

## MONITOR THE ELECTRICAL HEALTH OF YOUR ENTERPRISE

- Power Quality Audits Identifies Power Quality issues. This will further help you address reliability and stability concerns before they actually impact on your facilities performance and more important on bottom line of organization.
- "FIND POWER QUALITY PROBLEMS BEFORE THEY FIND YOU \_!!!"

### How power quality affects you.

- Higher energy consumption and High Current Load.
- Penalties Incurred for exceeding Tariffs.
- Production Quality & Quantity losses.
- Financial Losses due to stoppage.
- Increase in Reactive power consumption.
- Reduced life cycle of Equipment.
- Additional investment for Over sizing of equipment.
- Energy wastage.
- Increased Maintenance and Service cost.
- Over Voltage/Under voltage/Sag/Swell/electrical Noise/Surges/spikes.

### Why Power quality analysis is needed.

- To Improve Power Factor & system efficiency.
- To Avoid Break-downs & production Interruptions
- To Avoid excess Energy consumption.
- To remove Harmonics, Surges & Transients from electrical Network.
- To Avoid Voltage/frequency fluctuations & PLC Hang-up.
- To Avoid Transformer overheat, Capacitor burst, Trip Etc.
- Savings in Energy Bills due to reduced Losses & KVA demands.
- Accurate Measurements by Installed Meter.
- Better Production Rate and Quality due to reduced interruption.
- Enhanced Life cycle of Electrical network & component.
- Maximize Plant distribution Capacity.

## Reference standards for PQ study

PARAMETERS	REFERENCE LIMITS	REFERENCE STANDARD
<b>Power Frequency</b>	Mean value of fundamental measured over 10 s: +/- 2% for 99.5% of week;	EN 50160
<b>Voltage magnitude variations</b>	+/- 10% for 95% of week, mean 10min RMS values (LL / LN);	EN 50160
<b>Rapid voltage changes</b>	3% normal, 4% maximum, $P_{st} < 1$ , $P_{rt} < 0.65$	EN 61000-2-12
<b>Voltage Swells / dips</b>	LV: 10-50%; Locally limited swells / dips caused by load switching: swell/dip up to 30% of V-RMS and duration up to 10ms;	EN 50160 EN 61000-6-1-2
<b>Short interruption of supply voltage</b>	95% reduction for 5seconds;	EN 61000-6-1 & 6-2
<b>\Long interruption of supply voltage</b>	LV-MV: (up to 3 minutes) <10-50/year, EN 50160.	EN 50160
<b>Transient over-voltage</b>	+/- 2KV (Line to Earth), +/- 1KV (Line to Line), 1.2KV/50KA(8/20us) Tr/TH us;	EN 61000-6-1 & 6-2
<b>Supply voltage unbalance</b>	Positive, negative and zero sequence; 2% between Line to Line;	EN 61000-2-12
<b>Load unbalance</b>	Positive, negative and Zero sequence, leakage currents <500Ma	EN 50160
<b>Harmonics voltage</b>	V-THD<5%, Individual V-h <3%;	IEEE 519
<b>Harmonics current</b>	I-THD %: as defined by ratio of I(short circuit)/I(full load);	IEEE 519

## Power quality Audit Check List.

- Facility Walk through
- Load Study
- Inter Harmonics
- Harmonics (Vthd & Ithd)
- Earth-Pit resistance Test (at mains transformer)
- Reactive Power Analysis
- Power Parameters
- Line Disturbances(Transient, Sags, Swells at main Transformer)

- Captive Power Assessment
- Load Distribution
- Thermography
- Problem Investigation
- PQA Report
- Inferences & Recommendation

#### Solutions provided.

- Tuned/Detuned ,Active/Passive Harmonic Filter
- Power Factor Correcting Capacitor (APFC- Detuned and non Detuned)
- TVSS ( Transient voltage surge Suppressor )
- Power quality Monitoring Meter
- UPS/Inverters
- Peak Demand Management
- Power Factor Controller

#### Scope of work for Power quality Audit (“Harmonics”)

The following components will be included in the Electrical Harmonic Analysis and Survey:

##### **Power Network System Measurements and Data Collection**

Power network system measurements and data collection are typically taken at various essential locations throughout the facility to enable the accurate modelling of harmonic sources. This is required since the theoretical addition of harmonics from a number of sources will not be directly additive and could be considerably less. In addition to harmonic measurements, voltage and load measurements are also taken.

- System Voltage RMS
- System Current RMS
- Active & Reactive Power
- Power Factor (Instantaneous).

**The job shall also further include the following**

- Data collection from site.
- Harmonic measurements along with specific harmonic filtering at normal operating conditions.
- Voltage Improvement & stability study.
- Three phase balancing study.
- Surge & Transient Protection, study.
- KVA Capacity Release
- Broadband Harmonic reduction requirement if any.

### **Harmonic Analysis**

A harmonic analysis involves the use of computer programs to identify and predict potential harmonic problems and mitigation techniques. The study will also look at different operating points as well as system. Changes that might occur in the future.

### **Surges & Transient Analysis**

The study will be conducted to record the transient s & surges of 1KV – 6KV magnitude.

### **Voltage Dips Swells Analysis**

The study will be conducted to record the short term dips & swells along with magnitude & duration.

### **Reactive Power Analysis**

The study will be conducted to calculate the desired reactive power at distribution & load end. This will give precise reactive power & maintain unity power factor at PCC & reduce losses & resonance in network.

### **Captive Power Analysis**

The study will be conducted to calculate the desired captive power. Synchronise the captive power to cater to peak demands & reduce utility surcharge & fuel consumption.

### **Load Flow Analysis**

The study will be conducted to calculate the desired captive power. Synchronise the captive power to cater to peak demands & reduce utility surcharge& fuel consumption. A load flow analysis is conducted to predict power flow magnitudes, power factor, voltage levels, and losses in branches of the system based on the specified operating conditions. The job for the Electrical system Power Quality study and analysis shall be carried out as indicated below:-

Online measurement of the parameters mentioned above at the Plants Input Mains & subsequent important feeders by power quality analyzers KRYCARD ALM 30/35 to identify the quantum of the disturbances along with the thres hold parameters