Just What is Power Quality?

Part Two: Poor Power Quality and How it Affects Your Bottom Line

FIRST CONTEMPLATE...

TWENTY COMMON CONCERNS REGARDING *POWER QUALITY ISSUES*

1. **Breakers on the electrical panels sometimes trip for no apparent reason.** The resulting outage for the connected equipment could mean critical downtime, as well as damage or loss of product or processes.

2. **Programming in microprocessor based equipment sometimes fails or malfunctions.** Resets, reprogramming, reboots all mean downtime and lost production or processing.

3. **Electronic circuit boards "wear out" and have to be replaced.** Replacements of circuit boards, many times through a "standing purchase order" with a remanufacturer, are often dismissed as the "cost of doing business" and even built into the budget as a normal, expected expense.

4. **Lights sometimes flicker.** Lower level, cumulative transient damage to lighting ballasts and controllers, as well as loose connections at the transformer, distribution or branch panels and the lighting circuits themselves, can show up as flickering of the lights. All of these contribute to increased energy consumption and equipment failure.

5. **Motors sometimes stall during normal operation.** If the demand from the motor is higher than the circuit can deliver, the motor can stall out. It will also cause the motor to run hot and damage the motor over time.

6. **Picture size on video equipment in conference room changes during executive presentations.** Intermittent shorts on the system or startup of large, oversized loads with high inrush current draws can "rob" the other equipment on the system of sufficient power to operate properly.

7. **Energy bills seem to be rising out of proportion to the rate changes made by the local utility.** Without proper preventive maintenance, the system will deteriorate with loose connections, unbalanced loads, inefficient operation of equipment and increased energy usage.

8. **Electrical equipment seems to have shorter useful life expectancy than previous equipment.** Newer, faster, more advanced equipment is, by design, more sensitive to electrical disturbances, voltage transients and harmonics. These types of "low level" disturbances go unnoticed, but cause cumulative damage over time that weakens the components, resulting in early failure.

9. **Lights dim when certain equipment is in operation or starts up.** Improper, or insufficient, sizing of transformers and/or distribution systems that have large loads starting can starve lighting and other circuits of sufficient power to operate properly.

10. **Fluorescent lights hard to start.** Damage to lighting controls or ballasts, as well as the electrodes in the ends of the light tubes, from cumulative level transients will impede their ability to start properly. This is a progressive problem, ultimately leading to failure.

11. **Surfaces of breakers and transformers are warm, or even hot, to the touch.** Unbalanced loads, improper loads, harmonics, deteriorated and damaged insulation are some of the

causes in overheated transformers or breakers. The heat not only indicates a problem and potential failure, it is waste energy that is an unnecessary increase in the energy bill.

12. **Computers or controllers lose memory during operation.** Transients, harmonics, loose connections and abnormal heat build-up in electronic enclosures can cause intermittent problems with the operation of electronic control circuits.

13. **Mechanical timing relays and watt-hour meters sometimes give incorrect readings.** Harmonics, and sometimes transients, can cause meters to read improperly. It can cause timing relays to trigger early and watt-hour meters to read excessive amounts of energy above the energy used for actual production.

14. **Blown fuses or tripped breakers when no short condition can be located.** Failure to properly account for high inrush currents during the start-up of loads, as well as harmonics and transients on the circuits, can result in blow fuses and tripped breakers with no short condition.

15. **Power Factor or Demand penalties on your utility bill higher than you think they should be.** Proper start-up procedures include staged starting of loads throughout the facility to ensure no large inrush currents from multiple loads at the same time. Staggered re-start settings on motor starters in the event of a power outage. Properly adjusted, or auto-regulated, capacitor banks to control power factor. These are some of the ways power factor and demand penalties can be controlled.

16. **Telephone system disconnects calls for no apparent reason.** Transient voltage activity on the power and control circuits of the telephone system can cause disruptions in service.

17. **Audible noise coming from transformers.** Harmonics and unbalanced loads can cause transformers to produce an audible noise.

18. **Supply room is stocking large inventories of circuit boards, contacters, lighting tubes, ballast units, electric motor parts or fuses.** This is a true indicator of some type of power quality problem. If it is not addressed, the problem will only increase in volume and costs.

19. **Personnel shocked by touching the case of any equipment.** Improper grounding within the system can result in shocks to personnel that can range from a nuisance to severe injuries and even fatalities. This is an emergency condition that needs to be corrected immediately!

20. **Earth grounding system not properly tested annually for safety and quality.** Once an earth ground is established at a facility, it immediately begins to deteriorate. Changes in soil conditions, water table levels, weather patterns and physical conditions can result in a significant decrease in the effectiveness of the earth ground for the facility. At least annual checks of the system should be performed to ensure that the earth ground is within National Electrical Code tolerances, and that the internal grounding system maintains proper continuity throughout the system.

IN CONCLUSION...

Not every system will have all of these problems. A proper power quality survey will work with the customer to determine the customer's concerns, what types of problems may be present, and determine what testing is required to complete the survey.

The survey should be completed in a timely manner, and the report should clearly state the problems found and recommendations for correction in a manner that is easily understood.