WHAT YOU SHOULD DO IMMEDIATELY?

Check your monthly electricity bill to find out whether the utility imposes any surcharge on low power factor

If in doubt, consult the nearest Suruhanjaya Tenaga office or Tenaga Nasional Berhad or an electrical consultant

If necessary, seek the advice of an electrical consultant on how to improve the power factor of your installation.

Remember!

Higher power factor will not only save your money but will also help to improve the performance of our electricity supply system.

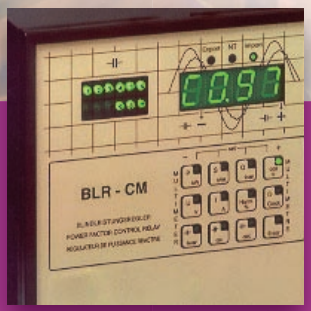
Prepared by:
Electricity Supply Regulatory Department
Energy Commission

Suruhanjaya Tenaga *(Energy Commission)*
No. 12, Jalan Tun Hussein, Precinct 2, 62100, Putrajaya.
Toll Free Number : 1-800-2222-78 (ST)
T: 03 8870 8500 F: 03 8888 8637
E: info@st.gov.my

Suruhanjaya Tenaga

FACTS ABOUT ELECTRICITY AND POWER FACTOR

WHAT YOU NEED TO KNOW



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Active and Reactive Electrical Loads

Electrical load generally means the power drawn by an installation or equipment connected to an electrical system. Electrical loads, in technical terms, are resistive or reactive in nature or a combination of both.

Equipment such as heaters, boilers and incandescent lamps are resistive loads whereas equipment such as motors, transformers, air-conditioners, refrigerators, fans, welders and fluorescent lights are partly resistive and partly reactive.

Resistive loads require active power {measured in Watt (W) or kilowatt (KW)} to operate whereas reactive loads require reactive power (measured in VAr or kVAr) to function. Active power is required to provide the energy to be consumed or used by an equipment whereas reactive power is required to create the electromagnetic field for the operation of certain equipment such as motors and transformers.

What is Power Factor?

Power factor is a measure of the active power required compared with reactive power. The higher the power factor, the lower is the reactive power.

An electrical installation or equipment operating at higher power factor requires less current compared with one with lower power factor.

Surcharge by the Utility on Low Power Factor

For the same active energy required, an electricity supply system with lower power factor requires a higher current to be generated and supplied through the transmission and distribution system. This will lead to an increase in equipment and cable costs and will result in higher energy loss in the power supply system.

In Malaysia, the electricity tariff is based on the active energy (measured in kWh) consumed and does not include any reactive "energy" (measured in kVArh) required. In order to recover the extra cost incurred in supplying the reactive "energy" required by the consumers, the utility imposes a surcharge on a consumer whose power factor averaged over a month is below the value of 0.85. However, the surcharge is imposed on medium to large commercial and industrial consumers only.

The surcharge is calculated basing on the following principle:

a) For power factor below 0.85 and up to 0.75 lagging, a supplementary charge of 1.5% of the bill for the month for each 0.01 part below 0.85 and up to 0.75 lagging power factor will be added to the bill for that month.

b) For power factor below 0.75 lagging, in addition to the charge payable under (a) above, supplementary charge of 3% of the bill for that month for each 0.01 part below 0.75 lagging power factor will be added to the bill for that month.

Advantages of Higher Power Factor to Consumers

A consumer with his installation or equipment operating at a higher power factor will have the following benefits:-

- avoid paying monthly surcharge imposed by the utility

- smaller cable, switchgear etc. can be used for supplying an equipment with higher power factor
- less current is required and hence less energy loss in the cable, transformer etc. supplying power to an equipment with higher power factor

What Can Be Done to Improve the Power Factor?

Power factor of an installation or equipment can be improved or corrected to a higher value by installing capacitors to the installation or equipment. The cost of installing such power factor correction capacitors can be recovered within just a few months for the saving of surcharge imposed by the utility.

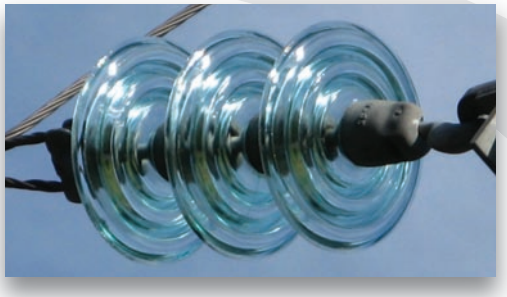
Sample Calculation on Benefit of Power Factor Improvement

(a) Statistics of the Consumer's Installation

Maximum Demand: 600 kW
Monthly active energy consumption: 216,000 kWh
Monthly reactive "energy" consumption: 161,600 kVArh
Power factor averaged over a month = 0.8
Electricity tariff: 39.7 sen/kWh (TNB Tariff B – For overall monthly consumption more than 200 kWh/month)

(b) Monthly Electricity Bill

Monthly energy charge
= RM 0.397 x 216,000 = RM 85,752.00



Monthly surcharge on power factor:

$$\text{RM } 85{,}752.00 \times \frac{0.85 - 0.8}{0.01} \times 1.5\%$$

= **RM 6,431.4**

Total electricity bill for the month
= RM 92,183.4

(c) Economic Benefit of Power Factor Improvement

In order to improve the power factor of the installation to 0.9, a capacitor bank of 160kVAr is required.

The cost of installation such a power factor correction capacitor bank with the associated control equipment at the main switchboard of the installation is in the region of RM 15,000.00, depending on the existing facilities in the installation.

$$\text{Hence payback period} = \frac{\text{RM } 15{,}000.00}{\text{RM } 6{,}431.4}$$

= 2.3 months

From the above example, it can be seen that it is very attractive to improve the power factor of your installation to above 0.85 to avoid paying surcharge to the utility.