Measuring Wire Temperature

Measuring wire temperature is a common but often challenging application. It is frequently desirable to know the actual temperature of the wire or cable before a coating is applied to it to ensure uniform and consistent process characteristics.

The application frequently offers the following challenges:

- The wire diameter is usually small making alignment difficult.
- Bare or uncoated wire often has a low emissivity associated with it.
- Sometimes the wire has some vertical movement or "flutter" where it is desired to measure.
- Often the desired process temperature is low.

ATC was asked to provide a solution for a cable company to measure a bare cable in preparation for putting a plastic coating on it further along in the process. This was particularly interesting because it was a little different with the following criteria (Figure 1):

Wire diameter 0.225"
Temperature range 170-300°F
Target material Braided aluminum
Speed 300-600 ft/min

We selected the Exergen IRt/c.3X-K340F and an ST-5000 Smart Transmitter. The transmitter was set up to cover a temperature span of 100-400°F and an initial emissivity of 0.300. Because of the small wire diameter, there was some "overlap" in terms of the spot size using the IRt/c.3X sensor (Figure 2). To compensate for this, the user just readjusted the emissivity setting to bring the temperature reading up to the correct value. We were very optimistic about the results for the following reasons:

- **The diameter was constant.**
- **The customer installed some "take up" pulleys to minimize vertical movement.**
- **The background temperature (floor) was relatively cool and constant..**
- **The customer was motivated and willing to do a little experimentation.**

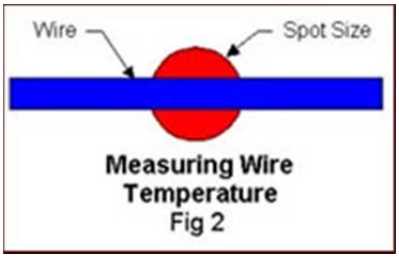
In addition to compensating for emissivity, the ST-5000 (Figure 3) also has the ability to download any Exergen sensor curve and incorporates moving average, peak picker and high temperature features as standard offerings.

The net result was that the customer was able to achieve his goal which resulted in his ability to increase his speed and still maintain a very consistent and repeatable process.

Wire Coating
Fig 1

The IRt/c.3X-K-340F/27C sensor is an infrared thermocouple, which emulates a K type thermocouple at temperatures close to its calibration point. For this model it is calibrated at 340 °F, so it is within 2% linear from 280-370 °F (140 - 190 °C) to match a K type thermocouple, when used with a non-programmable input device. Since this is used with a programmable input device (the ST-5000), it will become linear over a much wider range (-45 - 1200 °F, -45 - 650 °C).

Each IRt/c has a specified field of view as well. This model has a field of view of 3:1 (3X), which means that to measure a 1" diameter spot, you should be about 3" away. Other model selections include fields of view of 1:1, 5:1, and 10:1. They all have minimum spot sizes as well (1:1 and 3:1's are ~ 0.25", and all others ~ 0.80") The configurations come in either ABS plastic or stainless steel housings. Some have air purge for cooling and cleaning, and there are cooling jackets available for some models. There are also side view models available for tight mounting constraints.



ST-5000 Smart Transmitter