

SUCCESS STORY

SINEWAVE NEXUS™

MOTOR PROTECTION FILTERS

DISTRIBUTION / SUPPLY CHAIN

SineWave Nexus™ Significantly Reduces Downtime and Increases Life of Conveyor Gearboxes and Motors for Global Courier Company

Large courier companies rely on many moving parts to ensure they are able to move freight all over the world. Inside their package sorting facilities, there are conveyor systems pushing thousands of packages from one end of the facility to the other in a matter of minutes. The conveyors are connected to gearboxes that are powered by induction motors. In order to control the speed of the motors, to ensure packages are dispersed at a reasonable pace, Variable Frequency Drives (VFDs) are used. It's a very complex looking system that runs as smooth as a family of ants building their colony. However, when just one member of the family stops working, it disrupts the entire operation.

While VFDs provide efficiency to the package sorting process, they generate damaging differential and common mode voltages that, over time, cause motors and cables to fail - specifically motor windings, motor bearings, and cable insulation. When motors fail, conveyors can no longer push the packages to their destination causing disruption to the process and creating unwanted downtime and increasing maintenance costs.

The Challenge

Inside a package sorting facility with 160 VFDs, motors, gearboxes, and miles of standard building wire and cable, motor and gearbox failures were happening far too often. Motor winding failures were occurring due to high reflected wave differential voltage at the motor. Motor bearing failures were due to bearing currents circulating in the bearing raceway both on the drive end and the non-drive end of the motor. This high level of common mode current at the input shaft of the motor resulted in numerous gearbox failures. In addition to the equipment failures, frequent drive faulting and tripping was happening up to 17 times per day in some

instances. The downtime and cost associated with these failures was on the rise. Each motor and gearbox failure resulted in 1 - 2 hours of downtime, while the cost to repair or replace each one was between \$1k - \$3k. Total productivity loss is typically well over \$10,000.

The Solution

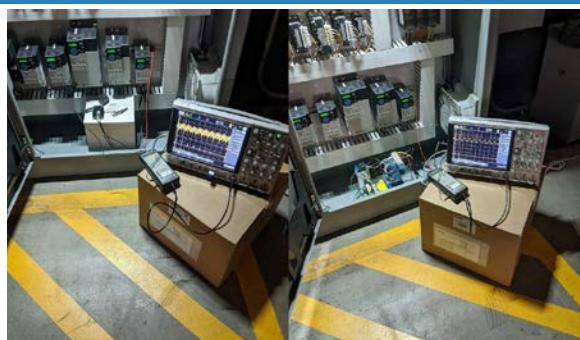
The customer evaluated multiple recommended solutions, but determined these temporary fixes were too costly and did not eliminate the problem. The customer then turned to MTE's Application Engineering team who met with the customer to evaluate their installation and the issues they were having. The MTE team suggested the customer install a 480V, 2A SineWave Nexus motor protection filter on the worst performing drive conveyor system. This filter protects motors from both the differential and common mode issues the customer was experiencing.

The Result

With the SineWave Nexus installed, the damaging effects from peak voltages, fast rise times, and reflected wave were greatly reduced. The common mode voltage and current, that caused significant bearing degradation, were virtually eliminated. Overall, the installation of the SineWave Nexus has led to the following:

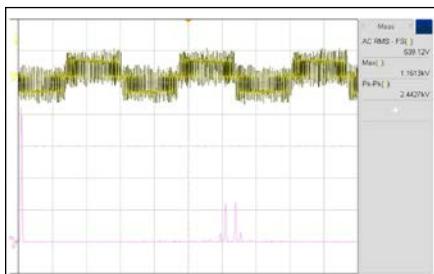
- Significantly reduced downtime.
- Increased life of the conveyor gearboxes, motors, and motor cables.
- Lower costs associated with production downtime.
- Reduced costs of maintenance labor, as well as the motor repair/replacement costs.
- Elimination of nuisance drive tripping.





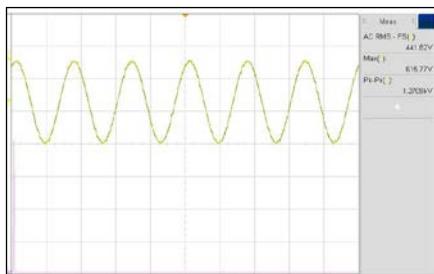
SineWave Nexus™ Performance:

Differential Mode Voltage with Frequency Spectrum



Without SineWave Nexus

High peak voltages when no filter is present results in the degrading of motor winding insulation and cable insulation.

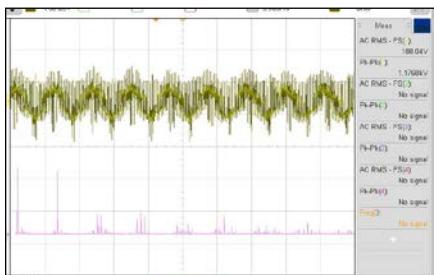


With SineWave Nexus

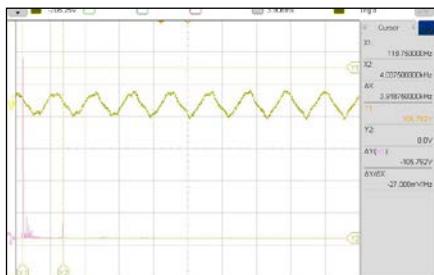
With the Nexus installed, peak voltages are reduced by nearly 50%, thus extending the life of the insulation.

Differential Mode Voltage (phase to phase)	Pre Nexus Installation	Post Nexus Installation	Percent Reduction
Peak	1,161V	615.8V	46.9%
RMS	539.1V	441.8V	18%

Common Mode Voltage with Frequency Spectrum



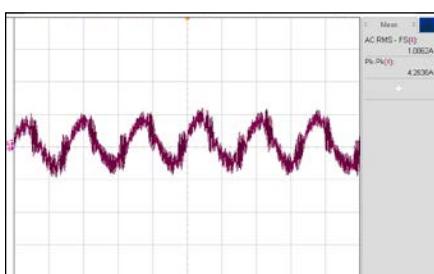
Without SineWave Nexus



With SineWave Nexus

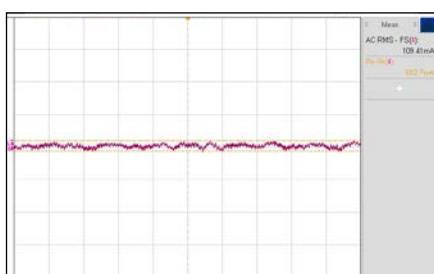
Common Mode Voltage (neutral to ground)	Pre Nexus Installation	Post Nexus Installation	Percent Reduction
Peak	588V	9.0V	98.5%
RMS	23.9V	6.4V	73.2%

Common Mode Current



Without SineWave Nexus

Common mode voltage induces dangerous common mode currents throughout the motor and cable resulting in bearing damage, frosting, pitting, and fluting which leads to motor failure.



With SineWave Nexus

The dangerous peak voltages and currents are reduced by over 98% and 84%, respectively, with the Nexus installed.

Common Mode Current (neutral to ground)	Pre Nexus Installation	Post Nexus Installation	Percent Reduction
Peak	2.13A	0.326A	84.7%
RMS	1.0A	0.109A	89.1%