EXPERIMENT-07

AIM OF THE EXPERIMENT:-

Distribution System Power factor improvement using Switched Capacitor.

APPARATUS REQUIRED:-

1) High voltage Transmission line Analyzer
2) Wattmeter : (0-600)V, (0-5-10)A - 2 Nos

LOAD SPECIFICATION:-

Resistive load: 3-Ph 415V, 1.5kW, 2A

Inductive load: 3-Ph 415V, 0.75kW, 1.9A, $\cos\phi = 0.75$

THEORY:-

Power factor is the Ratio of working power to apparent power. It measures how effectively electrical power is being used. A high Power factor signals efficient utilization of electrical power, while low 10W P.f. indicates poor utilization of Power.

$$P.f. = kW/kVA = \text{Cosine } \theta$$

θ = angle between Voltage Current phasor

It is achived by addition of Capacitor in Parallel with the connected motor or lighting circuits and can be applied at the equipment.

Care should be taken when applying power factor connecton star/delta, type control so that the capacitors are not subjected to rapid on-off on condition.

OBSERVATION:-

Sl No.	Load Data R+L in KW	Load Data 'c'	Sending end voltage (in V)	Receiving end voltage (in V)	Receiving end current (in A)	Wattmeter reading (W_1)	Watt meter reading (W_2)	P.f. (Calc)
1	1.35	0	410	191	0.53	5×8 =40W	29×2 = 58	0.808
2	1.35	6 μF	410	238	0.61	15×8 =120W	49×2 = 98	0.985

CALCULATION:-

Multiplying factor for W_1 = $\frac{600 \times 5 \times 0.2}{75} = 8$

Multiplying factor for W_2 = $\frac{600 \times 2.5 \times 0.2}{150} = 2$

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

$W_2 - W_1 = V_L I_L \sin\phi$

$\tan\phi = \frac{\sqrt{3}(W_2 - W_1)}{W_1 + W_2}$

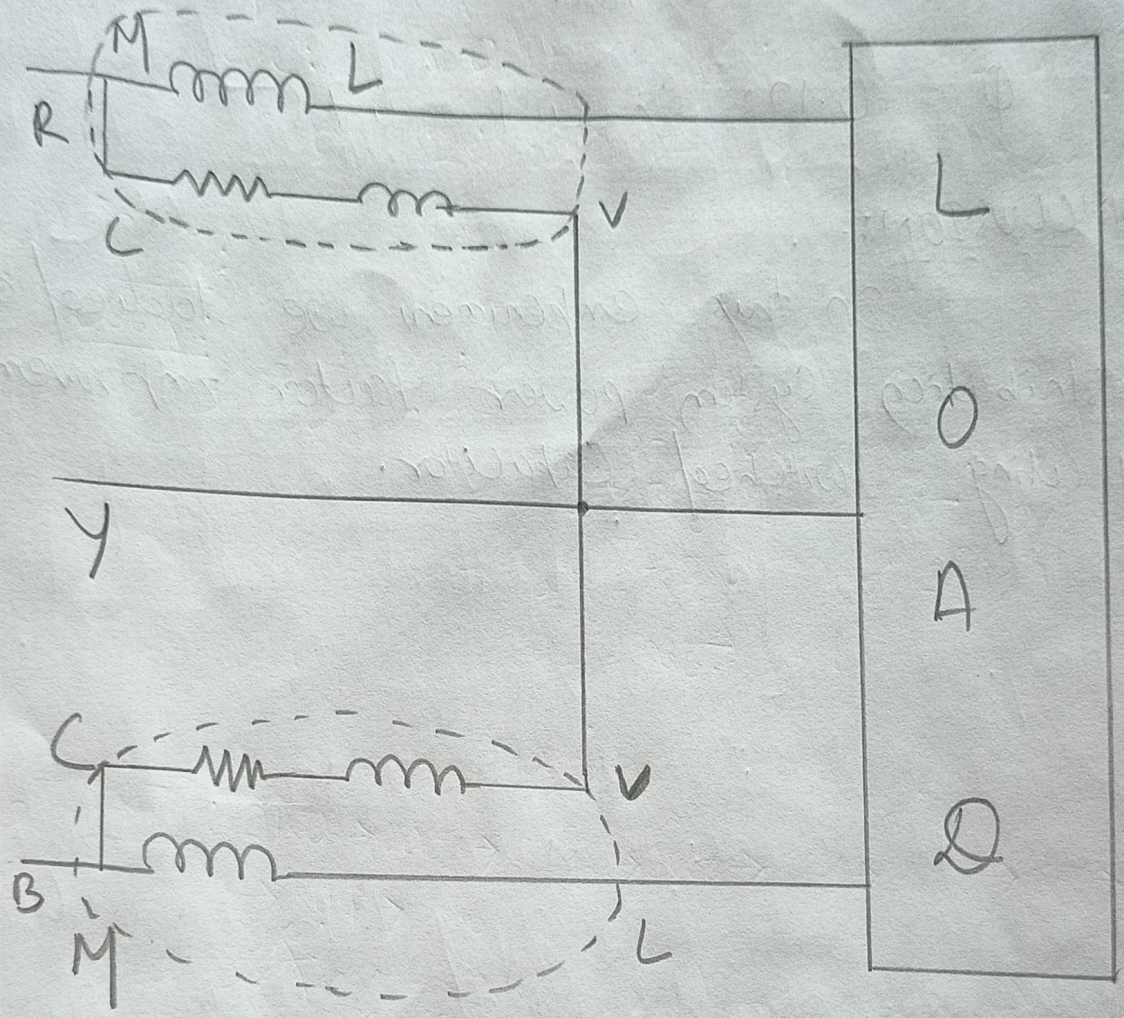
When load data 'c' = 0 μF

$\tan\phi = \frac{\sqrt{3}(98-40)}{98+40} = 0.728$

$\phi = \tan^{-1}(0.728) = 0.629$

$\Rightarrow \cos\phi = 0.808$

CIRCUIT DIAGRAM :-



Circuit for improvement of power factor

When load data C = 6 μF

$$\tan\phi = \frac{\sqrt{3}(98-120)}{120+98} = +0.1747$$

$$\phi = 0.173 \Rightarrow \cos\phi = 0.985$$

CONCLUSION:-

In this experiment, we studied about distribution system power factor improvement by using switched capacitor.

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