Technical Letters

Mica Band Heaters Installation Instructions & Considerations

Mica Band Heaters Materials & Construction
Mica band heaters are designed with nickel-chrome resistance wire precisely wound around a mica sheet, which is then placed between two additional mica sheets. Mica is used because it provides good thermal conductivity and dielectric strength. The nickel-chrome resistance wire and mica sheets then are surrounded by a corrosion-resistant outer steel sheath.

Because mica bands are conductive heaters, intimate contact with the surface to be heated is important to ensure long life. Operating sheath temperatures should not exceed 850'F (454'C). (Note that this rating is for the heater's sheath--not the process.) Maximum watt density varies by manufacturer, but the average is 35W/in . On smaller mica bands, the watt density usually can go slightly higher. If the application requires higher temperatures or watt densities, another style band should be selected.

Loss Prevention for Band Heaters
Most band heaters do not actually "burn out". Instead, it is often environmental factors that create a short, cause hot spots to develop, or simply push the heater beyond its normal operating temperature. All of these factors cause a heater to fail prematurely and require replacement. Obviously, minimizing these environmental factors can reduce the frequency of replacing band heaters in your operation.

Contamination

By far, the most frequent culprit of band heater failure is contamination. Liquid plastic, hydraulic oil and moisture (often from high ambient humidity) are three main causes of premature failure from contamination. Obviously, keeping the heaters free of contaminants will reduce the failure and replacement rates. In applications where liquid plastic and oil exposure is frequent and difficult to manage, the best solution may be to select low cost band-the heater will be replaced often, but the financial loss will be minimized. Alterna-tively, a band heater designed to resist contamination can be used. Keep in mind, though, that most heaters fail from the severe lead wire damage caused by contamination-not from contaminants finding their way inside the band - and contaminant-resistant heaters will not prevent lead wire damage.

Poor Contact Between Heater and Barrel
The second most common cause of premature failure is poor contact between the machine barrel and a low cost band. Because mica, high watt density and extruded aluminum bands are heaters, a tight fit is critical. Without a tight fit, localized hot spots can be minimized on the band and cause the nickel-chrome resistance wire to fail. As inside the higher the work temperatures, the more critical a tight fit becomes.

There are two strips you can take to ensure good contact with the machine barrel. First, make sure the machine barrel outer diameter (OD) measurement is accurate; then, order band heaters with that same measurement. The heater manufacturer will factor in a 0.25" gap, so there is no need to undersize the band's dimensions.

Second, follow a strict installation and tightening procedure for mica, high watt density or extruded aluminum band heaters. Before installation, clean and smooth the machine barrel surface, removing any plastic residue. To install, tighten the heater snugly to the barrel using a clamping bolt torque of 10 fl/lb. Next, apply power to the heaters and allow them to reach halfway to set point. temperature (or approximately 300'F [149'C]. Once at this temperature, cut the power and retighten the bands at 10 ft/lb torque. Retightening the band at an elevated temperature will account for the heater's thermal expansion. (Remember, ceramic bands are radiant heaters and should not be tighten in this manner.)

Handling Procedures
Often, failing to understand a heater's internal design leads to heater losses. For instance, stretching a one-piece mica band over a barrel during installation can damage the internal mica, resulting in a short circuit. Some manufacturers

offer band heaters similar to mica bands that can be stretched for installation, but using installation techniques inappropriate for a specific heater type will cause problems. So, in cases where one heater design will not work-for example, if a band cannot be installed over the end of a machine barrel without stretching the heater-use a heater that is better suited to application such as a two-piece mica or a one-piece expandable band. A two-piece design also is a good choice when a large diameter band is required-the two-piece design minimizes the chance that air gaps will develop. Two-piece ceramic bands also can be used on large diameter barrels.

Another simple handling tip is to use two wrenches to install the wiring onto the band's post terminations. This practice can eliminate failures because the wrench on the post's lower nut acts as a strain relief. If this procedure is not followed, the post's internal connection to the nickel-chrome resistance wire can be damaged and become a weak link within the heater.

Runaway Temperatures

Heaters are extremely obedient entities. If a controller tells them to produce temperatures beyond their limitations, they will do so-until their demise. Runaway temperature commands often occur when the thermocouple or RTD does not make solid contact with the surface measured. If the sensor becomes loose of disconnected from the surface, its readings may be hundreds of degrees lower than the process or barrel's actual temperature. This faulty input then is received by the control device, which calls for full output from the heaters when in fact the process is already up to appropriate temperature,

Design Considerations

When designing a system, it is a good idea to match the total wattage applied to the actual wattage required. This practice decreases cycling frequency and temperature overshoots while increasing the heater's life span. When possible, it also is good practice to specify strap-style clamping devices to hold the heater in place. These devices have a lower thermal expansion rate than the heater, so they can help hold the heater tightly against the barrel during operation.

Given the range of products plant maintenance or engineering personnel encounter, is not realistic for them to become experts on every piece of equipment used. This article only touches the surface of band heater design, options, performance expectations and loss prevention. Users should link up with a qualified supplier who can help design a new system or perform a design analysis on an existing system, then make recommendations to ensure the best performance for the given application. Systems arising from a good supplier/user partnership will extend equipment life and allow critical production schedules to by reached.

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