

Power Factor

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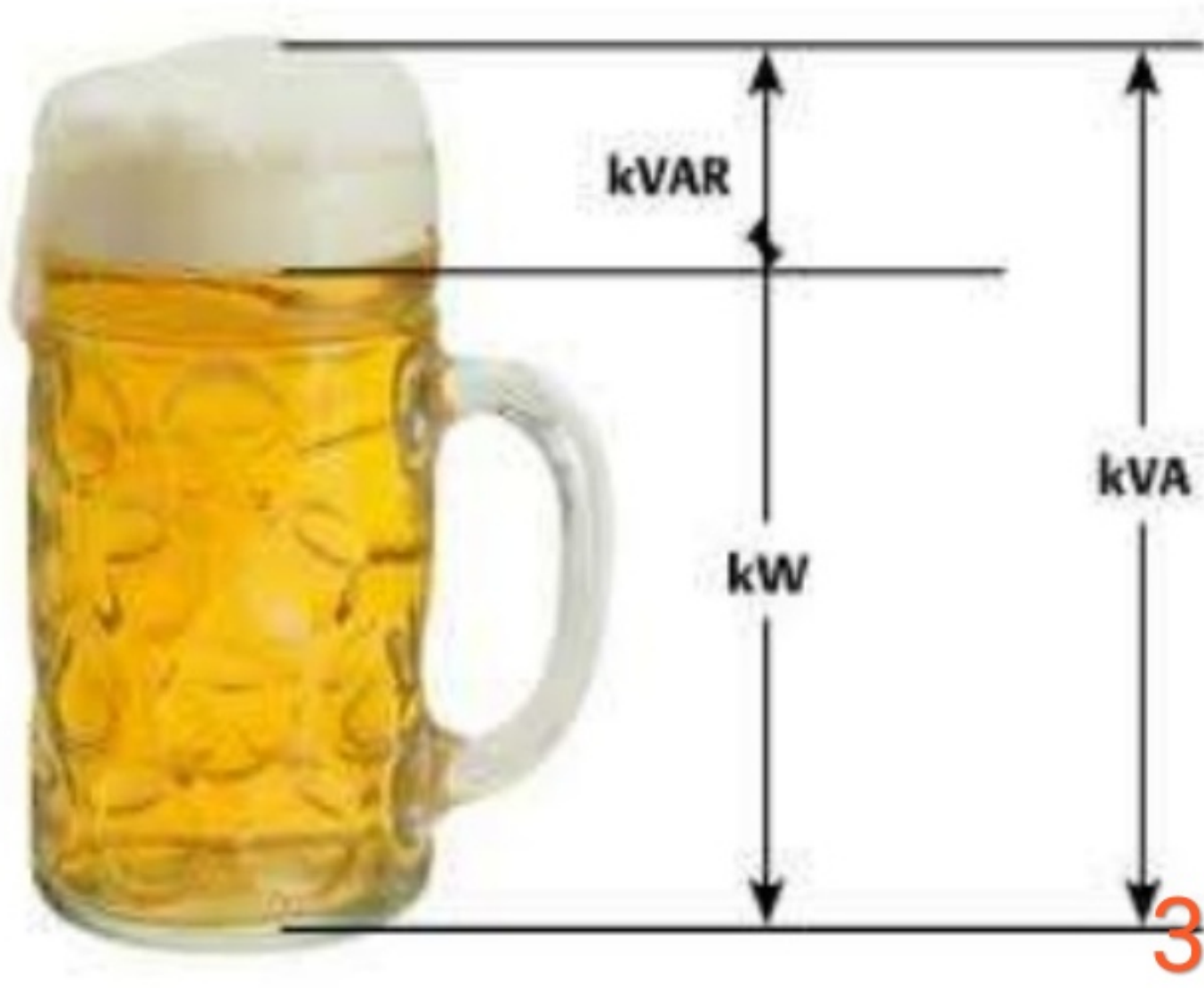
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Introduction

- The cosine of angle made between the voltage and current is called the power factor.
- In AC circuits, there is always the phase deference between the voltage and current, which is calculated in terms of power factor.
- If the load is inductive the current lags behind the voltage and the power factor is lagging.
- If the load is capacitive the current leads the voltage and the power factor is leading.
- The value of power factor can never be more than unity.
- It is usual practice to attach the word “lagging” or “leading” with the numerical value of the power factor to signify whether the current lags or leads the voltage.
- Thus if the circuit has a p.f of 0.5 and current lags the voltage, we generally write p.f. as 0.5 lagging or sometimes expressed as a percentage (50% lagging)

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Causes of Low Power Factor

- Ideally the power factor must be close to unity, where as low power factor is undesirable.
- Following are the causes of low power factor:
 1. Most of AC motors (i.e. induction motor) are used to work at low lagging power factor, which causes the low power factor.
 2. The load on power station is not constant but is varying; it is more at peak time (Day time) and reduces at night time. During low load period the supply voltage increases which increases the magnetizing current , this decreases the power factor.
 3. The arc lamps and industrial heating furnace operates on low power factor.

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Effect of Low Power Factor

➤ The low power factor causes the following effects:

1. Line losses (I^2R) will be more.
2. Lower the power factor higher will be the rating of electrical equipment, which makes the equipment more complex and larger in size.

$$KW = kVA \times \text{Cos}\phi$$

$$kVA = KW / \text{Cos}\phi$$

3. The useful load that can be transmitted is reduced.
4. There will be a poor voltage regulation
5. It reduces the handling capacity of the plant.

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