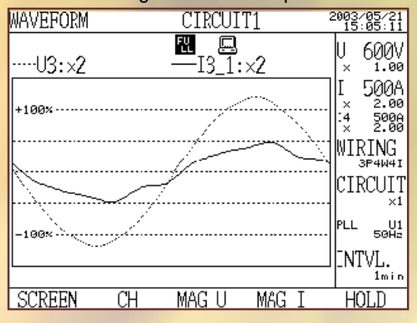
Power quality - Typical case study in an industrial environment
Before & After LECS APFC installation.

CA3 Series

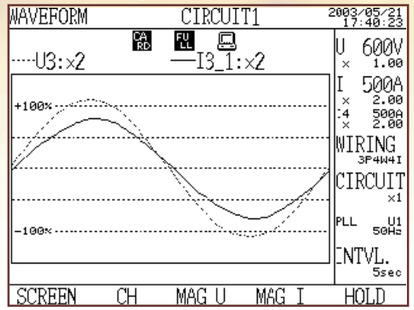
CA3-K Series

Voltage & Current outputs



Before APFC panel

Voltage & Current outputs



After installation of LECS APFC panel

LECS SERVICES

The system naturally needs to be designed to perfectly match the user plant character, to derive the best results and economics. To this end we have a team of engineers and instrumentation to survey & study the customer plants and submit best solutions.

You may please call us for this service to resolve your reactive power and harmonics problems.

Power Quality Study (using Power Analyzer & Data Acquisition System)

At Load Centre

At Power Control Center

At APFC Panel (Outdoor)

Designed by DESIGNCORE INDIA PVT. LTD.

Manufactured by
LAKSHMI ELECTRICAL CONTROL SYSTEMS LIMITED
Arasur - 641 407. Coimbatore Dist. India.

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Website : www.lecsindia.com

APFC/PA/E/a/0110

LECS®

APFC System

'Harmony without Harmonics'

An Optimized and fully Automatic solution for power factor maintenance and Harmonics control in LV industrial distribution system...

Corrupted Power
Corrected

EXCLUSIVE FEATURES

- Most reliable and hassle free contactor switching technology.
- Advanced micro controller based power factor controller with self-Diagnostic sensing and control of capacitor bank stages.
- Fastest PF correction time equaling the solid state switching performance.
- Detuned Harmonic reactors to prevent network resonance and absorb the line harmonics.
- Separate discharge resistor banks virtually makes 'Re-Switch in' instantaneous.
- World renowned “Sprecher+Schuh” heavy duty or capacitor duty contactors manufactured by Lakshmi Electrical Control Systems Limited, for fit & forget performance in APFC application.
- Leading brands of MCCB's, MCB’s and capacitors for reliable and trouble free operation.
- Well designed powder coated panel box with vermin proof and cooling fans for dissipation of heat.

ADVANTAGES

- Effective utilization of Maximum demand.
- Minimizing the line losses & Harmonics.
- Prevents voltage drop and transient in the system.
- Enhancing the life cycle of equipment's in the distribution network.

We specialize in Reactive power management,
Harmonics studies and Power quality studies.

An Optimized and fully Automatic solution for power factor maintenance and Harmonics control in LV industrial distribution system...

Electric power would remain to be a serious cause of concern for the industry both on cost and adequacy. So its efficient use means substantial savings. Electricity boards are naturally getting stringent on the power quality and forcing the consumers to maintain a stable power system.

Power quality?

In the present Low voltage (LV) industrial distribution system the power factor maintenance and harmonics control are the most critical issues to ensure acceptable power quality, and hence demands at most concern at consumers end to maintain a stable power system.

Power factor

Most of the industrial loads e.g. motor and transformers are inductive in nature and the power factor will be in the lagging side. Adequate reactive compensation is required at the consumer end to improve the power factor and effectively utilize the allotted Maximum demand. In a highly volatile load environment the reactive requirement of the loads is of variable nature and needs a dynamic & reliable reactive power compensation system to maintain the power factor and to control the Real power (KVA).

To maintain the power factor generally fixed capacitors are installed in industries at various load centers balanced to the connected load level. In the fixed compensation system the amount of capacitors (kVAr) connected in the system will be always constant irrespective of the load variations. In such conditions the power factor maintenance is highly difficult in the ambience of variable load pattern and the over all plant power factor will tent to be lagging or leading.

The leading power factor (I.e. excessive capacitors than the requirement) in the system will result in an excessive rise in the transient voltage during switching of loads and leads to insulation failures in the equipment and generates harmonic oscillations.

