

## Technical Paper

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**Subject:** T-Series Harmonic Filter for 6-pulse converter type loads.

**General:** In industry and commercial installations, the major harmonic generating loads are of six pulse converter type.

The typical loads of this type are:

- 1) VFD – Variable frequency AC Drives.
- 2) DC motor drives.
- 3) UPS and Inverters.
- 4) Induction Furnaces.

With such kind of loads, the electrical supply system gets loaded with Harmonics of considerably higher amplitude that are way higher than the any acceptable standards.

Typical harmonics seen with such type of loading are 5<sup>th</sup>, 7<sup>th</sup> Harmonic as prominent harmonics and 11<sup>th</sup> and 13<sup>th</sup> Harmonic to some extent. Total current THD% seen with such drives ranges from 35% to 65%.

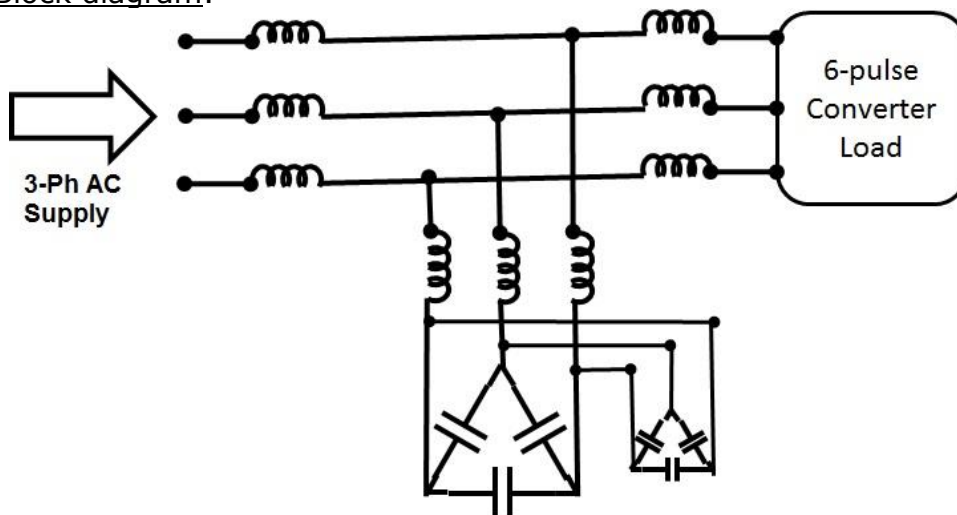
As one knows the extremely bad effects of Harmonics on the supply systems and needless to mention that such harmonics should be reduced / eliminated as much as possible from supply system so that their bad effects would not be felt.

T-Series filters are the filters for this job.

**Principle of Operation:** The T-Series filters are basically a low pass passive filters. They are series and shunt filter combination.

The current harmonic levels practically can be brought down to the level of 7% to 14%. The exact value of reduction is though dependent upon the supply network impedances.

Basic Block diagram:





From the block diagram, one can see that the configuration has series inductor elements in the load and in between the two set of inductors, there is a harmonic partially tuned L-C filter. The smaller capacitors are shown for fine tuning of the filter.

The input series inductor provides higher impedance path for the harmonics generated by load and the partially tuned L-C filter provides the low impedance path for the Harmonics. The further Inductor is just a small inductor in between the filter and the actual load for taking care of glitches generated by the load.

Sometimes there are some discharge resistors provided with filters to avoid overvoltage during the lower loading conditions.

### Advantages:

- Usage of passive elements giving robust maintenance free utilization.
- Bringing down the current harmonics level considerably.
- Price Economics makes this product highly suitable for the said application.

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