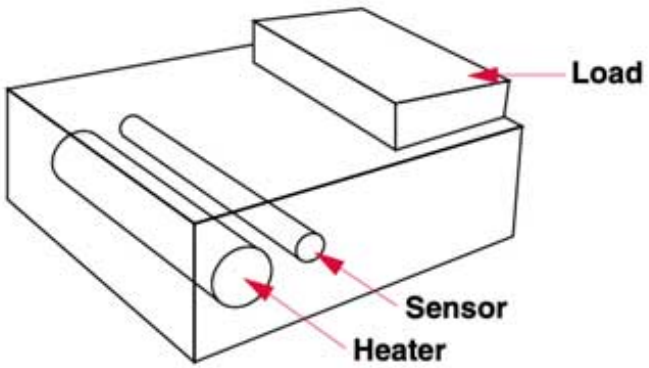
Where Should My Temperature Sensor Be Placed?

By: Admin - November 06, 2020

The placement of the sensor (/en/products/sensors), in relationship to the workload and heat source, can compensate for various types of energy demands from the workload. Sensor placement can limit the effects of thermal lags in the heat transfer process. The controller can only respond to the temperature changes it “sees” through feedback from the sensor location. Therefore, sensor placement will influence the ability of the controller to regulate the temperature for a desired set point.

Be aware that sensor placement cannot compensate for inefficiencies in the system caused by long delays in thermal transfer. It is also important to realize that inside most thermal systems, temperature will vary from point-to-point. For this reason it may be advantageous to utilize more than one sensor - one to maintain the desired application set point and the other to prevent over temp, such as a loop alarm.



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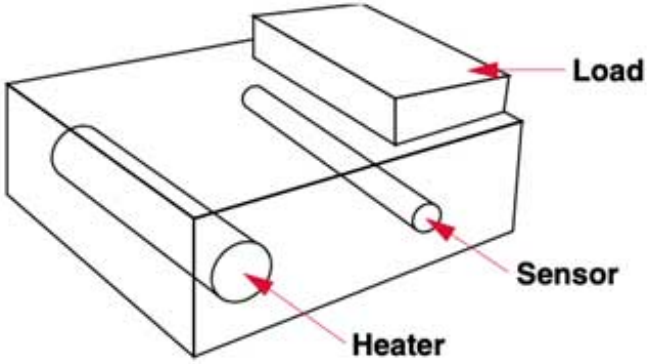
Temperature sensor in a static system

We call a system “static” when there is slow thermal response from the heat source, slow thermal transfer and minimal changes in the workload. When the system is static, placing the sensor closer to the heat source will keep the heat fairly constant throughout the process. In this type of system, the distance between the heat source and the sensor is small (minimal thermal lag). Therefore, the heat source will cycle frequently, reducing the potential for overshoot and undershoot at the workload. With the sensor placed at or near the heat source, it can quickly sense temperature changes, thus maintaining tight control.



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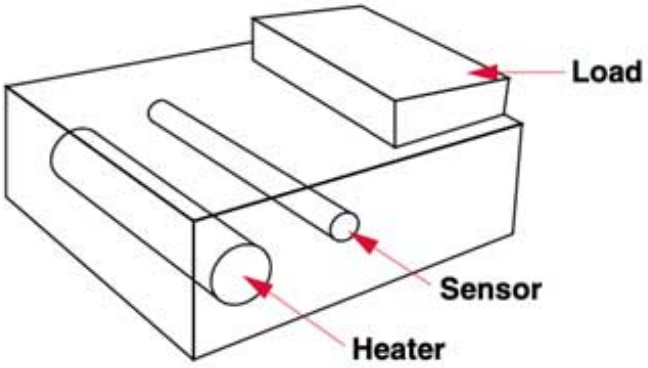
Sensor in a dynamic system

We call a system “dynamic” when there is rapid thermal response from the heat source, a rapid thermal transfer and frequent changes in the workload. When the system is dynamic, placing the sensor closer to the workload will enable the sensor to “see” the load temperature change faster and allow the controller to take the appropriate output action more quickly. However, in this type of system, the distance between the heat source and the sensor is notable, causing thermal lag or delay. In this case, the heat source cycles will be longer, causing a wider swing between the maximum (overshoot) and minimum (undershoot) temperatures at the workload.

We recommend that the electronic controller selected for this situation should include PID features (anticipation and offset ability) to compensate for these conditions. With the sensor at or near the workload, it can quickly sense temperature rises and falls.



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Sensor in a combination static/dynamic system

When the heat demand fluctuates and creates a system between static and dynamic, place the sensor halfway between the heat source and the workload to divide the heat transfer lag times equally. Because the system can produce some overshoot and/or undershoot, we recommend that the electronic controller selected for this situation include the PID features (anticipation and offset ability) to compensate for these conditions. This sensor location is most practical in the majority of thermal systems.

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