuous vs Sampling
Sampling refers to a process where temperature is measured at consistent intervals over time. This is common where temperature doesn't change frequently or quickly. It should be noted that this is typically a function of the control system and not the sensor itself.

To learn more about Tel-Tru temperature instruments on our website, click here or contact us.

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