SmartDG Analysis

A case study

Abstract

Power Factor and various cases affecting profitability of industry and how to tackle it

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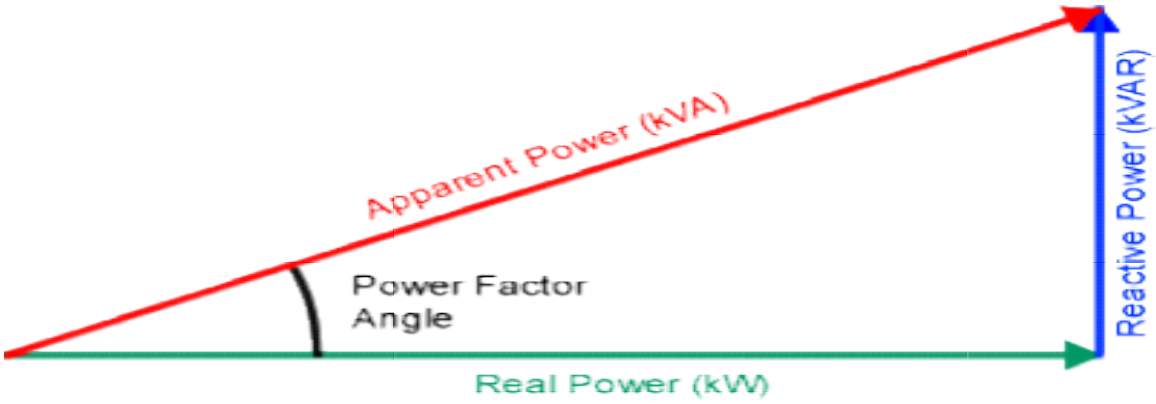
How much we can save by keeping the power factor unity:

Commonly power factor correction is calculated due to ambiguous knowledge about energy saving. Surely there are benefits for decreased power losses in 3 phase line and reduced voltage fluctuations but the main incentive here is avoiding penalties for low power factors from production area using the generated electricity.

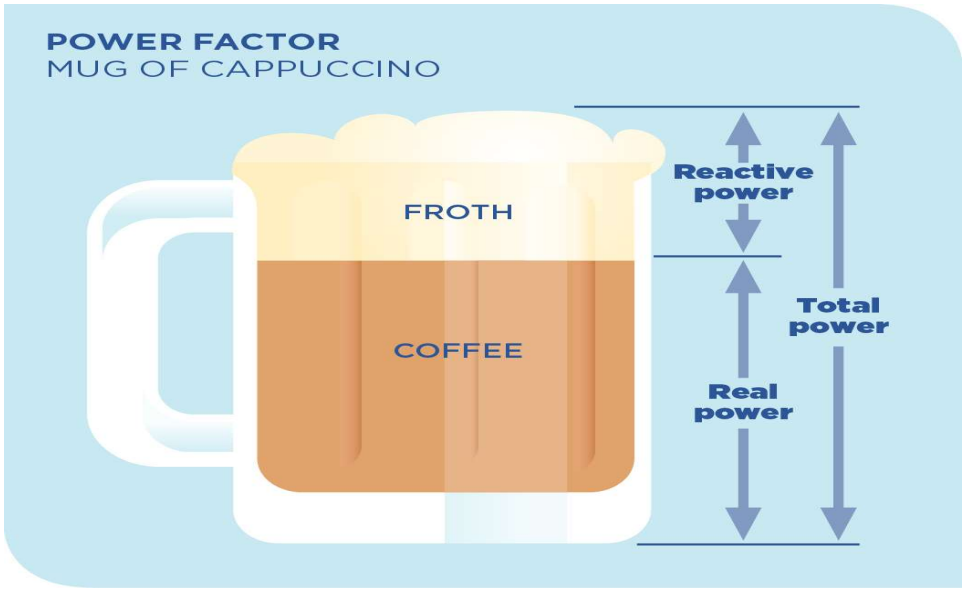
What is power factor:

Power factor is the ratio between real power and apparent power. In a circuit with no reactive power the ratio of real power to apparent power is equal to 1. When there is equal amount of real power and reactive power the PF is 0.707 i.e. 70.7% of apparent power is real power. PF enables you to know how much apparent power (KwA) is used for real power (kW).



$$\text{Power Factor} = \frac{\text{Real Power (kW)}}{\text{Apparent Power (kVA)}}$$

$$= \frac{\text{kW}}{\sqrt{\text{kW}^2 + \text{kVAR}^2}}$$



Case1:

An abc warehouse in Chennai has an average monthly electrical bill of 50,000 kWh and the power factor is 0.92. The bill is calculated based on energy charges 585paise per unit. Therefore total monthly bill of the organization is 50,000*Rs5.85=Rs 2, 92, 000 plus other spending.

But a closer look of Tamil Nadu tariff Electricity distribution shows that a user can get billed in two ways:

a. 526 paise per kVAh

b. 585 paise per kWh

If the organization opts for option a then the bill would have been

(50,000/0.92)*5.26= Rs2,85,870

Hence giving direct monthly saving of Rs6,630 i.e. early saving of Rs79,560. This is without any investment

If the PF is now improved to 0.99 then the yearly saving would have been over Rs3,20,000. Obviously this will require the cost of

implementation of SmartDG but it can be recovered in less than 2 years

Case 3:

For Paschim Gujrat Vij Company Limited (PGVCL), the charges and rebate are as follows:

. Energy charges: Rs4.45 per kWh

. PF rebate for each percent access of 95%=2.4%

. PF penalty for each percent drop below 90% up to 85%: 1%

. PF penalty for each percent drop below 85%: 2%

For a metal casting company having monthly consumption of 60,000 kWh the monthly energy charges would be Rs2,67,000 .The expected rebates and penalty based on PF can be:

. PF at 0.99=

2.5% of Rs2,67,000=Rs6,675 per month ie Rs80,000 annually

.PF between 0.9 to 0.95=

No rebate or penalty

. PF at 0.85=

Penalty: 5% of 2,67,000= Rs 13,350/month or Rs 1,60,200/yearly

Here ROI (Return of Investment) differs from case to case