

Bearing currents

Nowadays, frequency converters (FCs) are a simple, reliable and relatively inexpensive solution for speed variation in electric motors systems. Thanks to vastly improved operation and pre-programmed «intelligence», FCs have become a regular mass product. Their use offers a host of benefits and can also boost energy efficiency in many cases. However, FCs also cause effects that must be taken into account. In addition to the frequently cited harmonics, there is also an effect that can mechanically stress motors and at worst lead to a premature defect.

Bearing currents are undesirable leakage currents that flow through bearings and can have negative consequences. Lubricating oil film forms a barrier between the rolling elements and the track. The oil film acts as a dielectric, creating a current. If the current is too high, it «breaks through» and discharges. These periodic discharges melt the bearing's surface and cause minor damage. The surface quality deteriorates and wear increases. As bearings age, this periodic damage turns into more extensive defects that reduce bearings' service life owing to the higher mechanical load, and can even lead to bearing failure over time. In addition, these discharges (due to heat and the metal particles that occur) limit the lubricant's effectiveness and impact its properties.

Nevertheless, these effects of frequency converters can be avoided, or at least minimized, via different measures. Depending on the rated power of motors, various precautions help avoid bearing currents. One option is to use insulated bearings which stop the current flow. This approach is suited to hybrid or ceramic bearings

but can be expensive. Another possibility is to divert the currents in a targeted fashion using electrically conductive lubricant or via brush rings, before rolling elements are damaged. The Zurich University of Applied Sciences (ZHAW) has developed a series of tests on this topic and conducted an endurance test on the prevention and effects of bearing currents over almost a year. The final report has been published and can be ordered at: www.aramis.admin.ch/Texte/?ProjectID=37270

■ You can find much more information on bearing currents in Topmotors Webinar No. 10 by Dr. Hanna Putzi-Plesko (ZHAW School of Engineering) or in Topmotors Fact Sheet No. 31: Bearing Currents, at www.topmotors.ch



Photo: Ripple formation due to bearing currents
(Source: Dr. Hanna Putzi-Plesko, ZHAW School of Engineering)