Bearing Protection
HELWIG CARBON PRODUCTS, INC.

• Family-Owned Company since 1928
• Dominant Source for Replacement Carbon Brushes and Brush Holders in North America
• Major OEM Brush Supplier
• Supplier of Brush holders, Springs, Bearing Protection, and Mechanical Carbons
• One of the last major American owned carbon companies
• Diverse, Dedicated Workforce of over 250 Caring People
MODERN PRODUCTION FACILITY IN MILWAUKEE, WI, USA
135,000 sq. Feet  12,500 sq. Meters
HELWIG CARBON’S PRODUCT LINE

CARBON BRUSHES
BRUSH HoldERS
BEARING PROTECTION

• VANES
• SEALS
• BEARINGS
• BUSHINGS
BEARING PROTECTION

WWOA – Southeast Regional Meeting
March 2019
The leading cause of electric motor failures are the bearings, followed by the stator windings.

1. **Bearings**
   - Contamination
   - Stress, Load, Fatigue
   - Vibration
   - Misalignment
   - Heat
   - Lubrication
   - Electrical discharge

2. **Stator Windings**
   - Heat
   - Inverters
   - Voltage problems
   - Load
   - Contamination
PROBLEM:

- VFDs induce common mode voltage on the motor shaft
- Current passes from the motor shaft to the bearings to ground
- Pitting and Fluting leads to bearing failure and costly repairs
PROBLEM:

- Accumulated voltage seeks path of least resistance to ground
- Often path leads through motor bearings and bearing race
- Voltage discharges greater than 2V will cause bearing damage.
This damage is often a fluted pattern, pitting, etc. The resulting irregular surface on the bearing causes noise, vibration, and premature bearing failure.
ROOT CAUSES FOR BEARING CURRENT:

Pictured above: Unbalances in the AC three phase leading to common mode voltage (CMV)

Noticeable here: greater CMVs are present on the motor neutral
OPTIONS:

• Insulated Bearings: Very expensive with significant lead times

• Inductive Choke: Expensive & only partially effective

• Conductive Grease: Not an accepted viable solution

• Shaft Grounding Fiber Ring: Only reduces the current flow. Difficult to install

• Helwig Carbon Bearing Protection Kit: Affordable. Provides low resistant path to ground – less than 1 volt.
HOW DOES IT WORK?

• Silver Graphite Brush provides least resistant path to ground
• Constant Force Spring keeps brush in contact with the shaft
• Very little electrical wear – almost all mechanical
• Extra long life!
• Engineered Silver Graphite material is self-lubricating, low maintenance
UNPROTECTED VFD MOTOR

Shaft Voltage Unprotected
FIBER RING INSTALLED

Shaft Voltage with Fiber Ring
BPK INSTALLED

Shaft Voltage BPK
## SUMMARY and COMPARISON

<table>
<thead>
<tr>
<th>Technology</th>
<th>Cost</th>
<th>Ease of Installation</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulated Bearings</td>
<td>$$$$</td>
<td>Difficult</td>
<td>Motor needs to be designed to facilitate insulation</td>
</tr>
<tr>
<td>Ceramic Bearings</td>
<td>$$$$</td>
<td>Difficult</td>
<td>Best done on new motor</td>
</tr>
<tr>
<td>Conductive Grease</td>
<td>$</td>
<td>Simple</td>
<td>Conductive particles increase bearing wear</td>
</tr>
<tr>
<td>Metal Fiber Brushes</td>
<td>$$</td>
<td>Moderate to Simple</td>
<td>Can have very high wear rates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Debris between fibers render useless</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Can carry significant current</td>
</tr>
<tr>
<td>Carbon Fiber Brushes</td>
<td>$$</td>
<td>Moderate</td>
<td>Motor needs to be uncoupled to mount</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Need different size for each shaft size</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Needs silver epoxy to enhance the performance</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Cannot carry higher current</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Leaves some potential on shaft</td>
</tr>
<tr>
<td>Helwig Bearing Protector</td>
<td>$</td>
<td>Moderate to Simple</td>
<td>Can mount without removing motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Universal shaft size</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Unlimited current carrying capacity</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Lower inventory</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Many years of service from a single brush</td>
</tr>
</tbody>
</table>
LONGEVITY TESTING:

- This brush is running 24-7 for last 10 years
- With ZERO bearing failures reported
- Still has some brush life left
CERTIFICATE OF COMPLIANCE

Certificate Number: 20170223-E485288
Report Reference: E485288-20160715
Issue Date: 2017-FEBRUARY-23

Issued to: HELWIG CARBON PRODUCTS INC
8900 W TOWER AVENUE
MILWAUKEE WI 53224

This is to certify that representative samples of COMPONENT - INCOMPLETE ROTATING MACHINES AND ROTATING MACHINE PARTS
Shaft Grounding Kit, Models BPK-4, BPK-AM, BPK-IM2, BPK-S

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
MOUNTING OPTIONS

* Drill & Tap
MOUNTING OPTION

* 3M Dual Lock with Ground Wire
More than 1 kit used on larger shafts than 4” (Avoid 180 degree mounting)

- This option is used by GE
- On Industrial Motors for 24 years
- And still remains successful
MOUNTING OPTION

