

Existing Equipment SineWave Nexus Application Note

Some customers are using non-inverter duty rated motors and cables for their current applications.

Adding a variable frequency drive increases the efficiency for any given application, which is great, but if you follow the drive manufacturers recommendations, they also require the use of inverter duty rated motors and inverter duty rated cables.

Customer then have a difficult choice to make.

Do they replace their existing non-inverter duty motors with inverter duty rated motors?

Do they replace their existing standard 600V motor cables with 2kV shielded inverter duty rated motor cables?

There are many factors involved in this decision-making process such as physical space constraints in the field, material costs, labor costs and machine downtime.

The good news is that the SineWave Nexus sine filter allows you to run an existing non-inverter duty motor and existing non-inverter duty motor cable with a VFD, without issue.

The reason for this is that when you install the Sinewave Nexus sine filter, the sine filter protects the motor and the motor cable from both a differential and common mode point of view.

Differential voltage is measured phase to phase.

Common mode voltage is measured neutral to ground.

Typical VFD Differential Voltage Output Waveform:

Refer to a typical VFD differential voltage output waveform in Figure 1 below. This waveform shows the PWM waveform and resulting common mode waveform leaving the VFD and applied to the motor cable system and to the motor.

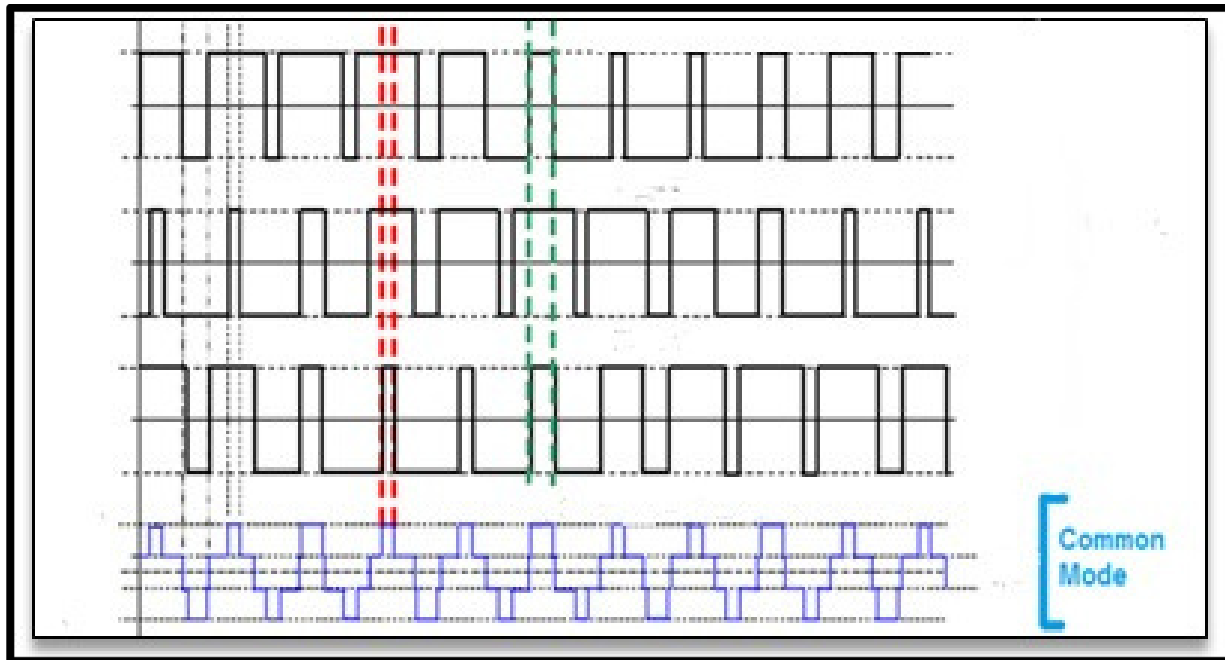


Figure 1: Typical VFD Differential Voltage Output Waveform

Typical Sine Filter Differential Voltage Output Waveform:

Refer to a typical Sinewave Nexus sine filter differential voltage output waveform in Figure 2 below. This waveform shows the proper sine filter output differential voltage waveform. Notice the low differential voltage distortion within the waveform below.

