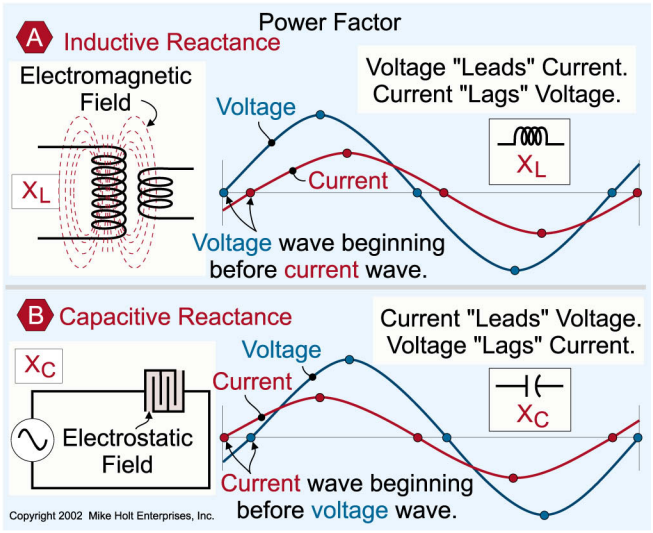

Figure 3-27
Power Factor

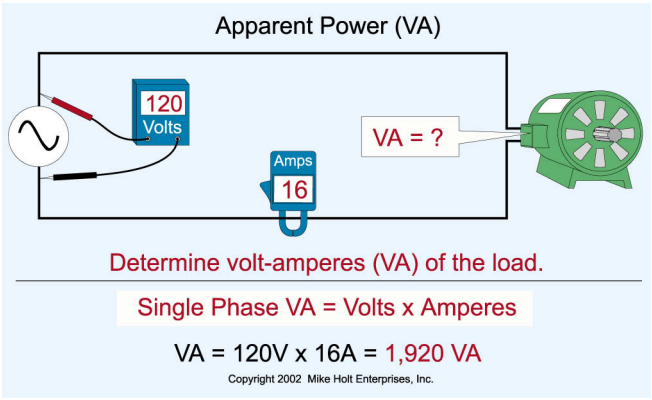

Figure 3-28
Apparent Power (VA)

3–16 POWER FACTOR

Power Factor is the ratio of active power (watts) to apparent power (VA) expressed as a percent that does not exceed 100%. Power Factor is a form of measurement of how far the voltage and current are out-of-phase with each other. In an ac circuit that supplies power to resistive loads such as incandescent lighting, heating elements, etc., the circuit voltage and current will be *in-phase*. The term "in-phase" means that the voltage and current reach their zero and peak values at the same time resulting in a power factor of 100 percent or *unity*. Unity can occur if the circuit only supplies resistive loads or capacitive reactance (X_C) is equal to inductive reactance(X_L).

The formulas for determining power factor are:

Power Factor = True Power (W)/Apparent Power (VA)

Power Factor = Watts/Volt-Ampere

Power Factor = Resistance (R)/Impedance (Z)

The formulas for current:

Amperes (1Ø) = Watts/(Volts Line-to-Line × Power Factor)

Amperes (3Ø) = Watts/(Volts Line-to-Line × 1.732 × Power Factor)

❑ Power Factor

What is the power factor of a fluorescent lighting luminaire that produces 160W of light and has a ballast rated for 200 VA? Figure 3–30.

(a) 80% (b) 90% (c) 100% (d) none of these

• Answer: (a) 80%

$$\text{Power Factor} = \frac{W}{VA} = \frac{160W}{200\ VA} = 0.80 \text{ or } 80\%$$

❑ Current

What is the current flow for three 5 kW, 230V, 1Ø, loads that have a power factor of 90%?

(a) 72A (b) 90A (c) 100A (d) none of these

• Answer: (a) 72A

I = Watts/(Volts × Power Factor) = 15,000W/(230V × 0.9) = 72A