MATRIX AUTOMATIC POWER FACTOR CORRECTION RELAY PANEL

QUALITY MAKES THE DIFFERENCE

RAWMATERIALS USED

- APFCR RELAY - MICRO PROCESSOR BASED (IMPORTED)
- CAPACITOR MPF CYLINDERICAL TYPE - SIEMENS MAKE
- INCOMMER - MCB / MCCB - L & T MAKE
- CONTACTORS - L & T / TC MAKE
- STEP INDICATORS
- INDICATING LAMPS

INTRODUCTION

BASICS OF POWER FACTOR : - Power factor is the ratio of true power (Active power KW) consumed by the load to the apparent power (KVA) drawn by the load. It is also defined as cosine of phase angle between voltage and current. Wherever there is inductive load the current lags behind the voltage depending on inductive load. Higher the inductive load more is phase angle between voltage and current, resulting in reduced power factor (Cos φ).

If the load is pure resistive then phase angle between voltage and current is zero and power factor is unity (Cos 0 = 1)0. Capacitor has a property of drawing leading current, which compensates the lagging current due to inductive load and results in increased power factor.

CAUSES OF LOW POWER FACTOR

- Most of the industries small as well as big, use induction motor as their main drives which operates at low power factor and contribute lagging power factor of the system.
- The industrial heating furnaces like arc furnaces, induction furnaces, resistance welding machines have very low power factor.
- Mercury arc lamps, neon tube lamps, fluorescent lamps operate at low power factor.
- Transformers at substations have lagging power factor as they draw magnetizing current which causes the current to lag behind the voltage.

EFFECTS OF LOW POWER FACTOR

Power transmitted at low power factor causes high current as per the following relation :

Power (KW) = V * I * Cos φ

Where,

V : voltage
I : current
Cos φ : power factor

This increased value of current due to low power factor has following detrimental effects:

- Due to high current, line losses will increase, which causes low voltage regulation and hence high capacity conductors, greater size of towers and costly voltage regulatory equipments are required.
- For low power factor, rating of transformer for the same load will be higher.
- Capital cost of switchgear, busbar, circuit breakers will be increased due to low power factor.
- The cables in the circuits feeding the inductive load will have to carry higher current and therefore their required dimensions will be more for the same load at low power factor.
- Though the alternator (generator) is fully loaded, at low power factor it will deliver low load causing low plant efficiency.

- For the HT consumers, for the same KW load, a higher maximum demand is required. This will increase monthly electricity bill, which is an added disadvantage.

PRODUCT DISCRIPTION

Matrix APFCR Panel improves the power factor **to reduce** system **losses** and to **avoid penalty** due to low power factor.

The voltage and the current information from the power lines is fed to the controller through the necessary sensors and the reactive power component is calculated on a real time basis. Whenever the Reactive power component (Rkva) of the power system indicates that the loads have a lagging power factor and the Rkva value is continuously beyond a present limit for two minutes (or any other predetermined time) the control unit gives a command to an appropriate Contactor or Solid State Relay to turn on so that a Power capacitor gets connected to the power system. This process is continued until the reactive power reduces below a certain limit or until all the capacitor banks available get connected to the power system. Similarly when the reactive power of the system remains below a present value or other Power Factor of the Loads goes to “Lead” continuously for two minutes (or any other predetermined time) the control unit gives out a command for the contactors or solid state relays to turn off so that the power factor of the system does not remain on the “Lead side”. This function takes place automatically taking into consideration the variations in the load currents and the power factors.

The control units continuously monitors the health of the capacitors by monitoring the currents drawn by them. Whenever any of the capacitors is diagonised to be faulty by the controller a corresponding indication is given on the front panel of the controller.

SALIENT FEATURES

- Adjustment to any step of capacitor value
- Micro controller based technology. Digital computation of various parameters
- Continuous monitoring the Line Voltage, Current, Active Reactive and Apparent Powers and Energies and the Capacitor current to achieve Target power factor.
- Protection of Capacitors against damage due to High Voltage, Low Voltage, Current imbalance etc.
- No-Volt release features to disconnect all capacitors in the event of power failure
- Dynamic control of Reactive Power and Power factor
- Reduction in cable losses
- Reduction of VA burden
- Increase in Efficiency of the Electrical Power system
- Data for analysis and preventive measure

ADVANTAGEOUS

- Fully Automatic, no Manual Interventions
- Avoid Penalty for low power factor
- Avoid excess demand charges
- Avail incentives by maintaining higher Power factor
- Optimise the capacity by reducing the maximum demand (KVA)
- Reduced line current losses and cable over heat
- Improvement in line voltage
- Reduces the overloading of the cables, transformers, and switchgears.
- Improved plant efficiency.
- Additional loads can be added to the system.
- Enhanced life for all electrical circuits & gadgets
- Reduced current consumption charges
- Avail 100% depreciation

TECHNICAL DATA

1.	Size of Capacitor	:	Up to 450 KVAR
2.	Number of Steps	:	4 / 5 / 6 / 8 / 12 / 16
3.	Nominal Operating Voltage	:	415V (+ 15 % / - 30 %)
4.	Maximum Load Current	:	1750 Amperes
5.	Nominal Frequency	:	50 Hz (+ 5 %)
6.	High Voltage Cut off	:	+ 10 % Nominal Voltage
7.	Low Voltage Cut off	:	- 20 % of Nominal Voltage

8. Capacitor Over load Cut off	:	+ 30 % of Nominal Capacitor current
9. Capacitor current imbalance	:	30 % between any two Capacitor currents
10. Energy Display	:	6 digit impulse counter OR 16 × 2 dot matrix LCD
11. Switching time between steps	:	120 sec (typical)
12. Switching OFF time in case of fault	:	3 sec (typical)