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Simulation of induction motor for reference of practical engineering

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Abstract : *This Project simulates an Induction Motor. It will be helpful for the performer in the practical, observation of the Induction Motor in the lab, as the design motor will be the simulation of the actual motor used for the practical and experiment. The Factors such as direction of magnetic field, magnetic field density, number of windings, heat dissipation, temperature gradient, current flow, etc. which are not visible for the performer but actually plays a very important role for the performance and the efficiency of the Induction Motor will be seen digitally, graphically with the help of simulation on the platform of ANSYS software. The design and calculation of various parameters of the induction motor are done to obtain a simulation which will be approximate to that of the induction motor used for the practical purposes. This will not only increase the interest of the performer but also the understandability of the practical will be more convenient as the performer will be able to gain knowledge about various parameter which were practically impossible to view.*
Keywords *- ANSYS, Design, Induction Motor, MAXWELL, Simulation.*

I. INTRODUCTION

The Induction motors are widely used because of their advantages such as simple and rugged design, less required maintenance and low cost when compared to DC motors. Hence the study of induction motor in academics holds much importance for the students in as a theoretical and numerical subject as well as practical and experimental study performed in the laboratory.

This project will prove to be a helping hand for the performer in the laboratory, as during the session of practical, the simulation of the same motor will be available for the performer and would be able to view many factors such as temperature rise, magnetic field, magnitude of different forces as well as their direction, etc. with the help of software.

While performing the practical the simulation of the motor would be seen by the viewer to understand and gain more knowledge of the various parameters which are running inside the induction motor.

This will boost the process of understanding the practical and basic knowledge of the subject for the performer and will gain more interest for the same.

To provide a side by side digital visual approach of the simulation of the induction motor for understanding the parameters of the performing practical and gaining more information and knowledge about the internal process of the induction motor.

This will include the visualization of the parameters such as increase in temperature, current flow, magnetic flux distribution, magnitude of the magnetic field in different portions and many more.

II. FLOW OF PROJECT

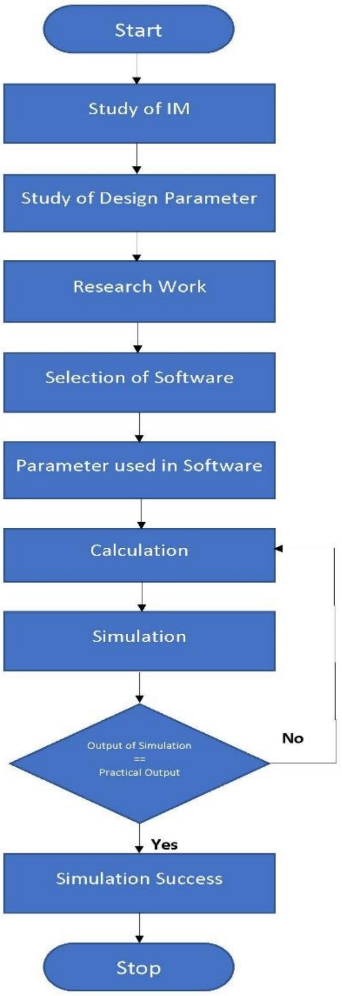

Figure. 1. Flow Chart of Project

III. OUTPUT

Table 1. General data

Given Output Power (kW)	1.1
Rated Voltage (V)	380
Winding Connection	Wye
Number of Poles	2
Given Speed (rpm)	1450
Frequency (Hz)	50
Type of Load	Const. Power

Table 2. No-load operation

No-Load Stator Resistance (ohm)	4.76837
No-Load Stator Leakage Reactance (ohm)	5.68191
No-Load Rotor Resistance (ohm)	3.76872
No-Load Rotor Leakage Reactance (ohm)	260.748
No-Load Stator Phase Current (A)	1.32797
No-Load Iron-Core Loss (W)	63.6207

No-Load Input Power (W)	219.283
No-Load Power Factor	0.238298
No-Load Slip	0.003592
No-Load Shaft Speed (rpm)	2989.22

Table 3. Break-down operation

Break-Down Slip	0.2
Break-Down Torque (N.m)	6.61016
Break-Down Torque Ratio	1.78204
Break-Down Phase Current (A)	6.97758

Table 4. Locked-rotor operation

Locked-Rotor Torque (N.m)	3.37892
Locked-Rotor Phase Current (A)	10.4422
Locked-Rotor Torque Ratio	0.910926
Locked-Rotor Current Ratio	3.15408
Locked-Rotor Stator Resistance (ohm)	4.76837
Locked-Rotor Stator Leakage Reactance (ohm)	5.65493
Locked-Rotor Rotor Resistance (ohm)	3.93985
Locked-Rotor Rotor Leakage Reactance (ohm)	14.8773

