

# POWER QUALITY

## *for efficient hotel management*

COLIN KINSEY | POWER SYSTEMS SPECIALIST, POWER PARAMETERS PTY LTD

If you're too busy to read this, then at least pass this on to your facilities manager, or maintenance engineering staff. Just be aware that poor electrical power quality is costing you real dollars, in effect adding another percentage or so to your electricity bill – you just haven't been aware of it as you perhaps regard maintenance expense as unavoidable.

**C**hances are you know the electrical energy usage in your hotel in detail. It is also a safe bet that you continue to look for ways of improving energy efficiency. You might well assume, that disposes of further electricity savings. However, electrical power quality is something quite different from electrical energy in that the former relates directly to equipment life and maintenance costs. In short: the poorer the power quality, the more electrical equipment replacement and maintenance costs are likely to be.

The rub, however is this: reading an electricity bill does not require specialist training. Power quality, or rather lack of it, doesn't present itself in conveniently-read bills. It is a bit like high blood pressure – slipping under the radar, until one bad day, some major health issue comes to light.

### POWER QUALITY – WHAT IS IT?

Let's quickly take the wraps of this power quality thing. The picture below tells the story. In short; although voltage should be constant – nicely level – and current, smooth, without sharp excursions, the practice is very different.

Forty years ago, or earlier, power quality was generally much better than today.

These days, with most electrical loads (air conditioning, lighting, IT, elevators, escalators, plus the stuff that guests plug in) having electronic front-ends, largely cause this poor power quality. And, there's pollution that comes down the line from the power company – more about this later.

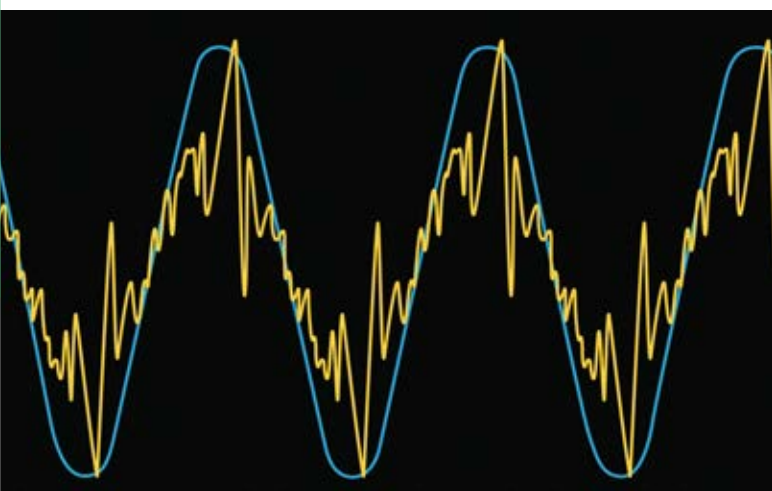
Before you lose your interest in some dissertation on electrical engineering, let's cut through to the commercial side of things, there being two important costs, maintenance and capital replacement. For this article to provide you with useful tools, in other words reduction in both these costs, a bit of accounting analysis is necessary.

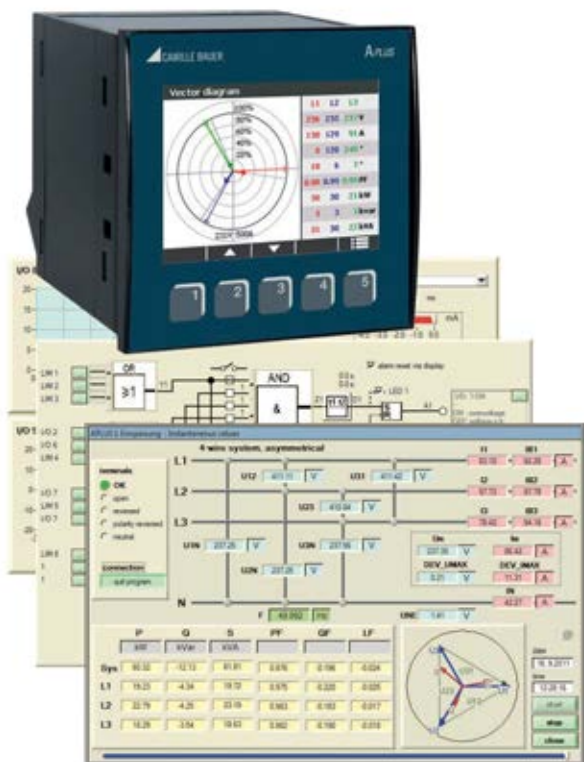
### MAINTENANCE EXPENSE REQUIRES DETAILED VISIBILITY

