CHAPTER - VI

SUMMARY AND CONCLUSIONS

During last few years personal computers are widely used in instrumentation and control applications because of upgradation of the computer, lowering down the prices. Now a days computer based data acquisition systems are very popular in many fields. For the measurement and control of physical quantities such as temperature, speed, displacement etc. transducers are used to convert physical quantities to electrical voltage. The electrical voltage is proportional to the physical quantity. The electrical voltage which is obtained as the output of the transducer is an analog quantity. It must be converted to the digital quantity by an Analog to Digital converter before it is given to a computer.

The electrical quantities like voltage, current etc. are analog quantities. They have to be converted to digital quantities before giving to the computer. Computer is a fast device, it can measure, process and control many signals one by one within the short time. To handle the multiple signals multiplexer must be used. When A.C signals are applied to A/D converter a sample and hold circuit must be used to sample an instantaneous value and hold it constant during analog to digital conversion.

An A/D converter, multiplexer, sample and hold circuit etc forms a data acquisition system. In computer based data acquisition system these component operates under the control of a computer. The off time manual parameter measurement of the induction motors requires many meters and has to record number of readings. The on line parameter measurement again becomes more complicated. To avoid this complications and loss of time in calculation, the computer based data acquisition system is suggested to measure on line performance parameters of induction motor.

Different phases of the work are divided into five chapters. Chapter I starts with the historical background of the induction motor. The survey of the literature regarding control of induction motor and its parameter measurement is also discussed. This chapter also describes the purpose of dissertation.

Chapter II introduces the subject of electrical machines. The theoretical background of the induction motor is given in detail. The construction of the induction motor is employed in which it is mainly consists of stator and rotor. Rotors have different types such as squirrel-cage and phase-wound. Mathematical equations for slip, rotor speed, torque and power losses are discussed. Combining stator and rotor, equivalent circuit of induction motor referred to the stator side is explained.

Chapter III describes how attempts have made to develop a computer based system for measuring various parameters like speed, current and voltage of a squirrel-cage induction motor operating under no load and full load conditions. The block diagram of the system is discussed which optimizes the characteristics of the system in terms of performance capability. The important factors that decides the configuration and the subsystem of the data acquisition systems are described.

The hardware of the system is divided into two parts as interfacing card and signal conditioning card. The interfacing card consisting of IBM PC/ XT/AT compatible ADC with 8-single ended input channels and DAC with single output channel is shown in block diagram. For base address selection miniature switches are used and switch position for the address selection is shown in table 3.1.

The signal conditioning card mainly consists of circuits of speed sensing, current sensing and voltage sensing of the induction motor. To sense current drawn by motor, step-up transformer is used by shunting its primary with a wire. The sensing arrangement is shown in Fig. 3.6. The speed measurement system was developed with slotted optocoupler. The block diagram of which is shown in Fig. 3.8. Voltage measurement is performed by using peak detector circuit which is shown in Fig. 3.10.

Chapter IV describes the development of the system software which organize the measurement of various parameters of motor like stator current, speed and voltage applied to the motor. The system software is menu driven which is divided into different modules namely main module, input module, computation module and display module.

Menu driven main program has different options. The flow chart for the main program is shown in Fig. 4.1. The input module does job of the data collection from the motor under control. To achieve same various steps are involved which are discussed in detail.

The computational module performs the task of computation of performance parameters of the motor by using the stored data in individual file, which is stored by the input module. The flow chart for the same is shown in Fig. 4.3.

The display module displays the calculated data in the form of graph. For the easier graphics selection, the display module is written in menu driven form. The graphical representation is done by selecting numbers from 1 to 9. The hard copy of the plot is possible by using the printer.

Fifth chapter deals with the theoretical parameter estimation of the motor and comparison of the results under no load and full load conditions.

As discussed in the previous chapters the developed computer based data acquisition system is tested for displaying the performance parameters and following conclusions can be drawn from the test results.

i. A wide range of induction motor characteristics and thereby the display of the parameters of the motors like power factor, horse power, percentage efficiency and speed may be possible with the present system with little modification in hardware and software.

ii. The accuracy of the present system can be improved slightly by using the higher bit-ADC at the cost of increasing the prices.

iii. The accuracy of the measuring system is solely depends upon the shunt wire used for current measurement and correction factor used in software for every parameter.

iv. The developed computer based system is very useful in measurement and display of parameters is quite advantageous for large capacity motors whose performance is to be monitored continuously.

v. The present system also proves its usefulness for those electrical machines on which there will be restriction in the conduction of the load test.

vi. Looking to the percentage errors for various motor parameters, it can be concluded that this method is quite feasible and adoptable as the percentage error are well within the tolerable limits.

vii. As the continuous information about motor parameters under operating conditions is readily obtained, this type of system can be used as a supervisor control system for the electrical machines .

In the present work only one motor is under control and we have used first three channels of ADC to sense the different parameters. With the additional channels the system can be expand for two machines as we have 8 channel ADC. The only one channel is sufficient for per motor if we use the multiplexer for each channel and the system can be used for supervision of eight motors.

Further expansion of the system with additional output card can be used for overload protection of all the motors under supervision.