Load Test on Three Phase Induction Motor

By conducting the load test on three phase induction motor, the performance of the motor viz. slip, power factor, input, efficiency etc. at various loads can be studied.

The induction motor is located by any of the following methods :

1. Brake test
2. By connecting a d.c. generator

In case of loading by connecting a d.c. generator, the induction motor is connected to a d.c. generator. The generator is loaded by a lamp bank. Thus inturn an induction motor is loaded. The Fig. 1 shows the experimental set up for conducting load test on three phase induction motor using a d.c. generator.

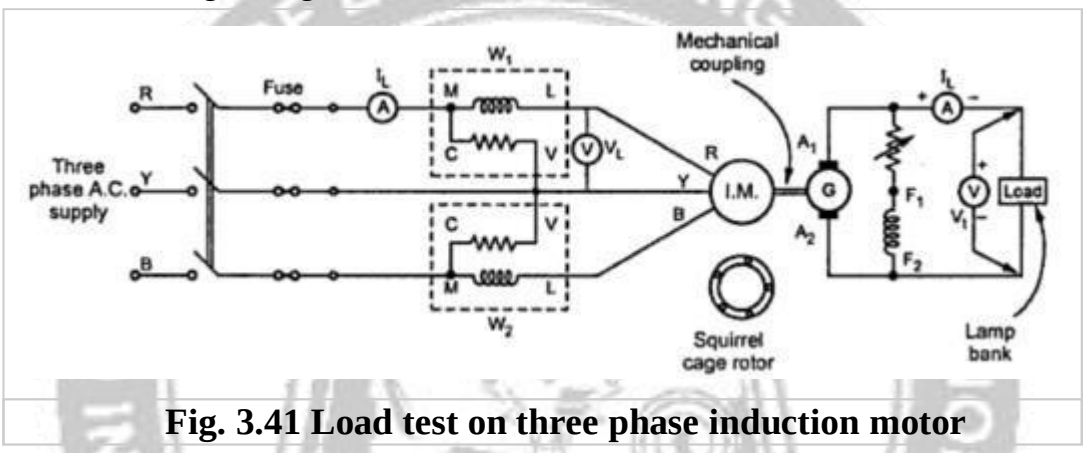

Fig. 3.41 Load test on three phase induction motor

On induction motor side, ammeter reads line current and voltmeter reads line voltage V_L. The two wattmeters are connected as per the two wattmeter method hence,

P_{in} = Power input = $W_1 + W_2$

On generator side, the ammeter reads load current and voltmeter reads terminal voltage V_t.

By varying the lamp bank, load on generator i.e. load on induction motor can be varied. The induction motor can be star or delta connected and can be squirrel cage or slip ring type. The speed readings are taken using tachometer. The load is increased till induction motor carries rated line current. The following observation table is prepared,

Induction Motor					Generator		
Sr No.	I_L A	V_L V	W_1 W	W_2 W	I_L A	V_t V	N r.p.m.
1							
2							
⋮							

Calculations : The output of induction motor is input to a d.c. generator.

Output of d.c. generator = $V_t \times I_L$ W

Assume $\eta_{gen} = 80\ \%$

$\therefore$ P_{out} of induction motor = P_{in} of d.c. generator

= P_{out} of d.c. generator / η_{gen} = $(V_t\ I_L)/\eta_{gen}$ W

P_{in} of induction motor = $W_1 + W_2$ W

$\cos \Phi = P_{in}/(\sqrt{3} V_L\ I_L) = (W_1 + W_2)/(\sqrt{3} V_L\ I_L)$ = power factor

$$\% \eta_{motor} = \frac{P_{out} \text{ of motor}}{P_{in} \text{ of motor}} \times 100$$

$$\% \text{ slip} = \frac{N_s - N}{N_s} \times 100$$

where $N_s = 120f / P$ for a given motor

For various loads above parameters are obtained. As the load on the induction motor increases,

1. The output of motor increases.
2. The power factor increases.
3. The efficiency increase upto certain load and then decreases.
4. The speed decreases marginally.
5. The slip increases.
6. The input current increases.

The various performance characteristics can be obtained as shown in the Fig. 3.42.

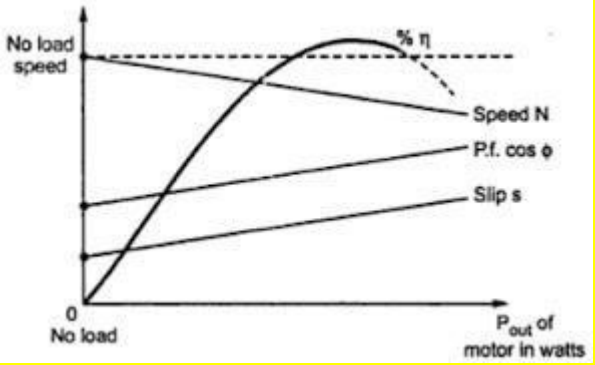

Fig. 3.42 Performance characteristics

The graphs indicate the behaviour of various performance parameters against output of the induction motor and not shown to the scale.