**REACTIVE POWER COMPENSATION**

**RESISTIVE LOAD**

RESISTIVE LOAD such as filament lamp in vector gram, load appears resistive when current and voltage are phase congruency.

**INDUCTIVE LOAD**

INDUCTIVE LOAD such as motors, compressor, relay and transformer.
1. Current of inductors lags voltage
   In vector gram, anticlockwise direction is set to be positive direction and U direction as the horizontal direction. Load appears inductive and resistive when I is within 0 to -90 degree.

KDS generates capacitive current to neutralize inductive content of the load, achieving the performance for current and voltage phase congruency.

**CAPACITIVE LOAD**

CAPACITIVE LOAD such as capacitor bank
2. Current of capacitors leads voltage
   In vector gram, anticlockwise direction is set to be positive and U direction as the horizontal direction. Load appears capacitive and resistive when I is within 0 to 90 degree.

KDS generates inductive current to neutralize capacitive content of the load, achieving the performance for current and voltage phase congruency.
POWER FACTOR

ACTIVE POWER, REACTIVE POWER, APPARENT POWER AND POWER FACTOR

Active power \( P \)

Apparent power \( S \)

Reactive power \( Q \)

\[ P^2 + Q^2 = S^2 \]

Power factor \( \cos \phi \)

\[ \cos \phi = \frac{P}{S} \]

BENEFIT FROM PFC

* Avoid penalty for low PF by Utility Company

* Reduce electric energy loss

* Release system capacity occupied by reactive power, increase usage effectiveness of system capacity.
**KDS WORKING PRINCIPLE**

External CT detects the load current. DSP as CPU has advanced logic control arithmetic, could fast track the instruction current, divides the load current into active power and reactive power by using the Instantaneous Reactive Power Algorithm, and calculates the reactive power change rate rapidly and accurately, then sends PWM signal to IGBT’s driver board to control IGBT on and off at average 20kHz frequency. Finally inductive or capacitive power compensation current is generated on inverter induction, at the same time CT also detects the output current and forms a negative feedback to DSP. Then DSP proceeds the next logical control to achieve more accurate and stable system.
Working principle of dynamic power factor compensation

CT detects the output current and forms a negative feedback to DSP. Then DSP proceeds the next logical control to achieve more accurate and stable system.

DSP function as brain
Analyze the reactive power content of the load current

DSP as CPU has advanced logic control arithmetic, could fast track the instruction current, divides the load current into active power and reactive power by using the Instantaneous Reactive power Algorithm, and calculates the reactive power changing rate.

IGBT function as heart
Generates inductive or capacitive reactive power compensation current on inverter induction

Realize accurate reactive power compensation
UNDERSTAND HOW KDS COMPENSATE REACTIVE POWER

1. DC BUS CAPACITOR
   DC bus capacitor, AC to DC rectifier storage

2. IGBT
   Controlled by DSP software algorithm, IGBT on-off timing selection and length could control inverter to generate an accurate reactive power compensation current.

3. INVERTER INDUCTION
   IGBT Compensating inductive reactive power or capacitive reactive power by controlling inverter induction to generate a capacitive current or inductive current to achieve bidirectional reactive power compensation.

4. LC FILTER CIRCUIT
   Both are for filtering. The combination of LC filter circuit and high frequency inductor are called LCL filter circuit

5. HIGH FREQUENCY INDUCTOR