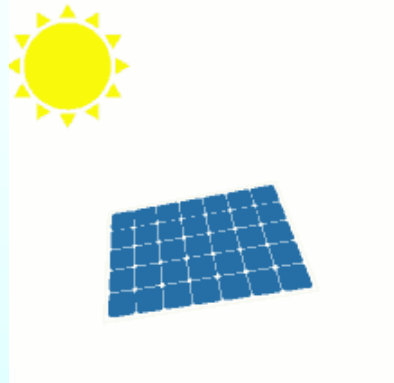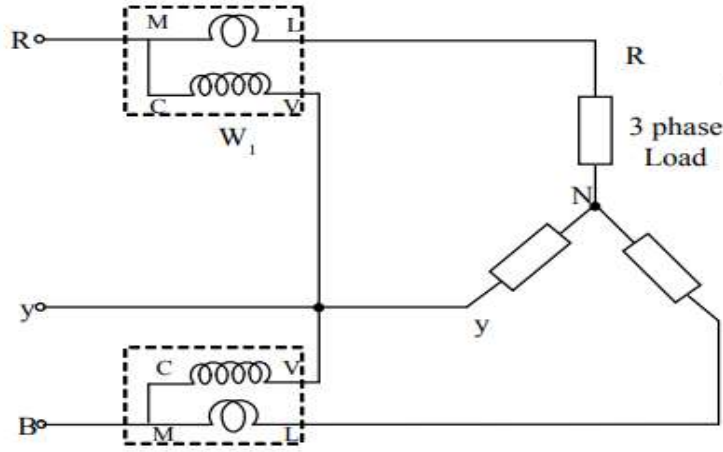# THREE PHASE POWER MEASUREMENT USING TWO WATTMETER METHOD
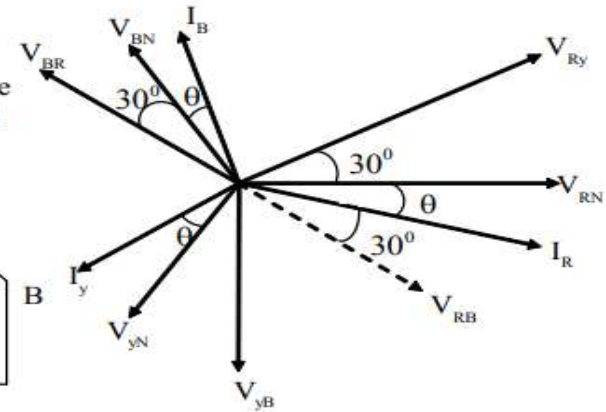

Rohini College of Engineering and Technology

2. Two Wattmeter Method

Fig. (a)   Fig. (b)

Fig. 4.39 Two Wattmeter Method

In this method, two wattmeters are connected as shown above for star connected load. This method is more convenient for measuring power in three phase circuits. This method is applicable whether the load is balanced or not. The two wattmeters current coils are connected in R and B lines. The voltage coils of the two wattmeters are across RY and BY. The phasor diagram for lagging power factor is shown in fig. 4.39 (b).

The wattmeters indicate the following values :

$$W_1 = V_{RY} \ I_R \ \cos(30 + \theta) = V_L I_L \ \cos(30 + \theta)$$

$$W_2 = V_{BY} \ I_B \ \cos(30 - \theta) = V_L I_L \ \cos(30 - \theta)$$

$$\therefore \ W_1 + W_2 = V_L \ I_L \left[\cos(30 + \theta) + \cos(30 - \theta)\right] = \sqrt{3} \ V_L \ I_L \ \cos\theta$$

Thus, total power is the sum of two wattmeter readings.

where, P is the total power. From the two wattmeter readings, the load power factor can be obtained. For leading power factor.

$$W_1 + W_2 = \sqrt{3} \ V_L \ I_L \cos\phi$$

$$W_1 - W_2 = V_L \ I_L \left[\cos\left(30-\phi\right) - \cos\left(30+\phi\right)\right]$$

$$= V_L \ I_L \sin\phi$$

$$\therefore \ \frac{W_1 - W_2}{W_1 + W_2} = \frac{\tan\phi}{\sqrt{3}} \Rightarrow \phi = \tan^{-1}\left[\frac{\sqrt{3}\left(W_1 - W_2\right)}{W_1 + W_2}\right] \qquad \text{------------(1)}$$

Power factor for balanced load

From equation (1)

Power factor is given by,

$$\cos\phi = \cos\left[\tan^{-1}\left(\frac{\sqrt{3}\left(W_1 - W_2\right)}{\left(W_1 + W_2\right)}\right)\right] \qquad \text{------------(2)}$$

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Thank You