FOX-TRACKS

Reliable Solutions Today!

April 2010

FOX BROS.
ELECTRIC MOTOR SERVICE, LLC

861 W. College St.
Murfreesboro, TN 37129
Ph. 615-893-0542
Fax. 615-893-8547

24 HOUR EMERGENCY SERVICE

Website: www.foxbroselectric.com
e-mail: fox@foxbroselectric.com

VARIABLE FREQUENCY DRIVES INDUCE SHAFT CURRENTS IN AC MOTORS (Part 2)

The following information is from the National Electrical Manufacturers Association's (NEMA) MG-1 Standards. www.nema.org

NEMA MG-1 2006 (2007 update)

31.4.4.3
Shaft Voltages and Bearing Insulation
Shaft voltages can result in the flow of destructive currents through motor bearings, manifesting themselves through pitting of the bearings, scoring of the shaft, and eventual bearing failure. In larger frame size motors, usually 500 frame and larger, these voltages may be present under sinusoidal operation and are caused by magnetic dissymmetry in the construction of these motors. This results in the generation of a shaft end-to-end voltage. The current path in this case is from the motor frame through a bearing to the motor shaft, down the shaft, and through the other bearing back to the motor frame. This type of current can be interrupted by insulating one of the bearings. If the shaft voltage is larger than 300 millivolts peak when tested per IEEE 112, bearing insulation should be utilized.
More recently, for some inverter types and application methods, potentially destructive bearing currents have occasionally occurred in much smaller motors. However, the root cause of the current is different.
These drives can be generators of a common mode voltage which shifts the three phase winding neutral potentials significantly from ground. This common mode voltage oscillates at high frequency and is capacitively coupled to the rotor. This results in peak pulses as high as 10-40 volts from shaft to ground.
The current path could be through either or both bearings to ground. Interruption of this current therefore requires insulating both bearings. ***Alternately, shaft grounding brushes may be used to divert the current around the bearing. It should be noted that insulating the motor bearings will not prevent the damage of other shaft connected equipment.***
At this time, there has been no conclusive study that has served to quantify the relationship of peak voltage from inverter operation to bearing life or failure. There is also no standard method for measuring this voltage. Because of this, the potential for problems cannot consistently be determined in advance of motor installation.

As you might be able to see from this information, the problem presented is an industry wide problem. If you are experiencing this problem, we are here to provide a solution.

In most cases, installation of the AEGIS SGR™ Conductive MicroFiber Bearing Protection Ring will be less costly than insulated bearings and/or housings, and it will also protect the coupled equipment. However, we can offer insulated bearings and/or housings as well.