CHAPTER -1

INTRODUCTION

1.1 GENERAL

The demand of control or electric power for electric motor drive systems and industrial controls exists for many years and this led to early development of Ward-Leonard to obtain a variable dc voltage, for control of DC motor drives[1]. Power electronics have revolutionized the concept of power control for power conversion and for control electrical motor drives[2-5].

The electrical characteristics and performance vary from one motor to other. The type of motor used depends mainly on the application. An AC motor, for an instance, may be quite satisfactory, for driving a fan. But it may not perform as well, the function in control system, where it may operate at low speed and smooth control of its speed is required. In that case DC motor is suitable. In the past AC motors have been used predominantly in industrial and control applications. Since World War II, however , when control engineering has become a formal decipline, more and more control systems have been designed using DC motors and today the DC motor represents one of the most important control system components. Over the years extensive research on magnetic materials and the design of low inertia armatures have been aimed at maximizing the torque to inertia ratio and minimizing the motor response. As a result, current designs of permanent magnet DC torque motors offer optimum output torque's per unit motor volume, with response time in low millisecond range.

1.2 REVIEW OF THE LITERATURE.

The development of DC machine took place in early 18th century [1] as the industrial revolution took place in Western Europe and America. Many industries started using machines for the speedy operation [2] of the various jobs. The earlier developed machines were heavy in weight, larger in size, requires high power for their operation. As the industrial revolution took place the demand of DC machines and power increased. To reduce the power consumption [3], much of the research took place in America [4-5].

Jerklin Kingsley developed the DC machine for the industrial purpose in which he considered the factor like power reduction, speed [6-8] and light in weight. Since then size of the machine reduced considerably. As the demand of DC motor increased for different applications, the DC machine is designed according to the requirement. With the invention of power devices [9-11] the required demand for speed, torque, power etc are fulfilled.

The modern system of DC drives are passed through stages of development and modification. The DC drives provides variable voltage at the armature of motor, so some line harmonic is present in it. R. Hoft [12-13] gave generalized technique to eliminate the line harmonics. Further K.A. Krishnamoorthy, T Matsubshi and many others put forwarded the methods of reducing the line harmonics [14].

As time passed speed of DC motor became one of the most important factor in the industrial applications. P.C. Sen and S.R. Doralda [15] put forwarded the control scheme for the improvement of speed of DC motors. With this speed controlled scheme G.Henry and P.Andrew etc[16] developed a high speed drives, but accuracy was the problem which was solved by Chin Shu [17] and was able to give the control scheme with very high accuracy.

Another important factor that industries faced during the development stages was power reduction[18] , so number of power reduction methods were developed. H.Johnson, H. Hillock, Karnio and Tsabai [19] worked on the reduction of power and currents in DC motors. In the latter stage of development Hill R.J. and John K. used power MOSFETs to control the DC motors.

Modeling [20-21] and simulation have been widely used both at designer and user stages for predicting and studying the steady state and transient behavior [24-30] of DC motors, the utility of these approaches has been further confirmed in DC motor drive analysis and the results seems to conclude that a more correct motor simulation can be achieved through an accurate parameter selection [22-23].

In order to improve motor parameter estimation, new procedures have been applied suggesting alternative use of sophisticated optimization algorithms. However more correct results can be expected from identification methods as parameter estimation is worked out through experimental measurements on the machine during its normal operating conditions following natural or impressed perturbations.

An accurate knowledge of the motor parameters is required in order to operate in abnormal conditions, where faults from normal operation can be expected . In such cases, fault detection techniques can be simplified by or even based on a real time knowledge of the machine parameters achieved through on line identification procedure. On line monitoring of DC motor and its parameter estimation is very useful now days because of continuous operation of machines in many industries. Such systems are rarely used now a days because of difficulties connected with a correct acquisition of needed experimental data and also because of the available identification procedures. These problems are faced

in the present work in order to identify the parameters of DC motor by using a personal computer based data acquisition system.

1.3 STATEMENT OF THE PROBLEM

DC motors plays significant role in modern industrial drives. As these motors have variable characteristics and are used extensively in variable speed drives. These motors can provide high starting torque and it is also possible to obtain speed control over wide range. The methods of speed control are normally simpler than those of AC drives. Both series and separately excited DC motors are used in variable speed drives. But series motors are normally used for traction applications, When very high starting torque is required. The on line monitoring and parameter estimation of DC series motor under such a applications gives some useful information

In the present work attempt will be made to developed the computer based data acquisition system for on line monitoring and parameter estimation of DC series motor. The parameter and performance characteristics will be displayed one by one as per the user requirement. To achieve the same the hardware for sensing and signal conditioning , for different parameters will be designed and developed in the laboratory. The developed hardware will be interfaced to the computer through the ADC/DAC interfacing card. The various measurement will be carried out on DC series motor under different load conditions. The necessary software will be developed in order to perform the task of interfacing with computer and performance parameter calculation. Finally this information will be displayed in graphical form with the help of output module.

1.4 ABOUT THE DISSERTATION

The different phases of work that has been carried out in the present dissertation is divided into five different chapters.

The chapter I deals with the brief account of the survey related to the DC motor and its drives.

The chapter- II represents the theoretical background of DC motors.

Design of the system with interfacing card and its testing in laboratory is carried out in chapter III.

Chapter IV deals with the development of software to perform the different tasks. The system calibration is important and is carried out in the same chapter.

Chapter V discusses the performance of the system. The results obtained from the system are discussed. Overall summery of the dissertation is presented in the chapter VI.

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