CHAPTER - V

RESULTS AND DISCUSSION

5.1 INTRODUCTION

The previous chapters (chapters - III and IV) describes the system design and software development . The data acquisition system now ready for measurement. The present chapter deals with the performance of the induction motor. The first half of the chapter describes how to calculate the induction motor parameters at a specific slip values. When complete performance curves for the motor are required over an extended range of slip value, the same program is modified to calculate the motor parameters for any desired range of slip values. From these results the various performance curves can be plotted for graphical representation. Further these theoretical results wiil be compared with the practical results of the motor under no load and full load conditions.

5.2 THEORETICAL PERFORMANCE OF THE INDUCTION MOTOR

To study behaviour of the motor the performance of the motor must be evaluated theoretically and further compared with the practical results obtained by data acquisition system. The program used to perform the calculation is described in the previous chapter. This program obtains the performance of the motor for different slip values and are tabulated in table 5.1. These results are also represented graphically. Figure 5.1 shows the graph of current versus speed. From the figure it is seen that as slip increases the stator current also increases. This may be because of increase in load on the motor.

The variation of efficiency of the motor with speed is shown in Fig.5.2. Figure shows that efficiency goes on increasing with increase in load and becomes maximum at

Table 5.1

Slip s	Current i	Power Factor pf	Speed nr	Torque trq	Horse Power hp	Efficiency eff
0.008	1.51	0.28	1428	0.56	0.11	64.3
0.016	1.70	0.48	1417	1.11	0.22	74.2
0.024	1.95	0.61	1405	1.61	0.32	76.0
0.032	2.23	0.69	1394	2.04	0.40	75.6
0.040	2.52	0.74	1382	2.42	0.47	74.2
0.048	2.81	0.78	1371	2.76	0.53	72.4
0.056	3.09	0.80	1359	3.05	0.58	70.4
0.064	3.37	0.81	1348	3.31	0.63	68.4

