



ADVANTAGE ACHIEVED BY INSTALLATION OF BEARING CURRENT PROTECTOR (BCP) OVER CARBON BRUSH

In continuation to the previous knowledge sharing about the failures in a VFD (Variable Frequency Driven) Motors my previous sharing pertained to *Introduction to TCO (Total Cost of Ownership) for motor, Reasons for bearing failure and Common mode voltage (CMV), Introduction to BCP (Bearing current Protector), Different reasons for dv/dt produced bearing current, Circulating Current, Electrostatic Discharge Currents (EDC), Different Applications where BCP can be used etc.* This article primarily deals with:

- ✓ Two Basic method for Preventing Bearing Damage.
- ✓ Advantage and disadvantage between installation of carbon brush vs BCP which comes under Alternate discharge path method. We tend to focus on one of the cheapest discharging methods and BCP in this information sharing session.

The damage caused to the bearings can be prevented by two ways. The same are enumerated in the succeeding Paragraphs: -

- a) **Insulation:** Insulating motor bearings may be accomplished by either adding an insulating material to the bearing race or bearing journal such as an insulating sleeve or ceramic coating or using ceramic ball bearings. This solution tends to shift the problem elsewhere as shaft current looks for another path to ground. Sometimes when ceramic coatings are used, because of the capacitive effect of the ceramic insulation, high-frequency Variable Frequency Drive (VFD) induced currents actually pass through the insulating layer and may cause electrical bearing discharges and eventually failure. Also, when an insulation method of the motor bearing is used, directly coupled attached equipment, such as a pump or encoder may provide a path to ground. Then, the other equipment often winds up with bearing damage of its own. Finally, insulation and other bearing-isolation strategies may be costly to implement, may result in special motor modification, and may be only partially effective.
- b) **Alternate Discharge Paths:** When properly implemented, a conductive link is established between the rotor and stator, usually in the form of a brush. These strategies are preferable to insulation because they provide an alternate discharge path for the shaft voltages and prevent bearing currents. Techniques range in cost and sometimes can only be applied selectively, depending on motor size or application. The ideal solution would provide a very-low-resistance path from shaft to frame, would be low-cost, and could be broadly applied across all VFD/AC motor applications, affording the greatest degree of bearing protection and maximum return on investment.

BCP has an edge over Carbon Brush when it comes to operational efficiency. The advantage and disadvantage between installation of carbon brush vs BCP which comes under Alternate discharge path method are tabulated below:



Method	Description	Advantage	Disadvantage
<i>Grounding Carbon Brush (CB)</i>	Installation of carbon brushes in a Spring-Loaded holding mechanism	✓ A metal brush contacting the motor shaft is a more practical and economical way	<p><u>LOW-IMPEDANCE PATH TO GROUND, ESPECIALLY FOR LARGER FRAME MOTORS.</u></p> <p>However, these brushes pose several problems of their owners:</p> <ul style="list-style-type: none"> ✗ Subject to wear & Tear due to mechanical contact. ✗ Contaminants on bristles reduce effectiveness. ✗ 3) Subjected to oxidation reducing grounding effectiveness. ✗ Higher maintenance cost increasing lifetime cost. ✗ Extra space and special mechanical design required. ✗ They also generate high heat at high speeds. ✗ Not suitable for applications > than 1800 RPM. ✗ Effectiveness significantly reduced immediately due to vibration of the brush mounting spring and oxidation of the shaft surface. <p>As a result, such brushes require frequent maintenance. In most applications, the contact brush may often be serviced when the bearings are replaced due to failure.</p>



Method	Description	Advantage	Disadvantages
Bearing Current Protector (BCP)	<p>Applied like a conventional grounding brush, this innovative new approach involves the use of a ring of specially engineered conductive micro fiber to redirect shaft current and provide:</p> <ul style="list-style-type: none"> ❖ Reliable ❖ Very Low Impedance Path from shaft to the frame of the motor, bypassing the motor bearings entirely. ❖ The ring's technology uses the principles of ionization to boost the electron-transfer rate and promote extremely efficient discharge of the high-frequency shaft voltages induced by VFDs. ❖ With hundreds of thousands of discharge points, the BCP channels currents around the motor bearings and protects them from electrical damage. 	<ul style="list-style-type: none"> ✓ Low-Cost solution that can be applied to virtually any size AC motor in virtually any VFD application. ✓ Simple to install & use. ✓ Lower Impedance Path. ✓ Micro-fiber brush construction – <i>Advantageous over the spring-loaded contact brushes.</i> ✓ Low wear & tear rate ✓ Light weight ✓ Heat generation negligible. ✓ Tests upto 14,000 rpm for 3000 hours. ✓ Negligible wear & Tear at the lower rotating speeds found in HVAC applications. ✓ No speed limitation. ✓ Higher current limits over solid carbon brush. ✓ Large real contact means higher efficiency. ✓ Corona discharge at the tip of the fibres when the fibres are over a charged surface. <p><i>Recent hard-disc manufacturer reports that currents can flow to a small diameter point without an intimate contact even though the surface voltage is less than 1 volt under a special circumstance. Since the corona discharge is through the air molecules, the discharge can also take place in the media of water or dirty grease. This current transfer mechanism due to electrolysis or ionization of a surrounding medium allows the micro-fiber brush to be maintenance-free for the life of a motor, even when the shaft has oil or grease on it.</i></p>	<p>× <u>NIL</u></p> <p><i>(But.....we are always open to suggestions & feedbacks)</i></p>