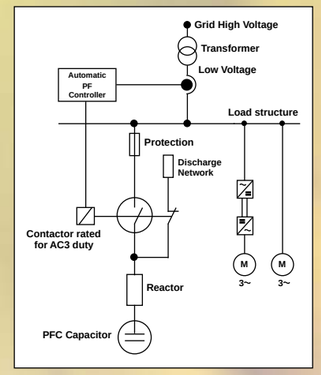
Harmonics

In recent years, with increased usage of AC/DC Drives, UPS, Computers, Arc Furnaces & Welders etc, Power harmonics (both Voltage & Current) have become a serious problem in industries and commercial installation. The harmonics generated by these Non-Linear loads are the biggest obstruction in maintaining the power quality and has been a major reason for equipment failure & many other problems like

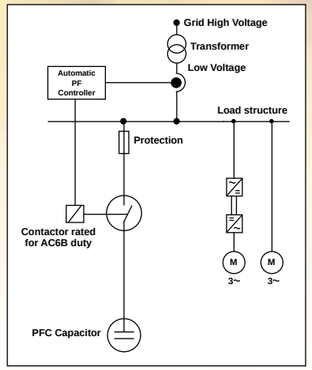
- Losses in distribution lines
- Malfunctioning of electronic equipment
- Unwanted tripping of circuit breakers and fuses
- Measurement errors in the metering systems and loss of data in computer & other electronic devices
- Overloading of transformers & Capacitors, etc.

LECS Solution

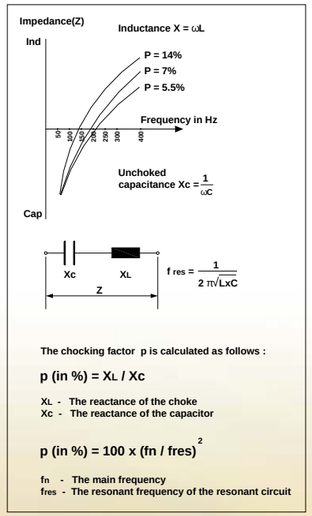
Noticing the anxiety of the industry for a dependable solution, we deeply explored the technology and conducted field studies on the current practices to configure a system matching our Indian Duty and environmental conditions. The configuration in the design of our APFC systems with perfectly calculated on line balancing devices for regulation and control is well acclaimed.



CA3 SERIES Fig.1



CA3-K SERIES Fig.2



Impedance curve of series resonant circuit Fig.3

Contactor

We offer two versions of contactor switching techniques in our APFC's with a choice to match duty conditions and economics.

- CA3 series(Fig.1) of APFC panels with capacity rated for AC3 duty
- CA3-K series(Fig.2) with AC6b capacitor duty.

In both the versions it is ensured that the contactors have ample thermal capacity and our techniques provide high impedance to the inrush switching current of the capacitor and limits it to below 20 times at rated voltage as against 100 times in normal switching . This increases the life of the capacitor and contactors.

Harmonic filter reactors

Resonance is the most series consequence when connecting a power capacitor in the LV distribution system. The capacitance of the capacitor forms a resonant circuit in conjunction with the feeding transformers and cables. The self-resonant frequency of this circuit lies typically between 250 and 600Hz i.e. in the region of the 5th and 11th harmonics and leads to the following effects

- Overloading of capacitors, transformers and transmission equipment's
- Harmonics amplification
- Interference with metering, control system, computers and electrical gear.

To overcome the resonance effect detuned filter reactor is connected in series with the capacitor and its self-resonant frequency is tuned below the lowest line harmonics by varying the choking factor of the reactor.

The diagram (Fig.3) shows that a series resonant circuit becomes inductive above its resonant frequency, which means that it is no longer possible to excite any resonance. Below its resonant frequency the resonant circuit is capacitive and can be used to compensate the reactive power.

PF controller

The PF controller is an advanced micro controller based on 4-quadrant measurement type with constant supervision of inductive/capacitive loads. Over and above, it is capable of self-diagnosing the capacitor bank stages automatically and switch in the optimum to the reactive variations. No pre-selected switching program is required.

Discharging network

Capacitors must be discharged to maximally 10% of nominal voltage before cutting them in again. Normally the discharge time for capacitors will be around 60 seconds and it is not recommended to switch-in before this period, to ensure the life span of both contactors and capacitors. In our system the discharge time is drastically brought down to just 1 second with an additional circuitry for faster charge balancing and get the bank ready for next switch-in with in a second. The re-switch-in time of a stage is possible down to 3 seconds, a unique feature equivalent to the thyristor controlled design for faster and efficient corrections over the reactive variations.