

PFC Engineering has been supplying high quality Power Factor Correction equipment since 1976. Over the last decade, new technologies have led to a requirement to control the quality of the power in which industrial and commercial consumers use. PFC Engineering is meeting this demand by the formation of our **Power Quality Division**.

Increased power quality problems are caused mainly by the increased use of non-linear loads such as computer equipment, variable speed drives and power electronics used in control gear. But as well as causing these problems, these devices are often directly affected by the system anomalies they cause. Historically, the main concern for electricity consumers was having sufficient power available for their requirements. Now however, consumers are increasingly forced to consider not only the “quantity”, but also the “quality” of power used, in order to maintain the correct functioning and reliability of their installed equipment.

Electricity as supplied by the main generating plants can be considered clean (i.e balanced, sinusoidal, three phase power). Disruption to this supply is only caused by equipment failure or adverse weather conditions. Therefore, any power quality anomalies experienced on the supply network can be attributed to consumers. These anomalies may take the form of voltage surges or sags, spikes, notches and harmonics.

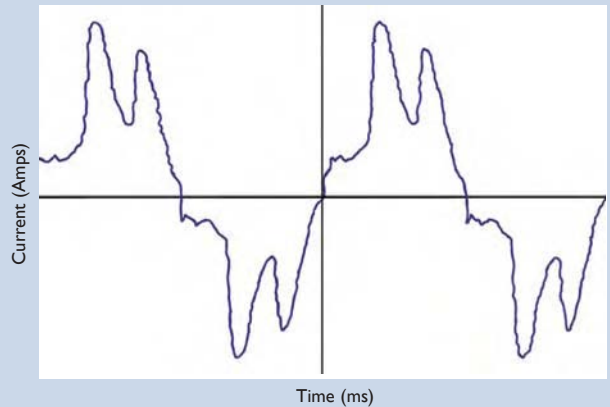
As these power quality problems are created by the consumer’s load, these anomalies can also easily travel within the common electricity supply network between premises, in turn disrupting a neighbouring consumers supply. In response to these occurrences, supply authorities have adopted guidelines such as G5/4 and IEEE-519 in order to limit the level of disturbance created by each individual consumer.

### **PFC Engineering’s Power Quality solution.**

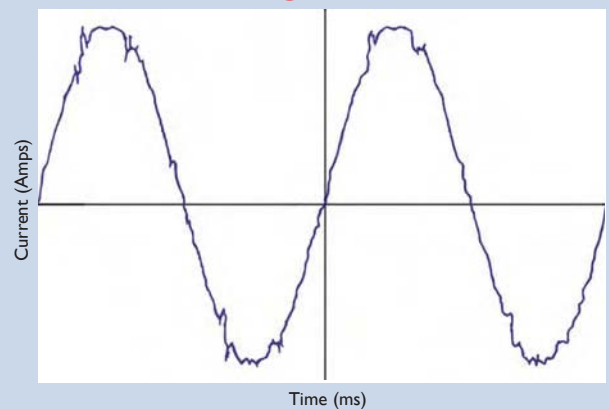
We have extended our field of expertise to offer a comprehensive service for Power Quality solutions, including:

- Full system analysis capability
- Consultation
- Tutorials and seminars
- Mathematical modelling
- Supply of remedial equipment
- Installation and maintenance

### **Current oscillogram before filtration**



### **Current oscillogram after filtration**



*A tuned 5th and 7th Harmonic filter .  
Cabling is accessed from below.*

# An outline of some of the more common problems associated with poor power quality.

Power Quality condition	Problems and effects	Typical causes	Remedial equipment
Harmonic current distortion (general)	Transformer & network overload Nuisance tripping premature failure of unprotected PFC System resonance Monitor display wobble	Non linear loads Variable speed drives Electronic lighting control / ballasts	Passive filter Phase shift or zig-zag transformer Active filter
Triplen harmonic current distortion	Neutral cables overheating Transformer burn out High neutral to ground voltage Circulating current	Non-linear loads Switch mode power supplies Variable speed drives	Transformers delta / star Phase shift or zig-zag transformer Passive / Active filter
Harmonic voltage distortion	Random equipment reset / crash Clock and synchronising problems due to multiple zero crossing	High non-linear current Variable speed drives System resonance High system impedance	Active filter Passive filter
Poor Power Factor	Excessive power usage High kVA demand Increased network losses	Inductive loads Motors Fluorescent lighting	Passive / Automatic / Static capacitor banks Active Power Factor Correction
Network anomalies:  Transients Surges & sags Flicker over-voltage under-voltage	Random equipment failure Computer data loss / error Power supply failure Circuit breaker tripping Equipment reset /error Motor torque reduction Motor overheating / burn-out Lighting problems / flicker Transformer noise Monitor display wobble	Tap changing Load switching Load variations System overload Motor starting Electrostatic discharge Lightning Arc furnaces	Surge arrestors Isolation transformers In-line filter reactors Electronic voltage stabiliser Uninterruptible Power Supplies (UPS) K-rated transformers Voltage stabilisers Static VAr Controllers
Supply Interruptions Power failure	Black out Data loss Network faults Production line down time	Fault clearing Load shedding Lightning interrupters Supply system failure	Uninterruptible Power Supply Back up generator / CHP Rotary UPS

Our policy is one of continuous improvement and we reserve the right to alter any details of design from that shown in this leaflet without prior notice.



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