## DRIVEDEFENDER Harmonic Filter Case Study

### AID's DriveDefender<sup>™</sup> Supports IEEE-519 Compliance and Delivers Cost Savings

As companies in the energy, wastewater and mining industries seek out ways to implement more environmentally friendly solutions in their operations, variable frequency drives (VFDs) have become increasingly prevalent. For over four decades on projects across the country, Advanced Industrial Devices (AID) has packaged drives to replace across-the-line starters — and more recently, diesel-driven motors — with this electric-driven alternative. With the current ESG and Carbon Neutral Initiatives around the world, the electrification of motor and pump drives has accelerated, with AID leading the way in automation technology. In fact, 10% to 20% of the company's projects include DriveDefender harmonic filters along with VFD solutions. The aim is to continue compounding that percentage year over year.

VFDs offer electrical efficiency and power savings, along with pollution reduction compared to diesel motors and pumps. By allowing a motor to ramp up slowly, VFDs reduce the AC inrush current or the power surge that takes place at the input of the motor. This helps reduce heat, offering the added benefit of extending motor life and uptime. On a 100HP motor that requires 800 amps to start, for example, VFDs can minimize that to 150 amps to lessen the demand charge on the power grid. As incoming AC voltage diverts to DC voltage and back to AC, VFDs essentially "chop" the sine wave to vary the speed of a motor, resulting in a distorted sine wave.



And while VFDs offer distinct advantages, they do come with one inherent problem: harmonics caused by the deviation from the standard electrical sinewave. High harmonics can increase heat to transformers, which can be damaging and waste electricity. It is noticeable to consumers on the grid in the form of flickering or dimming lights, noisy HVAC systems or electrical equipment that won't operate or operate properly.



Page 1

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AID has developed its DriveDefender to help companies reduce instances of harmonics. This is particularly important not only to reduce disruptions to the electrical grid, but also because all electrical systems designs must maintain compliance with the IEEE-519 Harmonic Standard. This standard defines the criteria primarily for current distortion, but also voltage distortion.

#### How DriveDefender helps

DriveDefender is a line-side filter that adapts to varying power loads to minimize harmonics and extend the life of electrical equipment. It is available in 103 to 1,000+ amp designs. The adaptive passive filter is designed to correct the harmonics created by 6-pulse drives and can meet IEEE-519 specs down to a 40% load. This combination of drive and line-side filter have a proven track record and is the most cost-effective way to mitigate harmonics. The added benefits of the DriveDefender include a complete use of demand power, as well as motors and transformers running cooler and therefore, lasting longer.

Because power surges are common, AID has equipped the DriveDefender with a surge protector to protect the components within the filter. AID includes a hinged door for easier installation and access, pilot lights for power and capacitor activation, and an internal fan and filter for additional cooling. AID also included a thermostat-controlled fan cooling system with filter. This system monitors the heat generated by the reactor and draws in ambient air to protect the filter's internal components from damage.

In addition to addressing harmonics and containing features to safeguard the drive, DriveDefender provides a solid return on investment (ROI) to those responsible for paying for the electricity. By cleaning up the sine wave, a higher rate of the demanded power is being used. This results in monthly electric bill savings, plus longer motor and transformer life due to the reduction of heat.

#### **Real life results**

To date, DriveDefender has proven successful in addressing harmonics issues for companies across the country and keeping them in compliance with IEEE-519. In fact, AID guarantees their ability to meet or exceed this standard.

### Four key projects exemplify the drive's ability to solve harmonics challenges and provide cost savings.

1. A leading global delivery service set forth green initiatives and was also looking for power cost savings. They had pumps, conveyor belts and HVAC systems, along with recirculating pumps to move water through the building for cooling



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purposes. Engineers recognized they had issues with harmonics due to the 200 VFDs in place — ranging from 5HP to 200HP— and they needed to be resolved.

Harmonic filters were placed on each of the VFDs, reducing the harmonics and providing the company with a ROI for the equipment in only nine months and three days due to their electric bill savings. The company also determined that they have extended the life of their collateral products, including fans, motors and pumps, collectively by 30%.

2. A U.S.-based energy company focused on hydrocarbon exploration found itself out of compliance with IEEE-519 due to the VFDs connected to its pump jacks, the pumps for saltwater disposal and vapor recovery units. The harmonics had affected power to a residential area and needed to be rectified within 30 days. AID installed six DriveDefender units and confirmed IEEE-519 compliance within 18 days.

3. An OEM for the oil industry was experiencing a 25% failure rate on its motors caused by common mode voltage damaging the windings and fluting of the bearings. The addition of filters on the load side reduced that failure rate to 2%. The offering of line- and load-side filters completes the AID solutions for protecting customer equipment.

4. A midstream water disposal company was running a configuration of three tanks, side by side, with three progressive positive displacement pumps to take excess water from oil wells. Each tank included a float switch inside to indicate when it was necessary to move water by way of pumps and VFDs. The harmonics were high enough that the third drive wouldn't engage, resulting in water overflow.

The addition of a DriveDefender cleaned the power and reduced the harmonics to alleviate the overflow. They currently have approximately 50 of the drives in the field and have experienced no further issues.

#### Looking to the future

As more companies look to introduce sustainability in their operations, VFDs are certain to become a more common solution for gaining energy efficiency and replacing diesel-driven machines. Add a growing infrastructure with more pipelines and housing, and it's clear that the power grid will begin to be absorbed at a higher rate. That will drive the need for more VFDs and means that harmonics are an issue that is here to stay. Companies will need to be vigilant in their compliance with IEEE-519 to reduce disruption to customers on the grid. AID's DriveDefender is a trusted solution that can help now and in the future.

