Product Service Bulletin
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US MOTORS

Ask the Experts

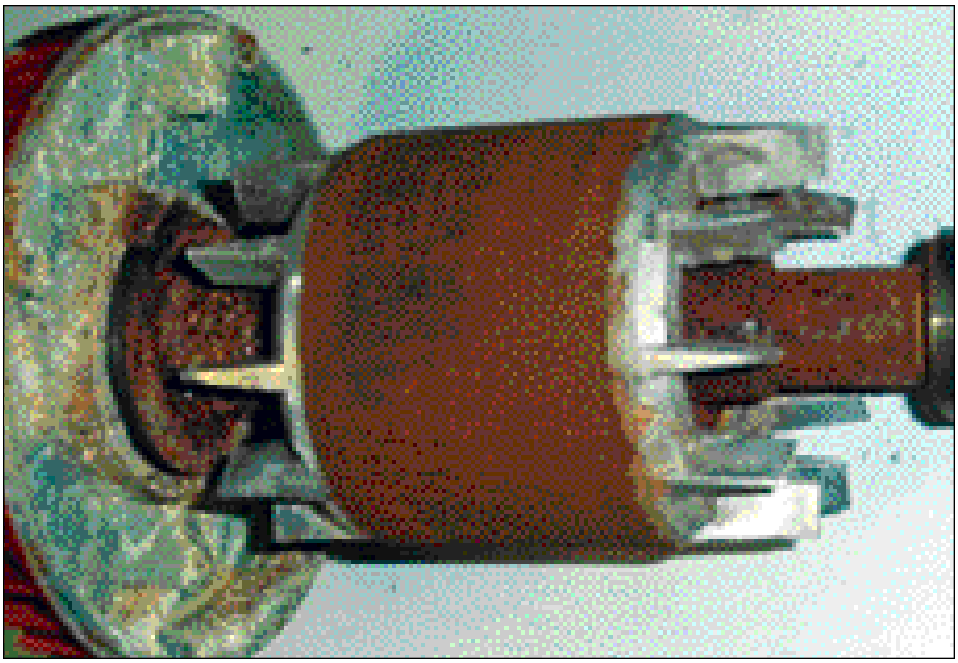
Q: How do I know what size space heaters I need, and how do I connect them to my starter?

A: The size (rating) of a space heater is determined by the frame size of the motor in which it is to be installed. For example a 140T frame motor will use a single 36 watt space heater while a 5800 frame motor will use two 192 watt heaters to obtain the 384 watts required for the larger motor. The heaters should be connected to the starter so they are energized when the motor is off and de-energized when the motor is started.

Have a question for the experts? Contact us at jim.bryan@emotors.com

Natural Disasters

Space Heaters Best Defense Against Damaging Effects of Motor Condensation



Condensation damage

by Ben Biondi

Internal condensation is a natural, but extremely damaging condition that can occur in an electric motor. If left unchecked, condensation can lead to swift motor failure. But with a few preventative measures and a little insight, a motor can be protected from this force of nature.

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 can also form in non-high relative humidity climates/applications where there is a significant temperature differential. 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

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EMERSON Motor Technologies

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pronounced the rate of deterioration.