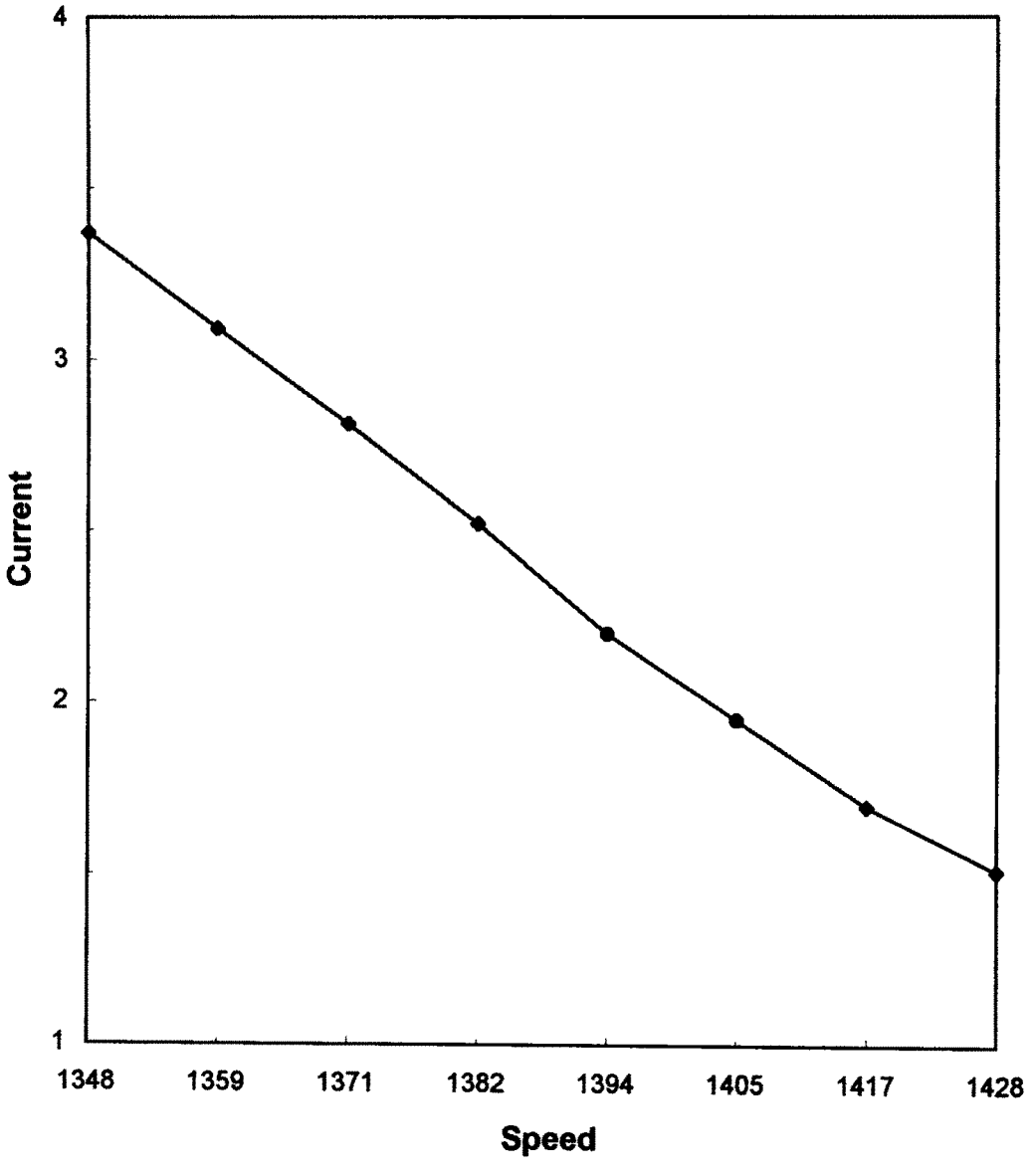

Fig. 5.1 Current-speed characteristics

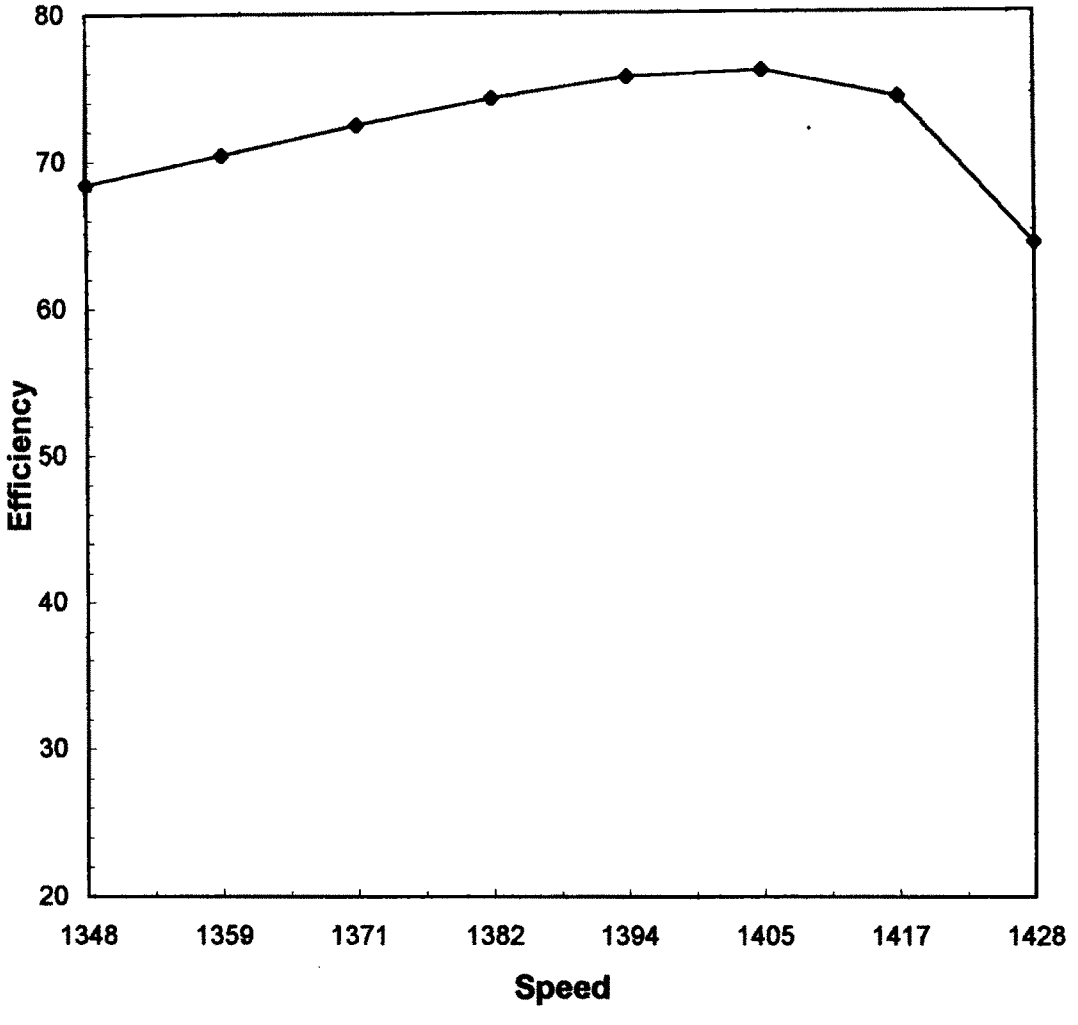

Fig. 5.2 Efficiency-speed characteristics

nearly 75% of rated load and for further increase in load efficiency goes on decreasing. This can be understood from the iron and copper loss statistics. The iron or core loss is practically constant for all loading conditions, including no load , however copper loss varies as the square of power output. Initially copper loss goes on increasing and becomes equal to core loss. The point at which iron loss and copper loss are equal the efficiency of the motor is high. For further increase in load the copper loss increases and efficiency goes on decreasing.

Fig. 5.3 and 5.4 shows variation of power factor and torque with speed of the motor. From the graph it is seen that power factor and torque goes on decreasing with increasing load on the motor. The torque developed in the single- phase induction motor is more sensitive to changes in excitation since it is produced by two oppositely rotating magnetic fields, that is if excitation voltage is below rated voltage the speed reduction takes place. The torque, changing as the square of this applied voltage and reduces to 50% of the rated value if the applied voltage is reduced to 70% of rated value. Power output of the induction motor is plotted as a function of speed and is shown in Fig. 5.5. From the figure it is seen that output power of the motor decreases as speed increases.

5.3 COMPARISON OF THE RESULTS

In the present work it is not possible us to vary the load continuously because of non availability of motor generator coupling, so the performance of the motor is measured under no load and full load condition. In this procedure of testing under no load and full load (while water pumping) the parameters are measured and calculations are made by using the computation module discussed in Chapter IV. The measured values from the

