



## Protecting VFD-Driven Motors: Motor Repair Best Practices

### VFD-Driven Motors Can Fail From Destructive Bearing Currents - Costing Downtime and Lost Production

Motors operated by variable frequency drives (VFD) are vulnerable to premature bearing failure from VFD induced shaft voltages and bearing currents – sometimes within only weeks or months – and the result is costly down time and production interruptions. Avoiding these costs makes economic sense and pays a high return on investment.

VFDs induce destructive shaft voltages and high frequency currents which will cause electrical discharge machining (EDM) pitting, fusion craters, and fluting damage to the motor's bearings and deteriorate the bearing lubrication by allowing electrical arcing to burn the grease.

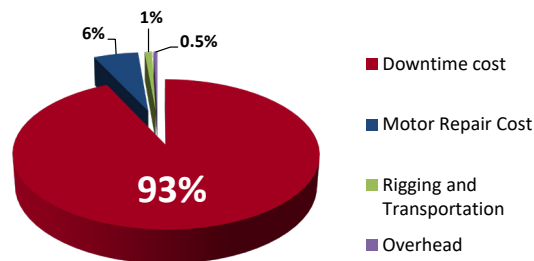
### Cost Avoidance - Follow Best Practices to Ensure Uptime and Reliability

Motor repair best practices will provide bearing protection from these destructive bearing currents by adding AEGIS® Shaft Grounding Ring Technology and when needed insulating a bearing to prevent high frequency circulating currents.

- Motors up to 100 HP - Add AEGIS® Shaft Grounding Ring to discharge shaft voltages to ground.
- Motors over 100 HP - Add AEGIS® Rings by one bearing and insulate the opposite bearing.

Detailed recommendations are contained in the AEGIS® Shaft Grounding Ring Motor Repair Handbook - an essential reference available upon request at [www.est-aegis.com/bearing](http://www.est-aegis.com/bearing)

### Motor Bearings are the Most Vulnerable Parts- Cost of a Failed Motor Adds Up Quickly



The return on investment in repairing motors and following the AEGIS® Shaft Grounding Ring Motor Repair Handbook's best practices recommendations will pay dividends day after day and ensure the most reliable repair to the motor.



Bearing Fluting (washboard pattern)



AEGIS® Shaft Voltage Tester



AEGIS® Installed Inside the Motor



AEGIS® Rings



## 1. Is Your Motor on a Variable Frequency Drive (VFD)?

Today, variable frequency drives (VFDs) are commonly used to control the speed of motors. They not only provide precise process control for improved productivity and product quality, they also save energy. But, VFDs can also damage motors. They induce currents on motor shafts that discharge through the bearings, causing pitting, fluting, and in many cases catastrophic motor failure. Without bearing protection, any savings from the use of VFDs can be quickly wiped out by system downtime and the cost of replacing motors.

## 2. How Long Has the Motor Been in Service? Does the Motor Have a History?

New VFD-driven motors should have bearing protection installed at start up. If the motor's been in service, adding a bearing protection ring could slow down the bearing failure process, however, damage to the bearings may have already occurred and the bearing may continue to wear. If the motor is in failure mode, a bearing protection ring can be installed when the motor is repaired.

## 3. Has the Motor Been Repaired? If so, were the Bearings Inspected and Did You Receive a Bearing Failure Analysis?

At the time of a VFD-driven motor repair, cutting and inspecting the motor bearings will often provide vital information needed to make the best repair recommendations. Detection of electrical discharge machining pits or fluting in the bearings often requires repair services.



- Bearings should be checked for electrical discharge machining effect (EDM); pitting, frosting, fluting
- Installing a Shaft Grounding Ring (AEGIS® SGR or PRO Series) on any motor operated on variable frequency drives (VFD)
- Isolating a motor bearing with an insulated sleeve; coating bearing housing with insulating material; adding a hybrid ceramic ball bearing or ceramic coated bearing to the repair for motors over 100 HP (75kW).

## 4. Do You Have Shaft Voltages?

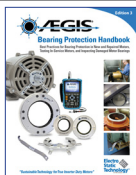
Measuring the shaft voltage on VFD driven motors provides valuable information to determine if there is a potential risk of bearing damage from electrical bearing discharges. Surveying and documenting shaft voltage readings and wave forms will assist in determining the appropriate mitigation or solution.



Note: The best time for shaft voltage measurements is during initial start-up in new or repaired motors. Shaft voltage measurements should be incorporated into preventive and predictive maintenance programs and may be combined with vibration analysis, thermography or other services.

## 5. AEGIS® Handbook

### ANSI/EASA Standard AR100-2010, Section 2, Mechanical Repair: 2.2 Bearings



***"Bearings should be inspected for fretting, fluting, frosting, scoring or other damage."***

Best practices for Bearing Protection, Shaft Voltage Testing, and Bearing Inspection.

Download a copy of the handbook at [www.est-aegis.com/bearing](http://www.est-aegis.com/bearing)