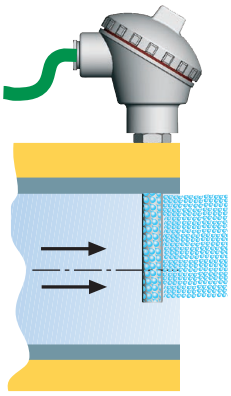
Questions should be of general interest and be about temperature measurement techniques and/or heat transfer.

QUESTIONS ANSWERS

Do wet sensors react slowly?

QUESTION: We measure the temperature of exhaust gas from a gas-fired furnace, which we use only in the daytime. The sheathed thermocouple has been installed so that we can measure the temperature at the gas exit. The temperature of the fumes is fairly constant when the furnace is in use. Strangely enough, the response time seems to be slower in the morning than later in the day. Can this really be so or are we just imagining it?

Nils L



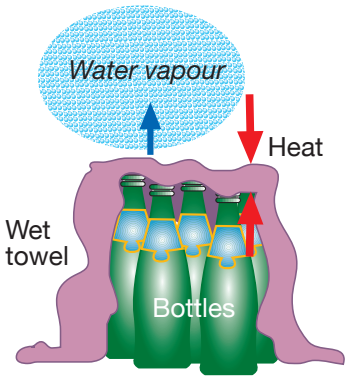
Vapourizing the moisture on the sensor requires heat, which disrupts the temperature measuring process by reducing the monitored temperature.

ANSWER: The longer reaction time in the morning can be due to several technical reasons. Of course, what you say could be correct – it may just seem that the response time is slower in the morning even though it actually is not. You can easily check this by systematically measuring the response time at different times during the day.

One possible technical cause could be that water has condensed on the sensor overnight. If so, then the slower response time would be due to the fact that the moisture has to vapourize and this takes a certain amount of time. The vapourization process requires heat, which is extracted from the exhaust gas and to some extent from the sheathed thermocouple. As long as vapourization is occurring, the thermocouple will not measure the monitored temperature of the exhaust gas, and this can be experienced as a lengthening of the response time. The exact extent of this lengthening depends on the specific conditions in each case. As soon as the moisture has disappeared from the sensor then the measuring system will return to its normal response time.

CHILLED DRINKS

The vapourization of water requires heat and this thermodynamic effect is a disadvantage when measuring temperature. However, the effect also has a positive aspect, which we can exploit to chill drinks on a hot summer's day. Wrap the bottles you want to chill in a thick towel and then make sure you keep the towel very damp, so it is almost dripping wet. The heat required for the vapourization process is drawn partly from the surroundings and partly from the bottles that you want to chill.



Vapourizing the moisture from the wet towel requires heat, which is taken partly from the bottles.

To express viewpoints or ask questions, contact Professor Dan Loyd, Linköping University by e-mail to: danlo@liu.se