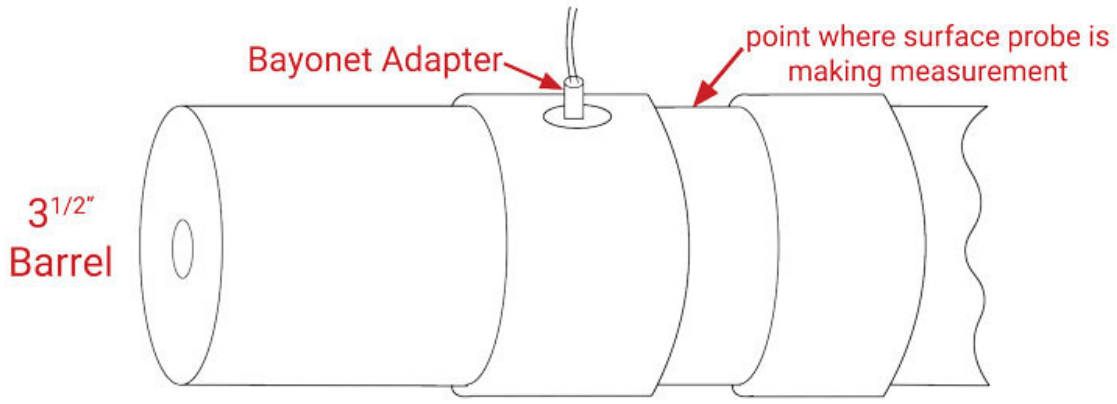
Case Study #004:
Problems with J-Type Thermocouple Reading

A customer called in about having problems with their thermocouple readings. The customer was attempting to measure the surface temperature of a barrel two separate ways, using two different types of thermocouples. The first measurement was done with a Fluke handheld surface probe thermocouple. It read 646°F. The second measurement was taken using a J-type thermocouple probe with an attached bayonet adapter. This time it measured 450°F. After changing out the J-type thermocouple several times and getting about the same readings each time, the customer gave us a call.

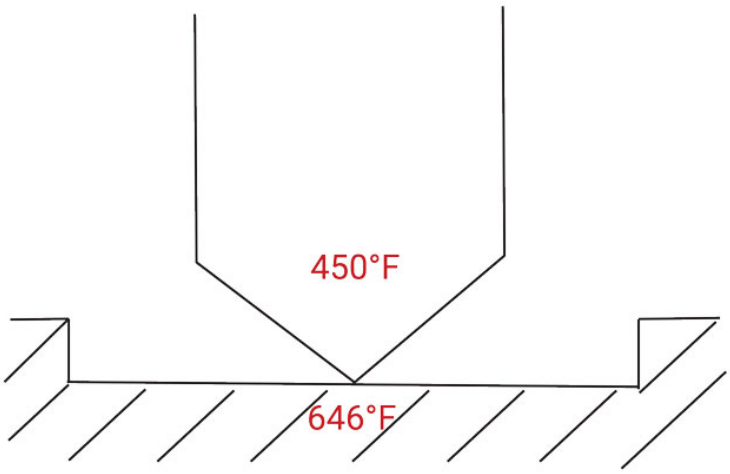
The customer believed that, based on the way the plastic was reacting to the heat, the Fluke thermocouple was giving him the correct reading. The first step I took in this case was drawing out how and where the readings were being made. I came up with the following diagram:



Bayonet adapter is built into heater. Probe sits on a recess in the barrel only 1/16" deep.

Why Are The Readings Different?

Both thermocouples, the Fluke and the J-type, were reading correctly. So, why are the readings different? The reason is that the Fluke surface probe thermocouple, as shown in the above diagram, is reading the true temperature of the surface. The J-type thermocouple is NOT a surface probe thermocouple, therefore, it is not reading the actual surface temperature. The probe tip is 450°F whereas the surface itself is 646°F. This particular probe had a drill-shaped tip, designed to fit a hole that has been drilled into a barrel, not a flat surface (see image below).



How is this happening?

The heat being transferred from the barrel through a point is a very small amount of heat. This small amount of heat is being removed by conduction to the back of the probe and through the wire. This pulls the temperature down at the junction, giving a true reading of 450°F.

The Solution to the J-type Thermocouple Reading Issue

Drill a shallow hole into the barrel and insert the J thermocouple down into the hole. It will now read the correct surface temperature of the barrel.

Have a question about a heating application?

Contact the Thermal Corporation engineers for assistance! We will work with you on any heating application struggle you may be encountering. Contact us today at engineering@thermalcorp.com or by phone at (800) 633-2962 x152.

Written by Jim Dixon and Shelby Reece
Edited by Kyle Otte
Date Published: 09.05.2019
Last Updated: 09.05.2019