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Active Harmonic Control with PowerLogic Solutions

Improve operating costs and lengthen equipment life-span with active harmonic control

In electrical systems, harmonics increase business operating costs by causing downtime, placing undue burden on the electrical infrastructure, making power factor correction difficult and causing poor total power factor. With new technologies and equipment on the rise, harmonics are an increasingly prevalent issue.

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Harmonic control has big benefits:

- In automated factories, harmonic control maximizes uptime by minimizing the distortion of control signals.
- Where there is a high investment in electrical systems, harmonic control lowers capital expenditure and frees electrical capacity.
- Where drives, UPS systems and other nonlinear loads are abundantharmonic control is often required for IEEE-519 compliance and to improve total power factor and reduce operating costs.

A Complete Solution

PowerLogic Active Harmonic Filters are a Power Correction System that provides Active Harmonic Control. It works by monitoring a distorted electrical signal, determining the frequency and magnitude of the harmonic content in it, and then cancelling those harmonics with the dynamic injection of opposing current. Active Harmonic Control provides the benefits of traditional harmonic filters, with far simpler application and engineering requirements, easier and less expensive installation, comprehensive control and assured compliance to IEEE-519.

Key Benefits of Active Harmonic Control

- Costly harmonic studies are minimized.
- Power factor correction capacitors can be left in place. PowerLogic Active Harmonic Filters stabilize the system by providing a perfect source for the load.
- PowerLogic Active Harmonic Filters are scalable. Filters are applied on the bus, and capacity can be added as needed.
- Reduces equipment failures due to heating.

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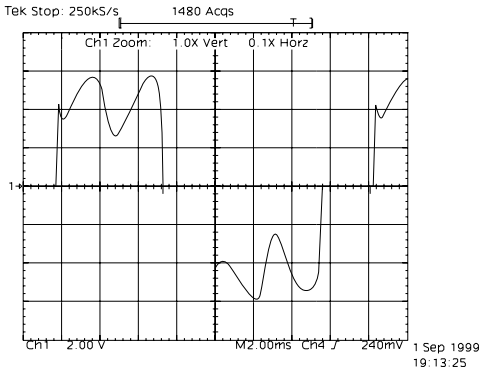
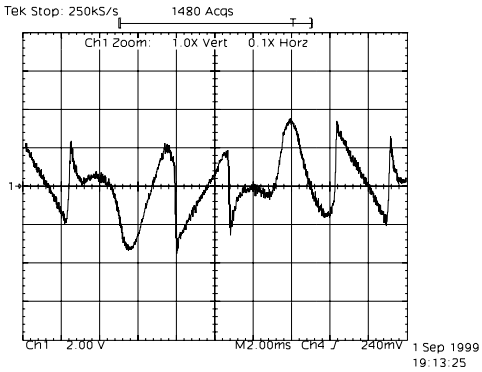
How PowerLogic Active Harmonic Filters Work

Active Harmonic Filters (AHF) are static power electronic products that employ digital logic and IGBT semiconductors to synthesize a current waveform that is injected into the electrical network to cancel harmonic currents caused by nonlinear loads. AHF employ current transformers to measure the load current to determine the content of harmonic current present. By injecting the synthesized current, network harmonic currents are greatly mitigated, thus reducing the heating effects of harmonic current and reducing voltage distortion to permit other equipment to operate properly and enjoy a long product life span.

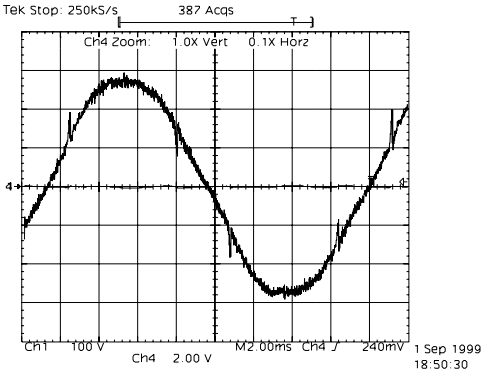
AHF also have the ability to correct for poor displacement power factor (DPF) and for mains current balancing. DPF correction can be provided for either leading (capacitive) or lagging (inductive) loads that cause poor DPF. Mains current balancing is achieved by measuring the negative sequence current present and injecting the inverse negative sequence current to balance the current for the upstream network.