Maintenance needs to be broken down into classifications (refer to the inset). Gathering this data on a historical basis might well be impossible because of insufficient 'granularity'. Starting from scratch might mean that any action plan for improvement in power quality would have to be delayed – and therefore most probably lost in the pressure of other priorities. However: by retaining an industrial electrical engineering company, or experienced electrical contractor for a facilities survey and a power quality survey, two important things can be established:

1. Level of power quality problems (note: not many installations are free from some degree of diminished power quality).
2. A sensible watch and monitor program.

Monitoring on a permanent, or semi-permanent basis is readily achieved and not involving significant costs. Basically, the fitting of some intelligent panel metering on your switchboard can take care of the task, and provide useful reports.





## THE NITTY GRITTY OF POWER QUALITY

Although there is expense involved, it is no different from other forms of consultation you might occasionally be in need of. The level of power quality is quantified by:

1. Voltage dips, swells, flicker
2. Phase balance
3. Harmonics

The first point provides very basic information: you'd like to think that there are no dips, swells, etc. but very often there are problems in the supply voltage.

The second point addresses more than likely problems in the wiring of the building.

The last issue deals with the effects of the electric loads in the building. If you're curious about harmonics, go google but in essence, today's electrical loads draw severely distorted currents. Similarly, supply voltage can be distorted. In effect these distorted voltages and currents, contain multiples of the basic 50 cycles per second (harmonics) supply.

Poor power quality is responsible for severely curtailing the life of motors, meaning condenser fans on the hotel roof, pool pumps, cool room compressors, variable speed drives for escalators, elevators, etc. In addition there can be bad overheating problems even causing fire in main switchboards. It is unfortunately not uncommon even for boards that are perhaps as lightly loaded as 40% of rated capacity to overheat.

## IMPROVING POWER QUALITY AND REDUCING MAINTENANCE EXPENSES

The electrical consultant to review your hotel's electrical installation will look at a number of areas. These include your lighting and power sub-distribution boards on each floor. The use of high efficiency lighting including LED lighting, CFLs, etc., are responsible for power quality deterioration. The use of IT equipment by guests adds to the problem.

The cumulative effect is the additional burdening of the electrical risers in your building and additional heating load on the main switchboard. Fortunately there are solutions available; sub-distribution boards can be equipped with 'filtering' equipment, basically localising the problem only to the floor.

The HVAC switchboard should be inspected for power quality issues. Investigating the causes including unbalanced transformer windings supplying drives for motors. Elimination, or at least reduction of these problems lightens the load on main switchboards.

A detailed investigation of the electrical layout will reveal opportunities to restore phase balance. To explain this: you will be aware that three-phase power is the basic way of distribution in buildings such as yours. It is a four-wire reticulation method comprising of three wires (the phases) carrying voltage, and a return wire (neutral). Very often the voltages are unequal, and even if only by a small percentage, motors can be severely impacted through overheating and shortened lifespan.

The investigation will also show up 'imported' problems – the ones from the poles and wire folks. Admittedly getting them to attend to these may be a tough ask. Mostly hotels are low voltage installations, i.e. incoming power is 415 volts, three-phase, and this power reticulation system can be seriously affected by local solar panel installations, and by 'pollution' from neighbouring light industrial facilities.

## WRAPPING UP

Power quality hasn't been 'front of mind', commercially speaking. However the electrical power reticulation sector is undergoing big changes, and much needed upgrading is not happening fast enough because of capital investment constraints. Similarly within commercial electrical installations, power quality issues are arising because of the types of connected equipment. The perennial drive towards higher operational efficiency demands improvements in power quality. Fortunately much can be achieved at the consumer premises' level.

### Important maintenance areas

Cool room compressor, commercial refrigerators, extraction fans	Replacement interval & cost	Repair including rewinds, time interval & cost
Heating, ventilation & air conditioning motors		
Elevator motors, escalator motors, pool pump motors		
Switchboard maintenance, power factor correction equipment		