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Protecting Motor Bearings in Hazardous-Duty Applications

Why CoolBlue® inductive absorbers are the complete solution in all environments

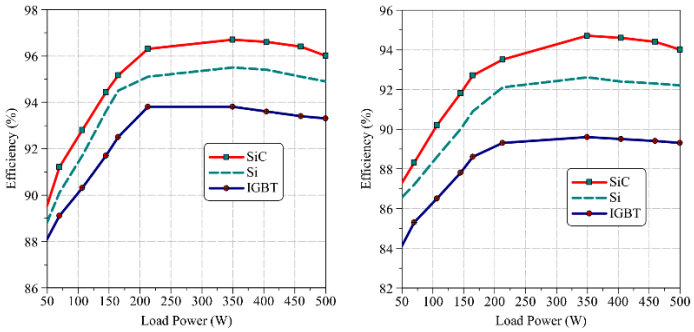
~ by Kristie Giles~

Any unintended ignition source in a hazardous industrial environment – even from a failing bearing – can trigger a fire or explosion. The possibility of sparking or flame is why motors and motor controls operating in an atmosphere subject to explosive gases or vapors, combustible dusts, flammable liquids, or ignitable fibers must be fully enclosed.

Controlling motor functions in hazardous environments using variable frequency drives (VFDs) requires solving the problem of electromagnetic interference (EMI) conductive currents caused by the VFDs. Traditional solutions have inherent risks and complexities, but CoolBlue®'s nanocrystalline inductive absorbers are a safe and effective solution.

Long-standing solutions come at a cost

Bearing failures from fluting caused by high-speed switching of the VFD's insulated gate bipolar transistor (IGBT) have been wreaking havoc in the motor world since their inception. Hazardous-duty applications are no exception. The new silicon carbide (SiC) and gallium nitride (GaN) switches pose an even greater challenge.



Efficiency comparison for 50 V input at **a** 20 kHz, **b** 50 kHz switching frequency (1)

Since the traditionally used shaft grounding devices cannot be used externally in hazardous-duty environments, the most common solution has been to install a shaft grounding device internal to the explosion-proof (XP) motor. This is typically done at the time the motor is manufactured because aftermarket installation requires costly recertification to maintain the motor's UL rating. Moreover, few motor repair shops have UL approval to rework XP motors and to re-nameplate and recertify them as explosion proof.

Even if installed at factory build, shaft grounding devices are not cost effective. An insulated/hybrid bearing is required in 100 HP motors and above, meaning all parts are wearable and will require maintenance and eventual replacement. Technicians must keep the contact point clean and make sure the brush always maintains contact with the shaft in order to ensure continued effectiveness in the hazardous application. This is not possible with internally mounted applications.

Nanocrystalline common mode chokes are the better alternative

The use of nanocrystalline chokes in hazardous-duty applications solves this long-standing industry problem. Common mode chokes are inductors that "choke" the high-frequency currents (in the kilohertz to megahertz range) generated by the high-speed switching of the VFD. Installing this solution at the source of the problem not only prevents bearing failures due to fluting, but it also reduces other electronic interferences to sensitive monitoring equipment.

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For more than 25 years, nanocrystalline inductive absorbers have been solving the problem of EMI caused by VFD operation, worldwide. They are increasingly utilized in hazardous locations such as petrochemical plants, paper and plastic plants, pharmaceutical plants, oil fields, oil rigs, grain mills, wastewater treatment plants, and more.



In the U.S., some VFD manufacturers recommend that their customers use CoolBlue® to address the EMI. Others have sourced their own line of choke, typically using a ferrite material, and offer it as an option. However, nanocrystalline chokes have much lower losses, higher permeability, a higher saturation rate, and better thermal characteristics than any ferrite. CoolBlue® is also non-sparking, flame retardant, and UL 94 V0 rated.

CoolBlue® cores are installed in the motor controls' hazardous-duty enclosure over the output cables, closest to the VFD. There is no need to pull any equipment out of service; simply power down the system for the few minutes it takes to install the cores over cables to the motor. No UL recertification is required.

Damaging high-frequency current is absorbed at the source and converted into a minimal amount of heat. Furthermore, CoolBlue® cores never need maintenance or replacement, which extends the cost and efficiency advantages of VFDs.

The distinction is clear: CoolBlue® is an electrical solution to an electrical problem, and it is permanent – no maintenance is required. Learn more by contacting 201-252-8125 or CoolBlue@mhw-intl.com, or visiting www.coolblue-mhw.com.

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(1) "Comparative Efficiency Analysis for Silicon, Silicon Carbide MOSFETs and IGBT device for DC-DC boost converter" written by Mohd Alam, Kuldeep Kumar & Viresh Dutta, *SN Applied Sciences* volume 1, Article number: 1700 (2019), Published November 27, 2019