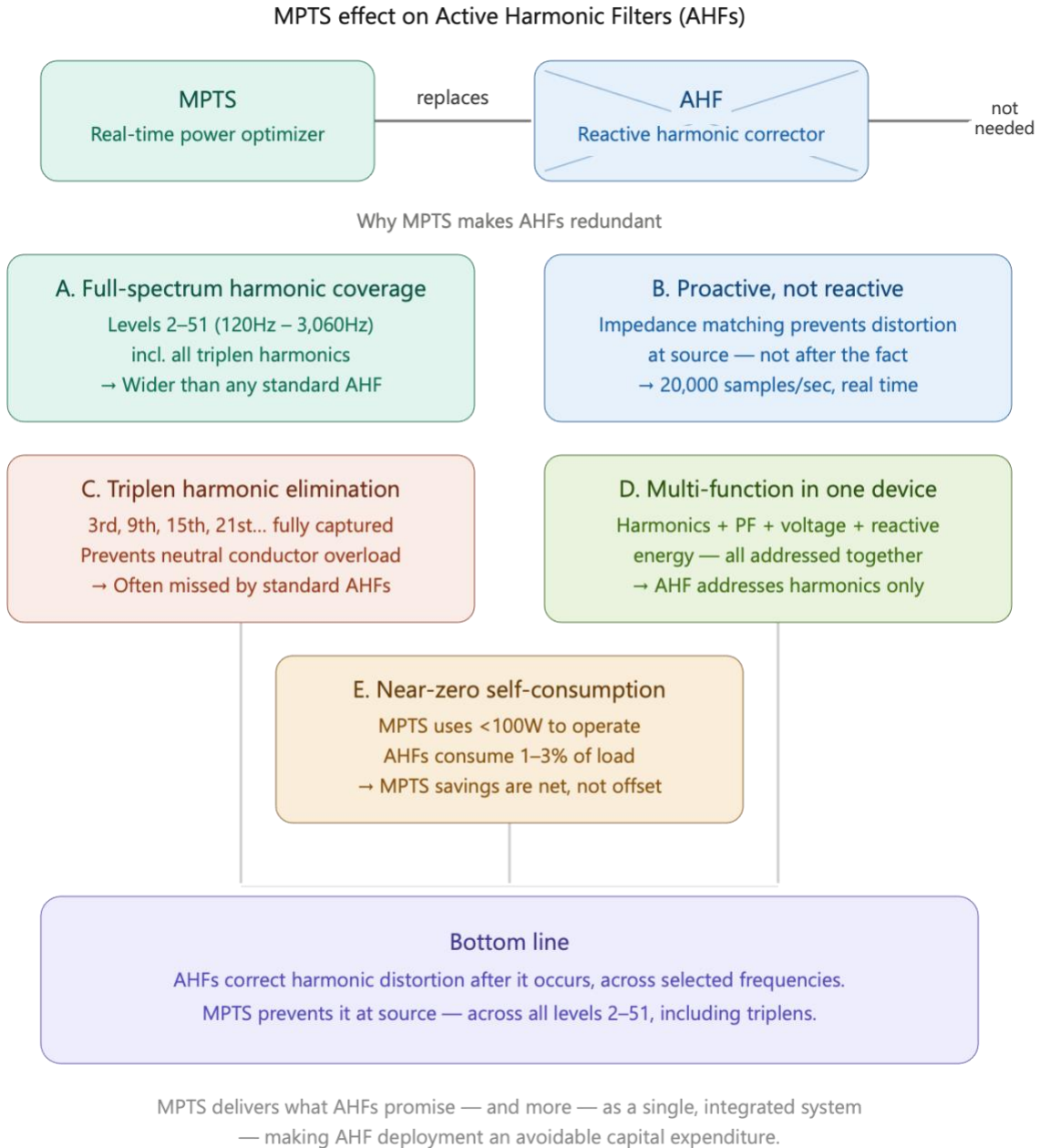


Why MPTS Eliminates the Need for Active Harmonic Filters (AHFs)

A summary:



The Detail:

What AHFs Do and Why They're Deployed

Active Harmonic Filters are power electronics devices that sense harmonics in real time and inject opposing currents to cancel them out. They offer dynamic compensation that adapts to changing loads and harmonic profiles and facilitate real-time power factor correction and load balancing.

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They are primarily a reactive, corrective technology, deployed after harmonics have already been generated by nonlinear loads, to cancel the distortion downstream. However, AHFs carry significant drawbacks: higher upfront and maintenance costs, an energy overhead of 1–3% of the load, and complexity that requires expert installation.

What MPTS Does Differently at the Source

Rather than filtering harmonics after the fact, MPTS intelligently optimizes incoming and outgoing AC power within the network, eliminating all "dirty power" caused by reactive current from anomalies and equipment in the system. This is a fundamentally upstream, preventative approach.

