FAQ - What is a harmonic?

A harmonic is a sinusoidal component of a periodic wave or quantity having a frequency that is an integral multiple of the fundamental frequency (IEEE Std 519-1992).

FAQ - What causes harmonic distortion?

As power utilities continue to be pushed to the limits of supply capability, rising energy costs and decreasing power quality will continue to be an issue for consumers. Users continually search for ways to not only reduce energy costs, but also ensure their processes will continue to operate, no matter the quality of the incoming power. To accomplish this, more and more variable frequency drives, UPS systems, and other non-linear loads are being installed. The usual waveform of an alternating current (AC) is generally that of a sine wave or a sinusoidal waveform. This is considered the fundamental waveform. Linear loads draw current in proportion to the sinusoidal voltage. Non-linear loads, such as drives, change their impedance by conducting current only near the peak of the wave. Switching loads on and off during the waveform results in non-sinusoidal current pulses. These pulses introduce reflective currents (harmonics) back into the power distribution system. The non-sinusoidal waveforms have the fundamental wave plus integral multiples of

FAQ - What is IEEE 519?

The IEEE is the Institute of Electrical and Electronics Engineers. IEEE 519, "Recommended Practices and Requirements for Harmonic Control in Electric Power Systems," was published in 1981. The document established levels of voltage distortion acceptable to the distribution system. This document has been widely applied in establishing needed harmonic correction throughout the electrical power industry. However with the increase in industrial usage of adjustable speed drives, rectifiers, and other non-linear loads, it became apparent that a rewrite of IEEE 519, treating the relationship of harmonic voltages to the harmonic currents flowing within industrial plants, was necessary to support control of harmonic voltages. The new IEEE 519, published in 1992, sets forth limits for both harmonic voltages on the utility transmission and distribution system and harmonic currents within the industrial distribution systems. Since harmonic voltages are generated by the passage of harmonic currents through distribution system impedances, by controlling the currents or system impedances within the industrial facility, one can control harmonic voltages on the utility distribution.

FAQ - What kinds of problems are caused by harmonic distortion?

Harmonic distortion can cause poor power factor, transformer and distribution equipment overheating, random breaker tripping, or even sensitive equipment failure. Since harmonics affect the overall power distribution system, the power utility may even levy heavy fines when a facility is affecting the utilities' ability to efficiently supply power to all of its customers.

FAQ - How can I find out if the filter will bring my power system into compliance with IEEE-519?

The best way for true power system evaluation is to have an actual power measurement taken at the facility. For the sake of an informal, computer assisted power system review, the Analyzer Program can be found on the TMS. Contact TMS Technical Support for assistance on this and other thoughts on compliance with IEEE-519 standards.

FAQ - I have a harmonic limit requirement for my facility. What size HGP filter do I use?

The best way to address specification and harmonic limits is to do a proper analysis of your power system to establish a base line value of the harmonics presently on the power system at the point of common coupling, (PCC). Once that value is found, a proper solution can be formulated for your facility. For specifications that state a specific value at the drive or filter terminals, TMS can typically

provide an HGP that will meet the limits of most power quality specifications. Most industry power quality people today rely on the committee studies and findings of IEEE. The guideline that IEEE established is their standard 519-1992. TCI complies with this standard on the HGP drive-applied harmonic filter when the customer evaluates the harmonic content at the point of the drive or filter terminals. This standard has reached an industry wide level of acceptance, and most power quality Engineers will reference this standard and openly accept the performance of the TCI HGP filter for drive applied applications. For additional information of IEEE-519 requirements and how the TCI HGP filter complies, contact the TMS Technical Support staff.

FAQ - How can a harmonic filter improve my system power factor?

"Real" or True power is used to perform real work. Inductive loads require Real and Reactive power. Utilities provide apparent power. Apparent power is a geometric combination of Real and Reactive (or imaginary) power. Reactive power performs no work. However, the flow of reactive current, a component of reactive power, does consume energy as it passes through resistive elements of the power system, thus reducing overall system efficiency. This reactive power is used to generate magnetic fields within motors, transformers, and other magnetic devices. Reactive power, combined with harmonic currents, contribute to poor power factor in electrical systems. The capacitors inherent in the HGP design supply the necessary reactive power so the utility doesn't have to. The reduction in harmonic currents further improves the ratio of active power to apparent power. This overall improvement to true power factor assists in the efficient operation of facilities and the avoidance of possible fines due to poor power factor.

FAQ - How can I estimate or calculate how much my system will improve with the use of the HGP?

This can be done with the TCI "Analyzer" program or reviewed and analyzed by the TMS Technical Support staff. For the sake of general evaluations, you may estimate the drive input terminal point to be at approximately 7% TDD. The system, as a whole, would need further review and program work.