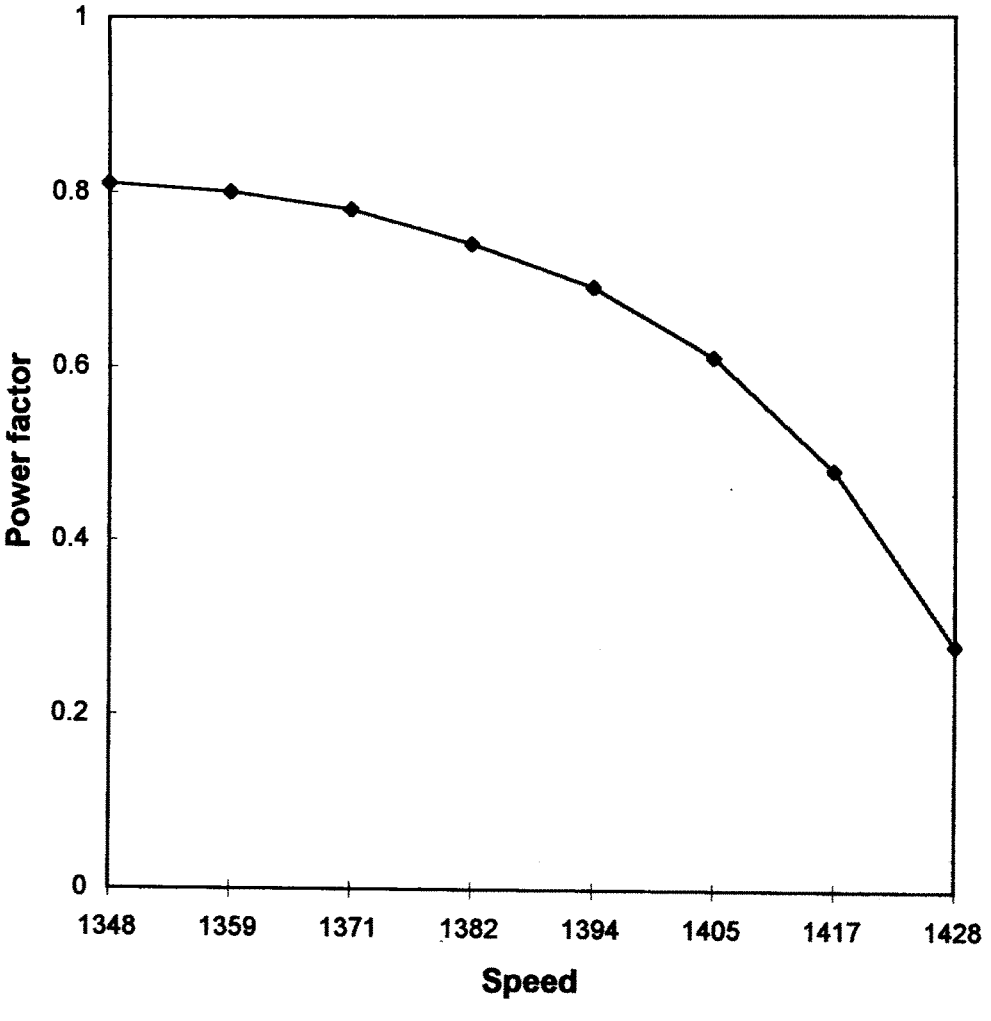

Fig. 5.3 Power factor - speed characteristics

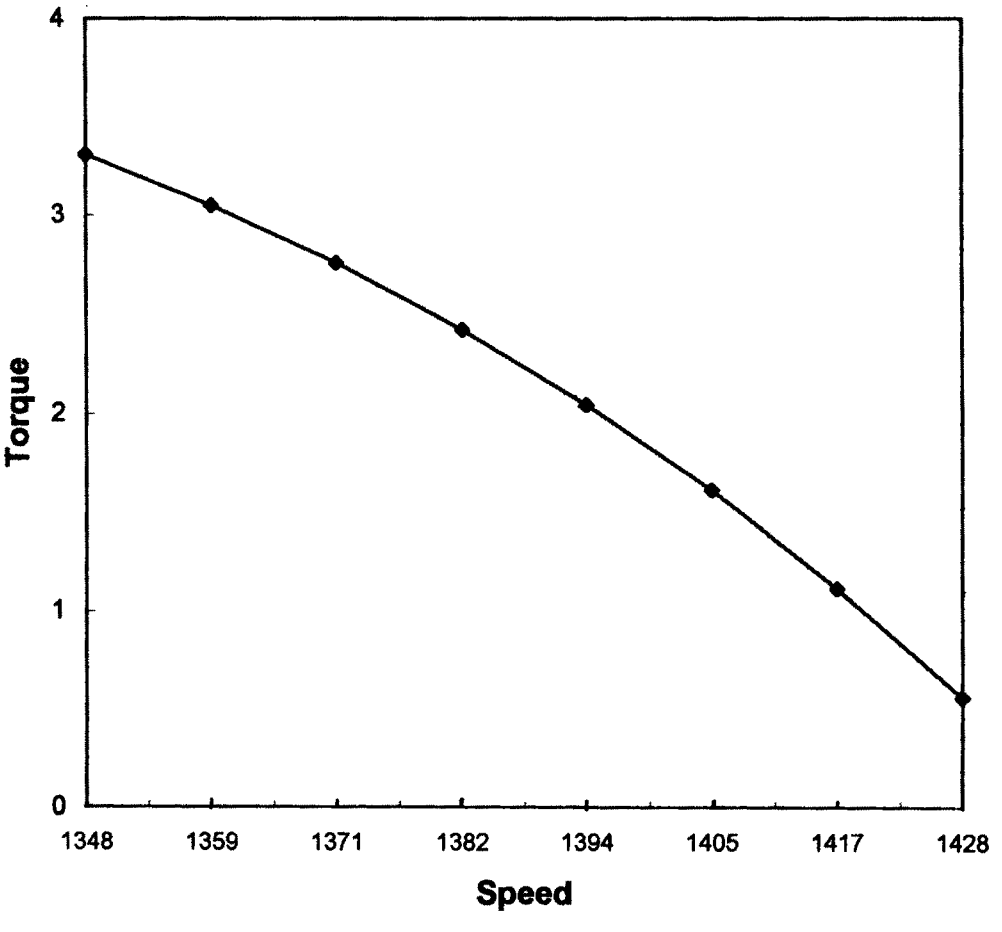

Fig. 5.4 Torque - speed characteristics