MPTS precisely senses the supply input and demand output, matches the electrical impedance parameters, adjusts the resonance of the resulting network loop, and optimizes by sampling the status of each of the 3 phases 20,000 times per second and adjusting electrical characteristics 10,000 times per second, virtually in real time.

The theoretical foundation is sound: the Maximum Power Transfer Theorem (Jacobi's Law, 1840) focuses on increasing total electrical efficiency by decreasing losses using impedance matching. When losses decrease, the phase angle nears zero and the power factor approaches unity.

MPTS Harmonic Coverage: Levels 2 Through 51

A critical, often overlooked distinction concerns the scope of MPTS harmonic mitigation. Apart from Harmonic Level 1, the fundamental frequency at 60Hz, MPTS addresses Harmonic Levels 2 through 51, spanning the frequency range of 120Hz to 3,060Hz. This comprehensive coverage includes:

- **Even harmonics** (2nd, 4th, 6th ...) - often generated by asymmetrical loads and half-wave rectifiers
- **Odd harmonics** (3rd, 5th, 7th, 11th, 13th ...) - the dominant harmonics produced by six-pulse and twelve-pulse rectifiers, VFDs, and switching power supplies
- **Triplen harmonics** (3rd, 9th, 15th, 21st ...) - all odd multiples of 3, particularly problematic in three-phase, four-wire systems, where they do not cancel in the line conductors but instead accumulate in the neutral conductor, causing overheating, neutral overloading, and transformer stress

This is a wider harmonic mitigation range than most AHF deployments address in practice. Many AHF systems target the 2nd to 50th harmonic orders, and even the most advanced solutions using MOSFET-Silicon Carbide designs reach up to the 61st order, but these are costly, premium, high-switching-frequency devices, not standard deployments. MPTS delivers Level 2–51 coverage as a standard, integrated function of its impedance-matching and network-optimization process, not as a separately engineered add-on filtering layer.

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Why This Makes AHFs Redundant

- 1. Harmonics are mitigated at the system level, across all relevant frequencies.** Rather than targeting selected harmonic orders through tuned filters or injected cancellation currents, MPTS resolves harmonic distortion across Levels 2–51 as a natural consequence of real-time impedance matching and network optimization. MPTS smooths out electrical "noise" that can interfere with equipment performance, systemically rather than selectively.
- 2. Triplen harmonics are fully addressed, a known weakness of many AHF installations.** Triplen harmonics (3rd, 9th, 15th, 21st, etc.) are among the most damaging in commercial and industrial facilities, yet they are frequently underaddressed by standard AHF configurations, which often prioritize the 5th and 7th orders. MPTS's full-spectrum coverage through Level 51 ensures that triplen harmonics are captured and mitigated as part of a unified process.
- 3. MPTS addresses the full power quality picture simultaneously.** MPTS cleans and stabilizes electrical power in real time, reducing current, harmonics, reactive energy, and voltage instability, while processing up to 20,000 cycles per second, enabling a single cabinet to deliver results that typically require multiple devices and layers of equipment. AHFs only address harmonics; MPTS addresses harmonics, power factor, voltage instability, and reactive energy all at once.
- 4. Power factor correction is achieved as a natural consequence, not a separate function.** MPTS's patented Advanced Switching Technique dynamically matches source and load impedances, achieving near-unity power factor as a natural consequence. This directly replaces one of the primary reasons facilities install AHFs.
- 5. MPTS consumes negligible power to do its job.** MPTS delivers verified savings while consuming less than 100 watts itself, whereas AHFs consume 1–3% of the load to operate, partially offsetting their own energy-saving benefits.
- 6. MPTS unlocks capacity that AHFs cannot.** MPTS unlocks up to 20% of hidden electrical capacity, allowing facilities to add loads, defer infrastructure upgrades, reduce demand strain, and lower total energy costs, without replacing transformers. AHFs provide no such systemic capacity benefit.

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Summary Comparison

Capability	AHF	MPTS
Harmonic mitigation range	Typically, 2nd–50th order (selective)	Levels 2–51 (120Hz–3,060Hz, comprehensive)
Triplen harmonic coverage	Often incomplete	✓ Fully included
Power factor correction	✓	✓ (achieved naturally)
Voltage stabilization	✗	✓
Reactive energy management	✗	✓
Load balancing	Limited	✓
Capacity release	✗	✓ (up to 20%)
Self-consumption overhead	1–3% of load	<100 watts
Multi-function device	✗	✓

Conclusion

AHFs are specialized, single-purpose corrective tools for harmonic distortion, typically targeting specific harmonic orders after distortion has already occurred. MPTS, by contrast, delivers comprehensive harmonic mitigation across Levels 2 through 51 (120Hz to 3,060Hz), including all triplen harmonics, as an integrated element of a broader, real-time power optimization platform. The conditions that necessitate an AHF (poor power factor, reactive currents, harmonic distortion across the frequency spectrum, voltage instability) are actively managed by MPTS at their source, continuously and automatically, making the separate deployment of an Active Harmonic Filter not only redundant but an avoidable capital expenditure.