

TECHNICAL UPDATE - TU-4005

SUBJECT: Safety Factors in electric traced design

A recent customer call brought to light a question that many have asked lately. What safety factor do we use when designing traced bundles.

The rule of thumb has been to design the bundle to maintain a temperature 10% to 15% higher than requested by the customer, at the lowest ambient. Now, the question is "Why do we do this?"

There are a number of reasons, and some indicate that 15% may not be enough of a pad.

Reason #1: The voltage source at the customer's site is not what he thinks it is. This is one of the most common reasons to pad the safety factor. We have had a number of instances where the customer thought he had 240 VAC, but it turned out to be 220 or 210 VAC. We can calculate the effect of this drop. The power output of the heater varies with the **square** of the change in voltage, so a 8% drop in voltage results in a 16% drop in power output.

Reason #2: The temperature that the customer thought he needed to maintain is not the temperature he must maintain. Another common problem, we call it "oops". If the customer is unsure, adding some pad to the safety factor can forestall future problems. Just be careful that this does not drive up your price to a point that you lose the order to the competition.

Reason #3: The gas inlet temperature is less than the requested maintenance temperature. This seems more common as of late. The customer is inletting at 150°F and wants to maintain a gas temperature of 200°F. As we all know, this is not an application for traced bundles except in very limited instances. If we do have an application that seems like it will work, it is a good idea to use a 20% safety factor to guard against unknowns in the final installation.

Reason #4: You are running an application where the bundle length is at the maximum circuit length of the heating element. There is a power drop along the length of the heating element due to the resistance of the copper bus wires. At the maximum circuit length this resistance results in a power loss of about 10% of the output of the heater. So, if you are designing a bundle with a run length approaching the maximum circuit length, increase the safety factor to at least 15%.

The first two reasons can be dealt with by getting the proper information from the customer. The power required in the third can be estimated by running the program "SAMP45" in the traced design package. The power drop seen in the last can be estimated by running the program "HTRPWR" in the traced design package.