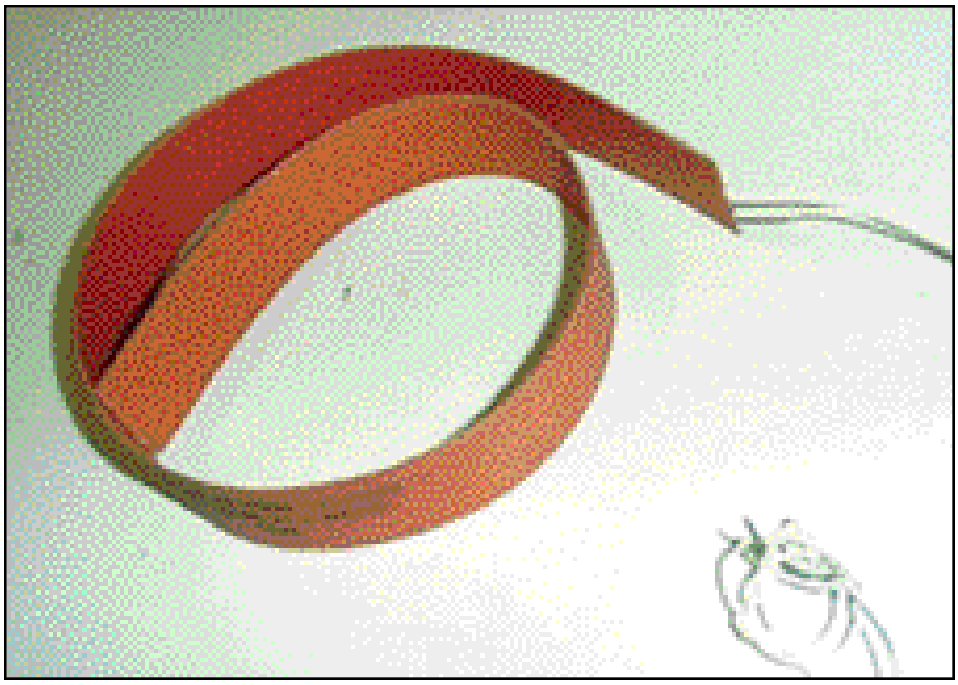
The most common method of combating a condensation problem is through the installation of small electric heating elements inside the motor, or space heaters. There are several options available including metallic or ceramic cartridge heaters, silicone rubber space heaters or trickle voltage heating.

The most commonly used, although not always the most effective, technology for combating condensation is metallic or ceramic cartridge heaters. Because these heaters are small, they must operate at a high surface watt density and consequently a high temperature. The high temperature causes rapid heater failure, often within the first year. This type of heater is also more susceptible to failure from physical shock due to the nature of its construction.

To combat the high failure rate due to the high surface watt density, many users specify that the space heaters be operated at one-half their rated voltage. This lowers the surface watt density to one-fourth the value with rated voltage and increases the heater life more than proportionally.

Emerson Motor Technologies has a better alternative to metallic or ceramic cartridge heaters that will reduce the rate of heater failure – silicone rubber space heaters. The heaters are manufactured by sandwiching a resistance wire network between two pieces of high-temperature silicone rubber and bonding the silicone rubber pieces together. The silicone rubber heaters are designed for low surface watt density by providing a large surface area (a heater measuring 45”x25” is rated at 169 watts, or 1.5 watts per square inch).

The heaters are cool enough to touch with the bare hand without being burned. Another advantage of silicone rubber space heaters is that they are applied directly to the winding end-turns, which facilitates the transfer of heat from the heater to the motor winding and provides the required condensation prevention at a lower power consumption. It is not necessary to drop the operating voltage on these heaters to increase heater life.



Silicone rubber space heater

These heaters can be installed in the field on most standard motors by removing the brackets and wrapping and gluing the strip heaters around the winding end turns. In order to obtain the correct wattage, where multiple heaters are required, they are 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. Silicone rubber space heaters, UL listed and CSA certified, can be supplied on explosion-proof motors frame 143T through 5800 on production motors.

Another method of combating condensation is single phase low voltage heating called “trickle heating.” This method is especially adaptable to Emerson’s 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, which 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 percent of nameplate amps. The dry type, two winding, transformer should have +5 percent and +10 percent voltage taps for final voltage adjustment.

The advantages to trickle heating are that the heat is more evenly distributed, the A.C. current reaction heats the rotor as well as the windings, the resistance of the motor winding becomes the heating coil, longer winding insulation life can result because of reduced thermal shock, installed costs compare favorably with heater installation and it is not necessary to run additional wiring to the motor since the power leads are used.

For more information about space heaters, contact Ben Biondi, Senior Product Service Engineer with US Motors, at 314-553-3875 or ben.biondi@emotors.com.