Solution Profile

Motor Protection Guide

Load-side solutions for power quality in systems using Variable Frequency Drives.

How Variable Frequency Drives (VFDs) Work

VFDs serve as a way of controlling the speed of AC motors by varying the frequency of the power source using pulse width modulation (PWM). This is done by switching the transistors, IGBTs, or thyristors, on and off continuously.

While the introduction of VFDs has brought precise control of motors and greater energy savings, it has also introduced new problems that, left unaddressed, can cause downtime.

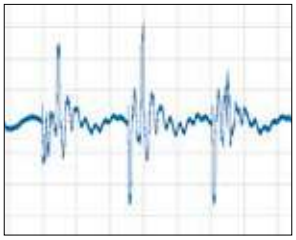
The Destructive Effects of Power Distortions

The presence of power distortions between VFDs and motors can damage equipment, jeopardize productivity, and decrease profitability.

Problems that can occur without motor protection filtering:

- **Damage** to motor bearings
- Unexpected **ground fault trips**
- **Erratic behavior** of VFDs and PLCs
- Premature **motor insulation failure**
- **Cable damage**

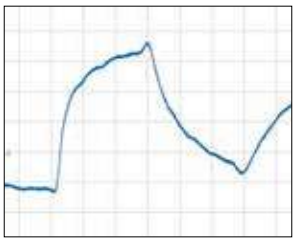
Common Mode



Three-phase utility power produces three smooth sinusoidal waves which at any point average a sum of zero. This creates an optimal scenario with zero Common Mode.

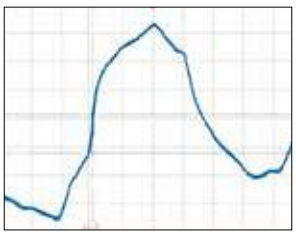
VFDs give off power in a continuous generation of pulses, which on average achieve a sinewave. However, the sum at any point is not always zero, which results in damaging common mode. This can cause motors to break down over time.

Peak Voltages



The pulse of VFDs is not a clear square pulse. Each rise and fall of the pulse has an over shoot or transient over voltage. This phenomenon is also known as a "reflected wave." These voltage spikes, especially in long cable leads, can reach dangerous levels and damage drives and motors.

Rise Time

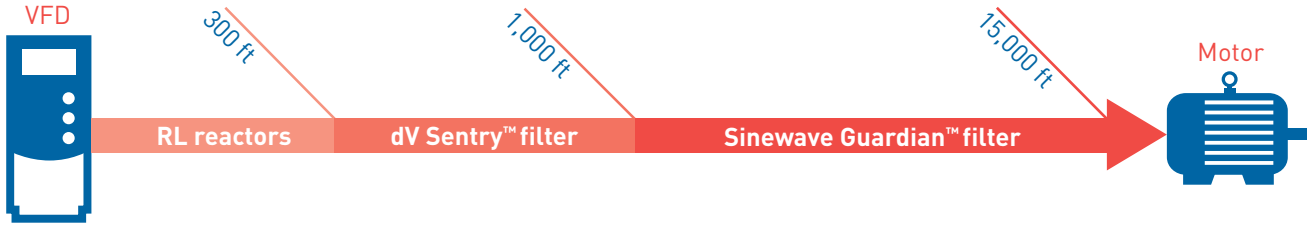


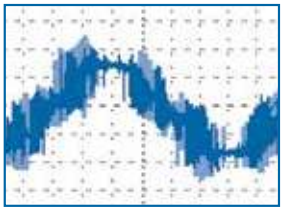
Modern VFDs utilize IGBT systems that create extremely fast rise times which can increase motor performance. This can also result in increased motor insulation heating, which can reduce motor life over time.

MTE
POWER QUALITY. SOLVED.

Motor Protection is Critical

MTE offers a full line of best-in-class products to protect motors and improve productivity.

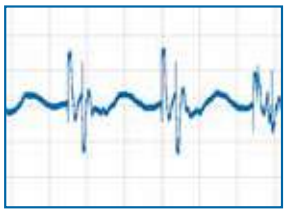




RL reactors

(for cable leads up to approximately 300 ft.)

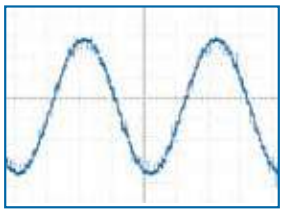
RL reactors are unequaled in absorbing power line disturbances. They are built to withstand even the most severe power spikes. They reduce nuisance tripping, reduce harmonic distortion, and minimize long lead effects.



dV Sentry™ filters

(for cable leads up to approximately 1,000 ft.)

The dV Sentry and its patented Triple Defense Core, is proven reduce common mode, protect against peak voltage, and reduce rise time – all in one unit.



SineWave Guardian™ filters

(for cable leads up to approximately 15,000 ft.)

This best-in-class filter delivers unequaled performance in cleaning the PWM waveforms generated by VFDs. It virtually eliminates high frequency content and voltage peaks, thereby reducing motor heating to provide extended motor life – and less downtime.

DID YOU KNOW ? Your system could experience peak voltages and rise times that exceed the NEMA MG-1, Part 31 Standard for inverter duty motors. Look for **Motor Protection** at **mtecorp.com** to learn more about what can be done to protect against this.

MTE Corporation
N83 W13330 Leon Road
Menomonee Falls WI 53051
(800) 455-4MTE • (262) 253-8200

POWER QUALITY. SOLVED.

Menomonee Falls, WI • San Diego, CA • Singapore • Xianghe • Tecate • Mexicali