Energy efficiency and maintaining good power quality was critical for the customer’s operation. An external agency was hired to carry out a power quality audit in order to solve nuisance tripping of breakers. Being a service industry in the IT sector, 24x7 availability is crucial for customer’s business in India.

The power quality audit confirmed poor power quality in the form of high neutral to ground voltages, high voltage distortion, overloading of neutral conductors due to unbalance in loading and presence of 3rd harmonic current etc.

Such problems are characteristics of office buildings/commercial establishments with predominant non-linear loads such as data servers, UPS systems and mix of single phase loads. Harmonics generated by such loads in the supply network create several problems such as overheating of cables, nuisance tripping of breakers, blowing of fuses, additional heating in the transformers etc. High levels of triplen (3rd order and multiple) harmonics specifically overload the neutral conductor and often result in unacceptable neutral to earth potential.

**ABB solution**

ABB has installed its PQF range of 3-Phase, 4-wire filters and achieved remarkable improvements in the power quality.

**Customer benefits: boost in power quality**

The load current in such installations are highly polluted due to presence of high level of harmonic current. Improvement up to the extent of 95% was achieved in the harmonic current distortion (THDI) at certain feeders after installation of the active filters. Excessive THDI at high load current is the main cause of higher heating losses, tripping of protection devices and other related problems.

**Customer benefits: improved energy efficiency**

The active filters not only reduced the high harmonic distortion but also improved the power factor close to unity (0.99 lag). This has resulted in up to 20% reduction in kVA consumption by the UPS system. Low power factor is characterized by high load current which in turn results in additional line losses, overheating and in some cases penalties causing direct financial losses. In fact, the ABB PQF range of filters has the unique capability to correct the leading power factor characteristics of loads in the IT industry. A leading power factor is not desirable and may require derating of UPS systems. The PQF range of filters correct the leading power factor to unity.

The combined effect of harmonic filtering and power factor improvement brings additional benefits to the customer. The transformer, cables and...
other network components are relieved and hence can support additional load. Reduced losses lower the operating temperature of the equipment which indirectly increases the life of the electrical equipment.

**Customer benefits: reduced equipment down time**

Thanks to the load balancing feature and high efficiency of filtering harmonic currents, the neutral currents at various feeders are reduced by 30-40%. Reduction in the neutral current not only reduces the losses but more importantly reduces the potential difference between the neutral and earth conductors. For sensitive IT equipment, a high voltage between neutral and earth leads to failure of electronic cards. Installation of PQF filters has significantly reduced the neutral current leading to reduction of equipment downtime at this location.

**ABB technology**

ABB’s PQF active filters offer unprecedented ability to clean the power supply of harmonics. They are insensitive to changes in network impedance due to alteration in network topology such as paralleling of sources and switching between mains supply and generator operation. The PQF monitors line current in real time and processes the measured harmonics as digital signals in a high-power multi-DSP (Digital Signal Processor) based system. The digital controller generates Pulse Width Modulated (PWM) signals which drive IGBT power modules to inject harmonic currents in the network of exactly the opposite phase to the existing harmonics.

**Key features of PQF active filters**

- Filters up to 50th order of harmonics
- Selective harmonics filtering
- Closed loop operation
- Provides dynamic reactive power / PF correction
- Load balancing
- Graphical display of all power parameters of loads and filter
- Never trip on overload
- Easy commissioning

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![THDI (%) Vs Time](image)

![ABB PQF active filters](image)