Current Waveform 38% Ithd



PowerLogic Injection Current

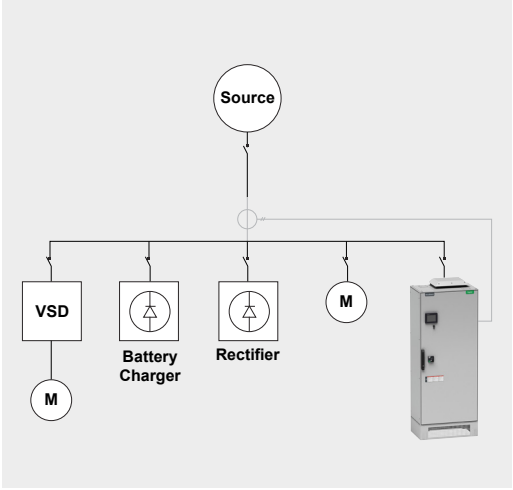


Corrected waveform. <4% Ithd

Application Guidelines

PowerLogic Active Harmonic Filters are a scalable solution for harmonic distortion. PowerLogic Active Harmonic Filters are sized to control existing or anticipated harmonic current in a system for one or many loads. The rated output current is equal to the square-root of sum of the squares of the harmonic and reactive current at the bus.

When the total harmonic current exceeds the rating of a single PowerLogic Active Filter, additional units can be installed in parallel.



Various non-linear loads with PowerLogic Active Harmonic Filters

Comparing Alternatives

You have many choices when it comes to harmonic control. Most harmonic control devices have roots in inductors, transformers and other electromagnetic devices and are designed for harmonic control when adjustable speed drives (ASDs) are present.

Inductors/Transformers

Today, line reactors and transformers are used for limited harmonic control with AC drives, although most are installed for protection of the drive from transients. In reality, significant harmonic control can only be achieved when the inductor has been sized correctly, when the source impedance is low or when the drive does not contain an integrated DC bus choke. A 5% impedance inductor will reduce current total harmonic distortion to approximately 35% at full load at the load connection point.

IEEE-519 - A short overview

IEEE 519-2014 provides recommended harmonic limits for voltage and current distortion for application at the point of common coupling (PCC) between the system owner/operator and a user. The PCC is usually taken as the point in the power system closest to the user where the system owner/operator could offer service to another user. The limits in the standard represent a shared responsibility for harmonic control between both parties: users should limit harmonic current injections while system owners/operators should decrease voltage distortion levels by modifying system impedance characteristics as needed.

The standard is often applied within a facility. Although this is technically incorrect, compliance with IEEE 519 inside the customer's system will not only satisfy the utility at the meter, but will also assure that load-induced harmonics problems within the customer's system are minimized. Most of the cost of harmonics is not incurred in the utility system, but rather within the customer's facility. Due to a direct connection between voltage and current harmonics, controlling current distortion leads to satisfaction of the voltage limits also.

Traditional Filters

A passive harmonic filter consists of a series shunt passive capacitor/ inductor network and a series inductor or transformer. They are often added to an electrical system as a peripheral to a drive system and are sized to an individual drive. Multiple drives require multiple filters.

If a single filter (bus-applied) solution is preferred, significant investment in system analysis is required, and the system is often no longer scalable.

Low Harmonic Drives (LHD) or Active Front End drives:

LHD drives are sold directly for and only because of the need for harmonic control for a single drive. The cost and size penalty can be severe, especially in low HP and when more than 3 drives are required to operate on a common LV bus.

PowerLogic Active Harmonic Filters

A Power Correction System like PowerLogic Active Harmonic Filters deliver complete harmonic control for multiple loads (of all types) or a single, large load. Sizing is simple, installation is inexpensive (in comparison with load-applied solutions), compliance is assured, and the system is scalable. When a bus serves many nonlinear devices, PowerLogic Active Harmonic Filters are often the low total cost solution.

Remember, Active Harmonic Control is just one of the benefits of a Power Correction System.

For additional information, refer to the PowerLogic Active Harmonic Filters catalog at www.se.com/us/powerquality.

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