JUNE 2022

Shaft Grounding Contamination Test

BPK vs. Carbon Fiber Ring

Purpose

The objective of this test was to verify the grounding performance of the carbon fiber ring and the Helwig Bearing Protection Kit (BPK) when grease gets onto the motor shaft.

BPK-S

Need

Grease is a common contaminant in industrial motor environments. When shaft grounding is necessary to protect bearings from damaging VFD-induced currents, it is important to know how the grounding performance is affected due to common contaminants, such as grease.

CARBON FIBER RING

Description of Tests

The carbon fiber ring and the Helwig BPK were installed on identical ABB-Baldor 184TZ frame Super-E 5HP motors with a steel sleeve over the shaft, making the contact surface 1.625" in diameter. The carbon fiber ring and shaft sleeve were sized to the recommended 0.035" interference fit, and the Helwig BPK-S was installed per our recommended installation instructions. The motor was then run unloaded at half speed, 850 RPM (362 FPM), clockwise, driven from Automation Direct VFD for both tests.

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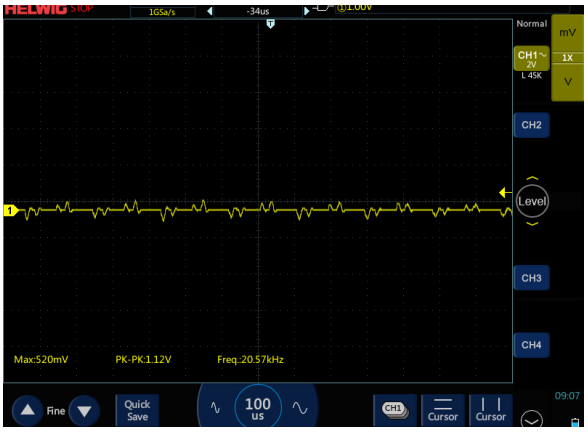
Results and Discussion

Carbon Fiber Ring

The initial performance of the carbon fiber ring with no grease was adequate with a recorded 1.2V peak-to-peak (vpp.). We ran the unit for 700 hours and checked the shaft voltage again. The voltage was just above 3V peak-to-peak, a failed test result. We then introduced used grease (bearing grease Citgo lithoplex HM No.2) to the shaft and let the motor run for approximately 48 hours. After the 48 hours elapsed, we tested the shaft voltage again. We recorded discharges as high as 21.2V peak-to-peak, also a failed test result. The carbon fibers were not providing sufficient grounding performance. As a result, the bearings will be damaged.

