PRODUCTS

Heaters and Trickle Voltage Heating to Combat Motor Condensation

Introduction
In climates and applications where unusually high relative humidity exists, warm humid air contacting a cold motor will cause condensation that can lead to accelerated deterioration of motor parts. Condensation does not exist while the motor is running because the heat generated by the motor keeps the motor dry. However, when the motor is shut down, condensation starts to form; the longer the idle period, the more pronounced the rate of deterioration.

Heaters
The most common method of combating this condensation problem is with the installation of small electric heating elements inside the motor. The normal heaters used by USEM are silicone rubber strip heaters which can be installed in the field on most standard motors by removing the brackets and wrapping the strip heaters around the winding end turns. In order to obtain the correct wattage the heaters are either connected in series or parallel and leads are brought out to the standard conduit box. A second separate conduit box can be provided when specified by the customer.

Trickle Voltage Heating
Another method of combating condensation is Single Phase Low Voltage Heating called "trickle heating." This method is especially adaptable to our method of insulation and can be added in the field without any changes to the motor. This system maintains 10 to 20 percent of the nameplate voltage in the motor winding when the motor is shut down. This low voltage results in a temperature rise of approximately 10°C above ambient temperature. A 10°C rise is normally adequate to prevent damaging condensation.

The trickle heating system applies voltage to two of the three motor leads. A single phase dry type, two winding transformer applies this voltage after the three phase power has been removed. Since the applied power is low voltage, single phase, the motor will not rotate with the trickle voltage applied.

To be effective the current should be approximately 25 to 35% of nameplate amps.

The dry type, two winding, transformer should have ±5% and ±10% voltage taps for final voltage adjustment. Refer to Technical Service for the required transformer secondary voltage and KVA rating recommendations, since this will vary with motor ratings.

The following are some of the advantages of this system over conventional space heaters:

1. The heat is more evenly distributed, not localized as in the case of heating elements.
2. The A.C. current reaction heats the rotor as well as the windings, which means that heat can travel along the shaft by means of conductions (direct contact) to warm the bearings more effectively than by convection (heat transfer by moving air) from heaters.
3. The resistance of the motor winding becomes the heating coil, which means the elimination of disassembly and re-assembly procedures to replace defective heaters.
4. Trickle voltage heating can actually result in longer winding insulation life because of reduced thermal shock. When the motor is started, the winding is already "warmed-up". Conversely, when the motor is stopped, the winding will gradually cool from running temperature to "trickle" heating temperature.
5. Small motors, especially totally enclosed, have very little room available for installation of heaters.
6. Installed costs compare favorably with heater installation. Also, replacement motors do not have to be equipped with space heaters.
7. It is not necessary to run addition wiring to motor since power leads are used for trickle voltage heating.

Heating in Hazardous Locations

1. U.S. Motors' U.L. listed 56 through 5800 frame motors utilize specific silicon rubber heaters that are U.L. recognized and CSA certified. The strip heaters are fastened to the motor end turns and are rated 115, 230, 460 or 575 volts.
2. Trickle voltage heating is not included in USEM's U.L. Listing. Therefore, though we may suggest that it be considered, the decision to utilize is the responsibility of customers, users, and/or authorities having jurisdiction.

NOTE:
Transformer secondary voltage should be 10-20% nameplate. Amps will be 25-35% of nameplate. Transformer should have ±5% and ±10% primary voltage taps, refer to Technical Service for recommended transformer rating.

CAUTION:
Refer to Electrical Code in your area, certain connections may not necessarily be in accordance with local electrical code.

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