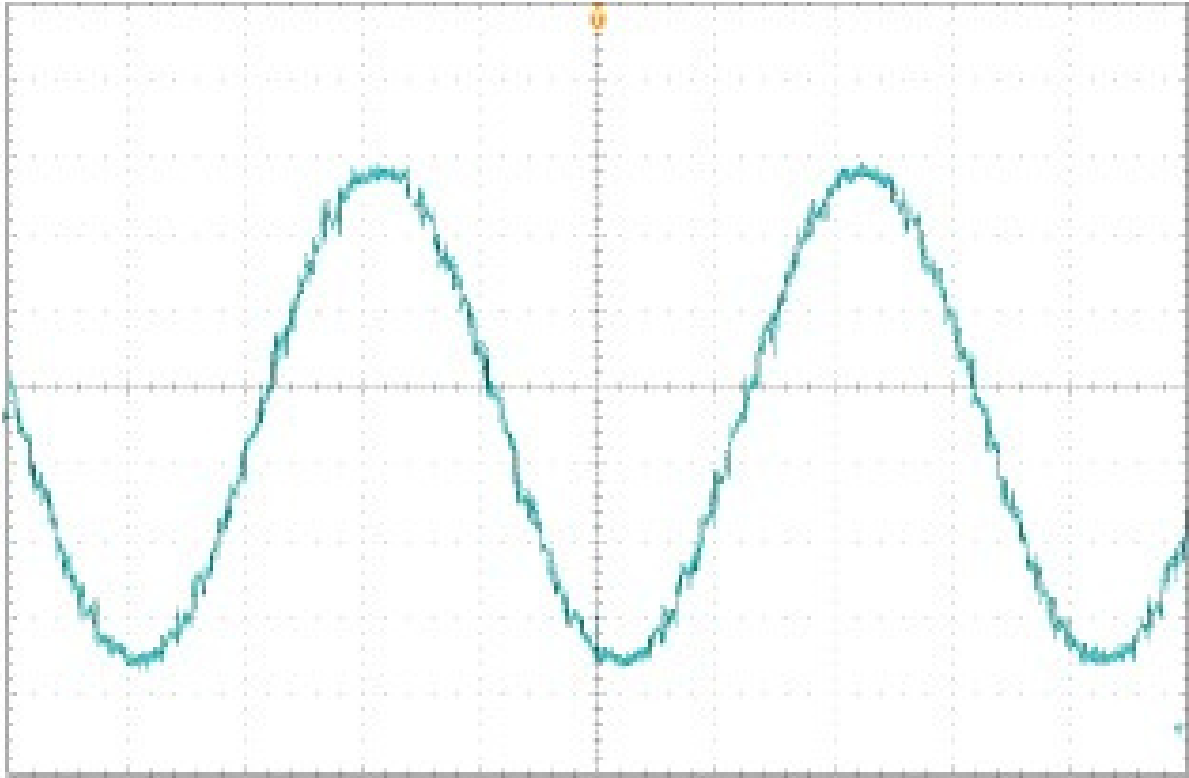


Figure 2: Typical Sine Filter Differential Voltage Output Waveform

Typical Sine Filter Common Mode Voltage Output Waveform without a Sinewave Nexus:

Common mode voltage without a Sinewave Nexus.