* Internal Mount
SLEEVE & SHIM
SELECTING THE RIGHT BPK

**BPK Kit Selection Guide**

<table>
<thead>
<tr>
<th>Shaft Diameter</th>
<th>BPK-IM 2</th>
<th>BPK-4/BPK-S/BPK-SB</th>
<th>BPK-AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7 in (19 mm)</td>
<td>Single Kit</td>
<td>Single Kit</td>
<td>Single Kit</td>
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<tr>
<td>1.25 in (32 mm)</td>
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<td></td>
<td></td>
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<tr>
<td>2.0 in (50 mm)</td>
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<tr>
<td>3.0 in (75 mm)</td>
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<tr>
<td>4.0 in (100 mm)</td>
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<tr>
<td>5.0 in (125 mm)</td>
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<tr>
<td>6.0 in (150 mm)</td>
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<tr>
<td>7.0 in (175 mm)</td>
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<tr>
<td>8.0 in (200 mm)</td>
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<tr>
<td>9.0 in (225 mm)</td>
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</table>

**Mount 2 kits at 90° — or 3 kits at 120° — for reliable contact in the case of vibration.**

**For larger diameter shafts, the contact area can be increased with more kits or a larger kit.**

**More contact surfaces provide assurance of optimal grounding protection.**
CUSTOM MOUNTING BRACKETS
APPLICATION: FAN/BLOWER
APPLICATION: HYDRONIC PUMP
APPLICATION: WIND PITCH MOTOR
TRANE – Lexington Facility
OEM: BALDOR ABB

Super-E® Motors with Baldor Shaft Grounding Brush
1/2 – 50 HP, 56C thru 326T

Applications:
Heating, ventilation and air conditioning blower and fan motors, pump motors, and other general purpose applications using an adjustable speed drive.

Features:
- Baldor shaft grounding brush installed internally
- Compact, rugged, spring loaded carbon brush
- Choice of TEFC or ODP enclosures available
- Variety of 2, 4 and 6 pole designs
- 1 – 50 HP standard T frames
OEM: WEG

Industry Leading
shaft grounding solution!

HELWIG CARBON PRODUCTS, INC.
THE LEADER IN CARBON TECHNOLOGY

(800) 962-4851 | (414) 354-2411
OEM: WEG

WEG’s Bearing Protection Kits fit a variety of motor frame sizes/shafts and bearing caps. These Bearing Protection Kits will deliver years of superior performance.

**Bearing Protection Kits to fit the following motor frame sizes:**

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Bearing Cap</th>
<th>Order by Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>344_5TS</td>
<td>6316</td>
<td></td>
</tr>
<tr>
<td>404_5TS</td>
<td>6316</td>
<td></td>
</tr>
<tr>
<td>504_5T</td>
<td>6314</td>
<td></td>
</tr>
<tr>
<td>444_5TS</td>
<td>6314</td>
<td></td>
</tr>
<tr>
<td>445_7TS</td>
<td>6314</td>
<td></td>
</tr>
<tr>
<td>447_9T</td>
<td>6314</td>
<td></td>
</tr>
<tr>
<td>506_7T</td>
<td>6314</td>
<td></td>
</tr>
<tr>
<td>508_9T</td>
<td>6314</td>
<td></td>
</tr>
<tr>
<td>L447_9T</td>
<td>6322</td>
<td></td>
</tr>
</tbody>
</table>

90.372512.1.907

90.372512.1.910

90.372512.1.905

90.372512.1.907
OEM: BROOK CROMPTON
OEM: WORLDWIDE HYUNDAI

HYUNDAI Severe Duty Large Frame Motors are designed for high reliability in severe industrial applications while delivering the performance and efficiency you demand.

- Available: 4470 high tensile strength steel shafts on 4470 Frame, 1600 and 2100 RPM motors.
- New Design: Cast iron TEFC enclosure, IP55 degree of protection.
- Sealed: Metal press-on sleeve creates a labyrinth-type seal. No seals to tear or wear out.
- Protected: Frame mounted grounding pad with copper wiring plate.
- Flexible: Two heavy duty lifting lugs can be positioned at all four corners for greater flexibility.
- Prevent bearing damage: New Helwig Carbon® Bearing Protection Kits available for all models. Easy installation, no drilling or tapping. In stock and ready to be shipped with the motor.

- Bearing Protection
  - Helwig Carbon®
  - Bearing Protection Kits available for all models
  - Simple installation, no drilling or tapping
  - In stock and ready to be shipped with the motor
OEM: WORLDWIDE HYUNDAI

HSD-5008-9
BPK-4-OEM02

HSD-5010-11
BPK-4-OEM02
RECOMMENDATIONS:

- The brush should ride perpendicular to the shaft
- The Kit should be as close as possible to the bearing
- The brush track should be free of keyways, scratches, nicks, or defects of any kind
- Ideal shaft surface should have a finish between 10 and 63 RMS
- For 2 or more kits, mount at 90° not 180°
- Do not use any external lubrication
- There is no need to apply silver epoxy on the shaft
- Per Electric motor industry standards insulated bearing is needed on ODE (Opposite Drive End) for motors above 100 HP
BPK LABELS

* Included with every BPK kit.
Helwig Bearing Protection Kit Advantages:

- Effective and reliable long-term performance
- One size fits a wide range of motor frame sizes
- Easy to install
- Maintains positive contact through life of the silver graphite brush
- Long life – almost no electrical wear just mechanical. Silver Graphite material provides low friction and no need for silver epoxy paint on shaft
- Cost effective alternative to other options
THANK YOU

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