The Benefits of Using Type LPF Low Pass Harmonic Filters

There are several distinct benefits realized by the application of TYPE LPF Low Pass Harmonic Filters. First and foremost is the minimization of harmonic current distortion at the input to three phase non-linear loads such as variable frequency drives (VFD) and uninterruptible power supplies (UPS). Other benefits include the reduced system bus voltage distortion, reduction of peak current and true rms load current, reduced kVA capacity requirement, reduction of electrical equipment operating temperature and increased life expectancy of electrical equipment.

Harmonic Distortion

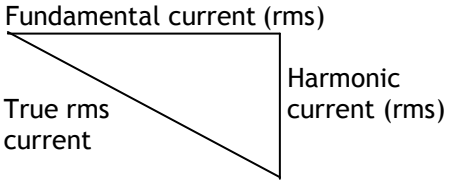
Type LPF filters reduce harmonic current distortion at the input to a six pulse rectifier typically to less than 5% THD-I. The following chart illustrates the harmonic current distortion for VFDs of various ratings, and with various harmonic mitigating solutions, with each being supplied individually by a 500kVA transformer with 5% nameplate impedance. The Low Pass Filter typically reduces current distortion to 5% or less.

500kVA, 5%Z Transformer, plus:	% THD-I if VFD = 25HP	% THD-I if VFD = 50HP	% THD-I if VFD = 100HP	% THD-I if VFD = 250HP
Nothing else	140% THD-I	100% THD-I	72% THD-I	47% THD-I
3% Line Reactor	42% THD-I	41% THD-I	39% THD-I	34% THD-I
5% Line Reactor	34% THD-I	34% THD-I	32% THD-I	30% THD-I
Low Pass Filter (LPF)	**5% THD-I**	**5% THD-I**	**5% THD-I**	**5% THD-I**

When harmonic current distortion flows from a power source to a load, the harmonic currents, multiplied by the series inductive reactance through which this current flows, equals harmonic voltage distortion of the common voltage bus. Supplying equipment, including motors, from a distorted voltage source may cause malfunction, failure or reduced life expectancy. The LPF reduces current distortion to below IEEE-519 limits so that equipment can function properly with normal life expectancy.

Reduced Current and kVA

Harmonic current increases the true rms and peak currents flowing though the transformer, fuses, and conductors to the load. Higher current means higher system losses and greater demand on power sources.



The following chart indicates the amount of current flowing in excess of the fundamental current, due to the harmonics associated with each method. Additional current is calculated using THD-I in chart above.

500kVA, 5%Z Transformer, plus:	% THD-I if VFD = 25HP	% THD-I if VFD = 50HP	% THD-I if VFD = 100HP	% THD-I if VFD = 250HP
Nothing else	+ 72%	+ 41%	+ 23.22%	+ 10.49%
3% Line Reactor	+ 8.46%	+ 8.08%	+ 7.33%	+ 5.62%
5% Line Reactor	+ 5.62%	+ 5.62%	+ 5.00%	+ 4.40%
Low Pass Filter (LPF)	**+ 0.12%**	**+ 0.12%**	**+ 0.12%**	**+ 0.12%**

Excessive rms or peak current, caused by harmonic distortion may cause nuisance operation of fuses and circuit breakers and increased heating of upstream components such as transformers and conductors. The LPF reduces input current to within 0.12% of the normal fundamental current. This prevents nuisance fuse blowing, nuisance circuit breaker tripping and reduces the operating temperature of supply transformers. As harmonics are reduced, the load demands less kVA from the power source. Equipment operating temperatures (ie: transformers, generators) are reduced and their life is extended.