Oscilliscope Testing

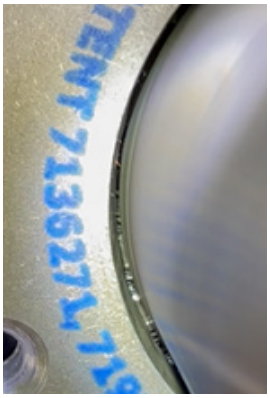


INITIAL VOLTAGE

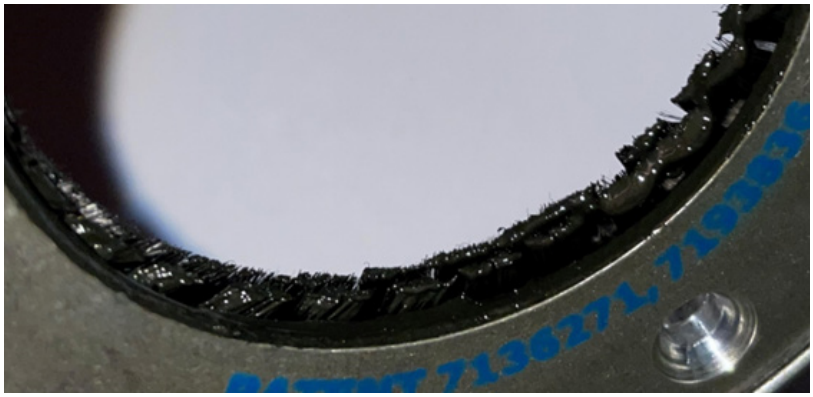
VOLTAGE AFTER GREASE

Additonal Pictures of Carbon Fiber Ring

BEFORE GREASE



AFTER GREASE



GREASE TRAPPED IN FIBERS OF RING

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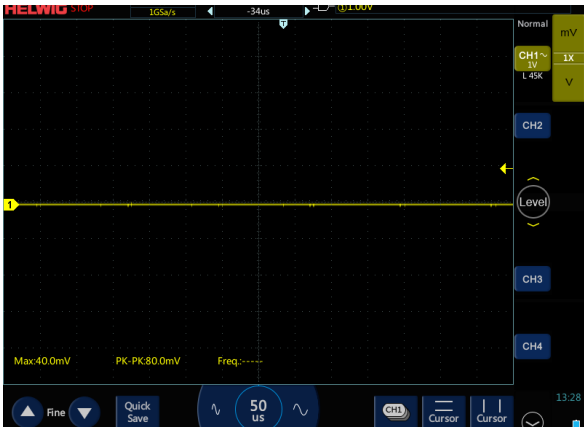
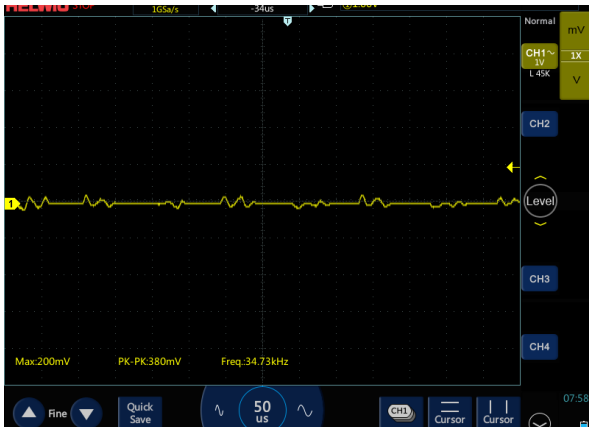
Helwig BPK

The initial performance of the BPK was excellent with less than 1V peak-to-peak (vpp.). The unit was also run for 700 hours. The shaft voltage was checked again and it was still under 1V peak-to-peak, a passing test result. The same method, amount, and type of grease was introduced to the motor shaft. The motor was allowed to run for 48 hours, and the shaft voltage was tested. The shaft voltage after the introduction of grease was still less than 1V peak-to-peak. We then added additional grease to see if this affects the Helwig BPK grounding performance. After adding 4X the amount of grease compared to the carbon fiber ring, the shaft voltage was still under 1V peak-to-peak. This passing test result shows that the bearing are still being protected. The positive spring force on the low resistivity, proprietary Silver Graphite brush helped keep a low contact resistance with grease being pushed out of the brush path.

Oscilliscope Testing



INITIAL VOLTAGE



VOLTAGE AFTER 4X AMOUNT OF GREASE

Additonal Pictures of BPK

BEFORE GREASE

AFTER GREASE

CLEAN BRUSH TRACK FROM BPK

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Conclusion

As recorded, the performance of the ring dropped off rapidly over a short period of time. The shaft voltage recorded even prior to the application of grease was higher than the 2V threshold that Helwig Carbon considers damaging. After application of grease, the shaft voltage exceeded 20V in just two days. This is a huge spike which would reduce the L-10 life of the bearing and cause premature failure. The carbon fiber solution is not effective even with small amounts of grease commonly present in the field. The Helwig BPK consistently kept the shaft voltage under 1V, even after applying 4X more grease than the carbon fiber test. The high conductivity and low contact resistance of the BPK product allows for satisfactory over the carbon fiber solution in areas where there is oil and grease contamination. In tough applications such as this, the Helwig BPK will reduce downtime and continue to protect your motor bearings from electrical discharges.

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