Table 5. Losses

Copper Loss of Stator Winding (W)	156.793
Copper Loss of Rotor Winding (W)	71.4512
Iron-Core Loss (W)	54.4812
Frictional and Windage Loss (W)	103.425
Stray Loss (W)	11
Total Loss (W)	397.15
Input Power (kW)	1.49716
Output Power (kW)	1.10001

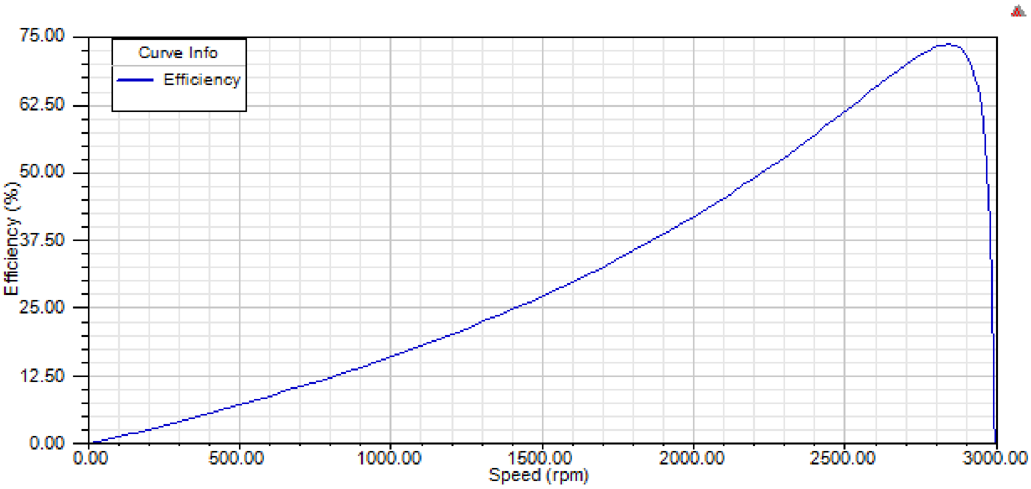

Figure. 2. efficiency vs speed

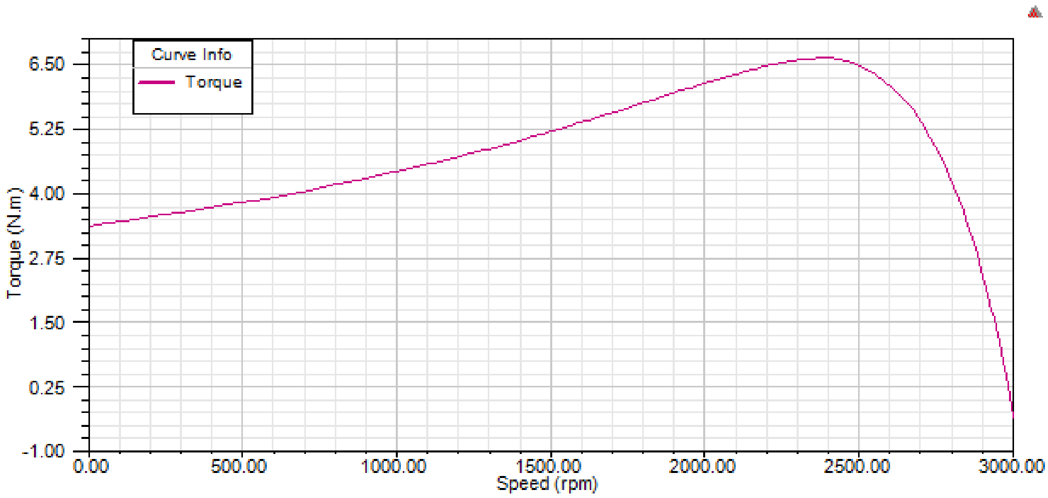

Figure. 3 torque vs speed

IV. CONCLUSION

This project would be a boon for all the practical performed in the lab by the students as there would be a new and different perspective of a simulated based study on the experiments.

The side by side analysis of the induction motor can be done by viewing the internal parameters that were not possible in the traditional approach of performing the practical including the magnetization, current flow, magnitude of force generation, temperature rise etc. This would provide a detailed study of the induction motor and a new way to cross check the readings of the undergoing practical of the induction motor.

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