ABSTRACT

In industrial drives market, requirements related to control quality and price of drives are important. In any drive, aims are achieving of good performance and longer life.

The motor parameters are required to estimate the performance of motors and working environment for estimating the life of insulation and hence motor.

Hence it is necessary to determine the exact value of these parameters. Various methods are available in literatures to estimate the parameters from motor label or by simple measurements. However these parameters vary due to variation in atmospheric conditions, saturation level or due to measurement. In this work the parameters are calculated from simple no load and blocked rotor test and presented to algorithm based on NR method to modify it. Results obtained are very encouraging and matches with the experimental results.

For the investigation purpose four motors were designed and manufactured. Two motors were manufactured to investigate the distribution of voltage in winding whereas two more motors were manufactured for the purpose of performance evaluation.

Ten Programs MATLAB are developed to evaluate the motor Output, Input, Efficiency, PF, Torque and Speed of the motor. These performance parameters are compared with the actual test parameters. The results are in good agreement. Hence these programs can be used to predict the performance of the other motors.

CRO of Yokogawa, Japan, Model No. DL 750 was used for the measurement purpose. Investigation was made for three different source of voltages [1] Sinusoidal utility 50 Hz supply [2] Filtered inverter supply taken from drive No. VDF007B43A of Delta [3] Unfiltered inverter supply taken from drive no. VFD004S43A of Delta. Around 600 wave forms are being recorded and investigated. Investigated wave forms are of coil voltages with respect to phase voltage and voltage of one coil with respect to voltage of second coil. When motor is operated on sinusoidal supply, then during switching period voltage across motor phase becomes equal to supply line

voltage and the maximum voltage across any of the coil obtained is 80 V. Unexpected behaviour was observed in variation of coil voltage (harmonic voltage after few cycle from starting) with sinusoidal supply during starting, however this is not producing over voltages or high dv/dt. Voltage rise time when motor is supplied with converter is very small and is of the order of micro second. In some cases the peak voltage at motor terminals reaches to value which more than twice the value of dc link voltage and rated line to line voltage of the motor. However for low voltage motor as peak is not reaches to large value coil manufactured with medium covering enamel wire and due care is taken to maintain the thickness around the conductor can with stand this voltages even though the variation of supply voltage is very peculiar particularly at low frequency.

The distribution of voltage during switching condition is not even among the coils of a winding and hence turns. The voltage drop in coils near terminal is more than that of in other coils. The measured voltage drop across first coil from terminal of winding of four coils in series is varying 30 to 56% of the phase voltage against 25% of the phase voltage. During the transition period voltage across first coil may be 70% of the total voltage. Comparison of wave forms for sinusoidal supply and inverter supply shows that distortions were very large with inverter supply which increases the losses and produces more stresses on the insulations.