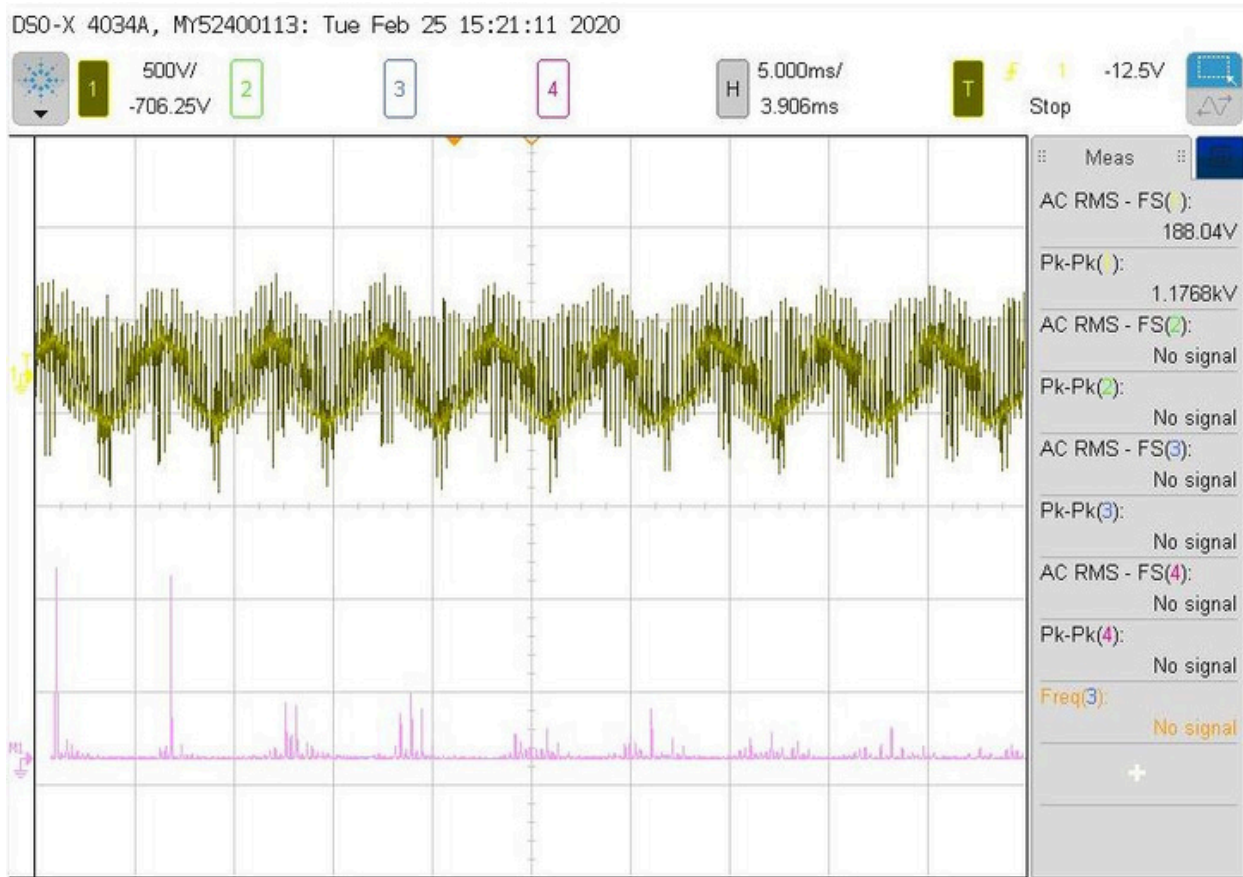


Figure 3: Common mode voltage without a Sinewave Nexus.

Typical Sine Filter Common Mode Voltage Output Waveform with a Sinewave Nexus:

Common mode voltage with a Sinewave Nexus.