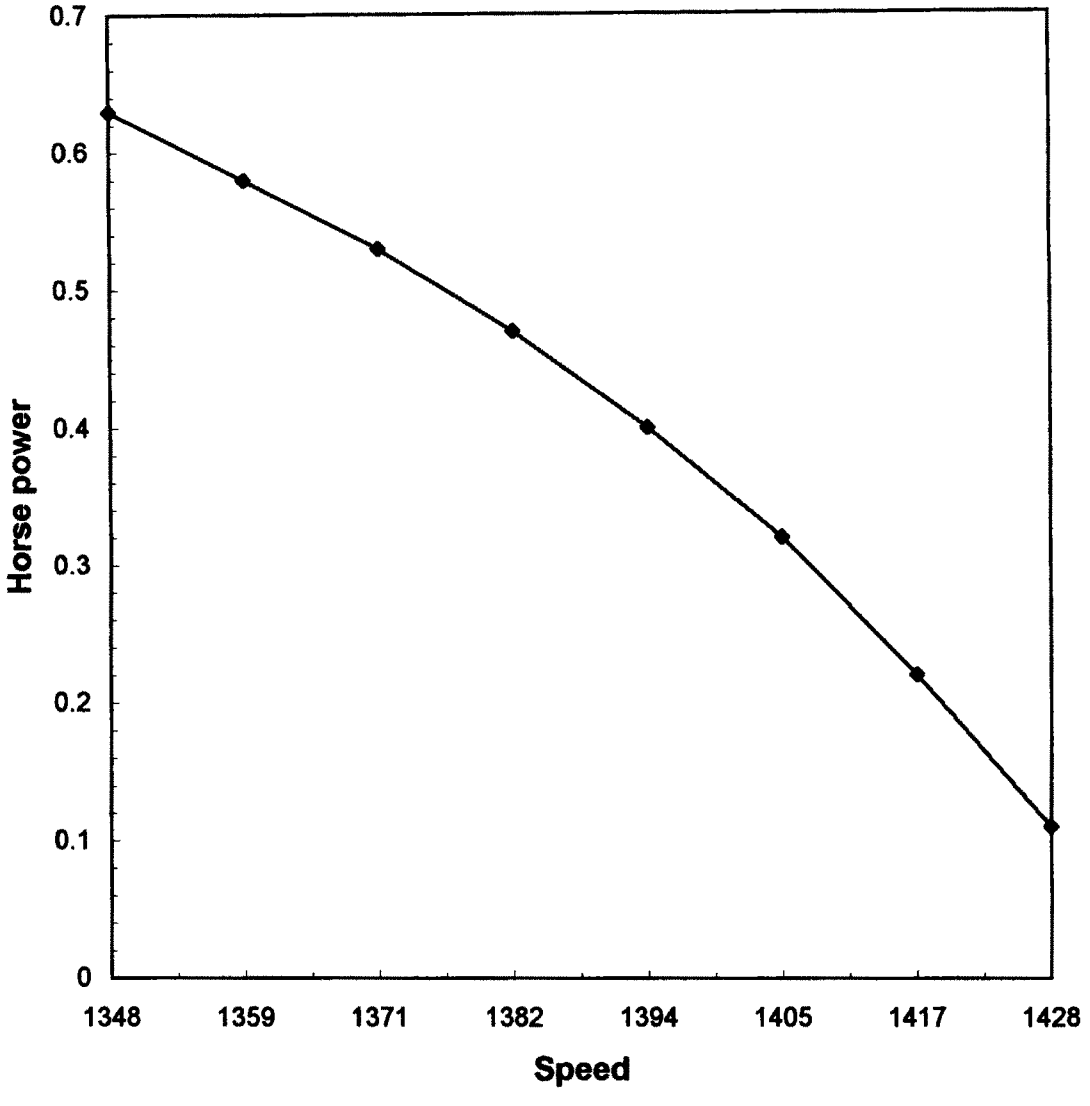

Fig. 5.5 Horse power - speed characteristics

data acquisition system are lower than the calculated values. This may be attributed to losses in machines.