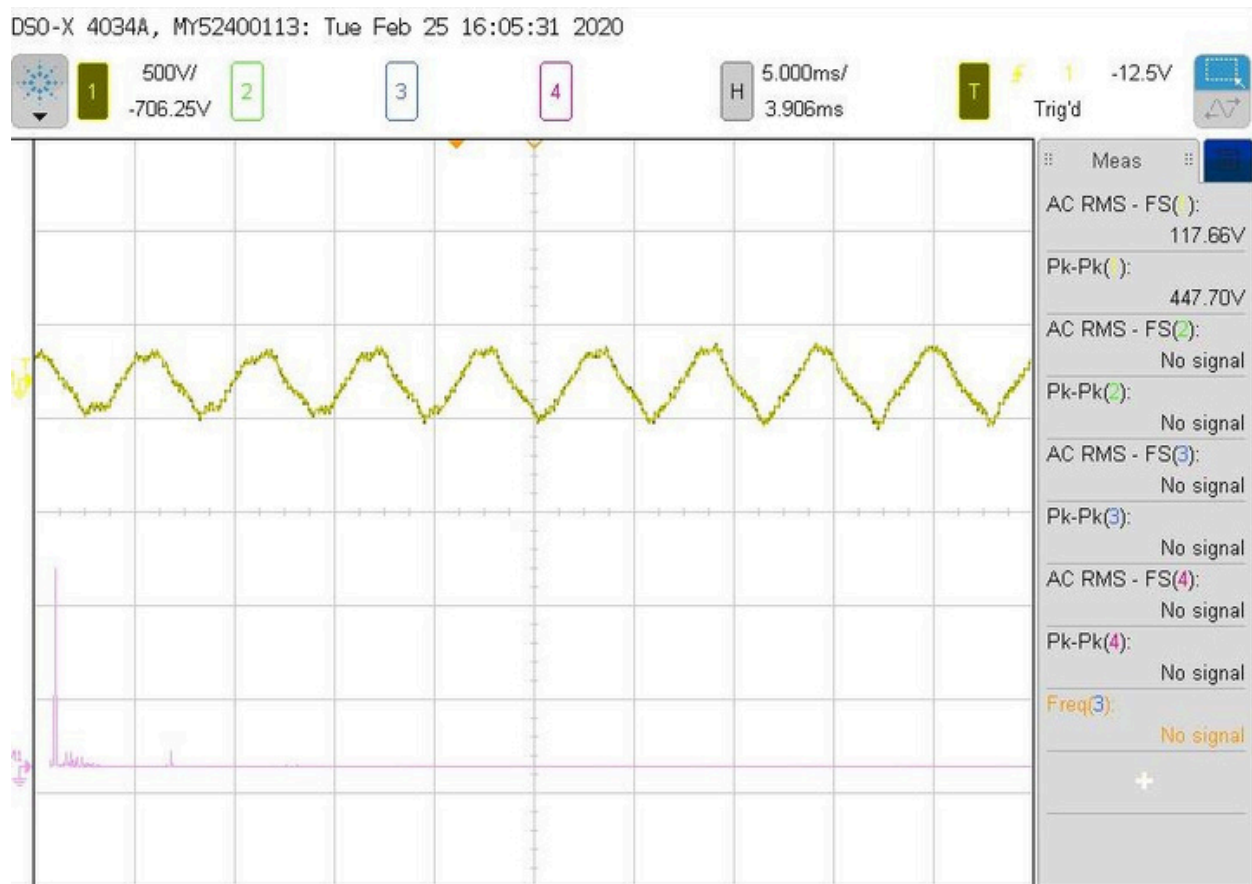


Figure 4: Common mode voltage with a Sinewave Nexus.

As you can see, most of the high frequency components of the common mode voltage were eliminated.

Typical Sine Filter Common Mode Current waveform:

Common Mode Current when using the Sinewave Nexus (bottom graph).

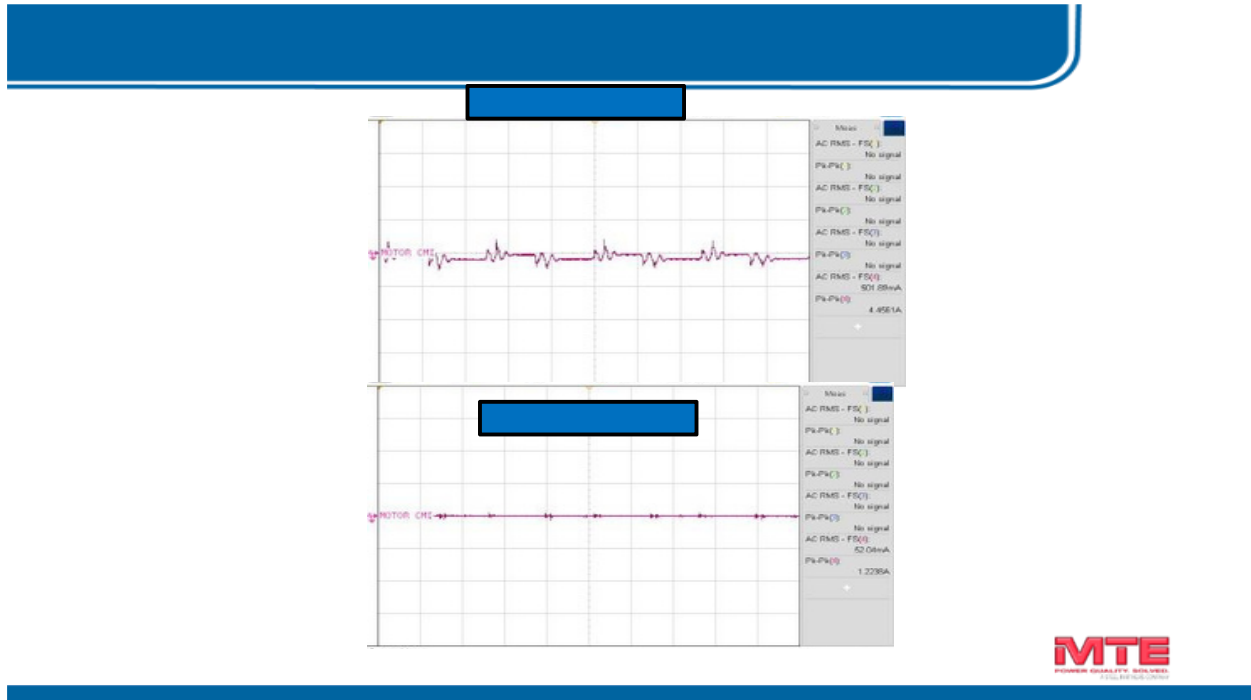


Figure 5: Common Mode Current when using the Sinewave Nexus (bottom graph).

As you can see, most of the high frequency components of the common mode current were eliminated.

Case Study 1: Wastewater facility on the east coast

Outlined below is a case from a Wastewater facility on the east coast. The facility did not have the physical room to install an inverter duty rated motor on the baseplate shown below. This customer is currently evaluating the SineWave Nexus sine filter.



Case Study 1 cost analysis: Application: 100HP, 460V, 60Hz, 3-phase, 1800RPM, TEFC, 500FT drive to motor cable run. Assumptions: Customer has an existing drive, existing standard duty motor and existing standard 600V tray cable installed with their application.

Case 1: Standard Duty motor and cable:

Drive = 100HP, 460V, 60Hz, 3-phase, NEMA 1, 124A = \$8,500 (existing).

Motor = 100HP, 460V, 1800RPM, 124FLA, TEFC, standard duty motor = \$8,500 (existing).

Motor Cable = 500FT of standard tray cable (1/O awg, 600V, non-inverter duty) = \$3,700 (existing).

SineWave Nexus Sine filter type SWNG0130E = \$6,866

Installation Cost = 16 hours of labor at \$100/hour = \$1,600

Total incremental cost for case 1 = \$8,466

Case 2: Inverter Duty motor and cable:

Drive = 100HP, 460V, 60Hz, 3-phase, NEMA 1, 124A = \$8,500 (existing).

Motor = 100HP, 460V, 1800RPM, 124FLA, TEFC, inverter duty motor = \$12,250.

Motor Cable = 500FT of inverter duty motor cable (1/O awg, 2kV, shielded), Belden # 299529C = \$8,760.

dV/dt filter type DVTG0130E = \$1,892.

Installation Cost = 120 hours of labor at \$100/hour = \$12,000.

Total incremental cost for case 2 = \$34,902.

Comparing Case 1 and Case 2, we see that the customer will save \$26,436 per motor by installing the Sinewave Nexus sine filter on their existing application.

Summary:

If you are considering adding VFD's to your non-inverter duty motor and 600V standard motor cable applications, consider the benefits of the MTE SineWave Nexus sine filter and keep your installation costs down and your application reliability high.

Additional Support?

Contact MTE Applications at appengrg@mtecorp.com or 262-946-2818