

Simulation of Three Phase Induction Motor Using MATLAB/Simulink Software

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Abstract: This paper provides the torque, current and speed of induction motor with the aid of the usage of mathematical modelling the use of simulation of three segment induction motor. Electrical energy is needed in the daily life use as well as in the industry Induction motors play a very important role in the world because of its low maintenance cost, reliable operation, robustness and simple construction. To derive the mathematical mannequin of a three segment Induction motor. mathematical fashions are employed in to greater apprehend the behaviour of induction motor. Dynamic model is typically used to learn about the constant country and transient conduct of induction motor. This paper gives the mathematical mannequin of an induction motor the usage of Park transformation and Clark transformation of stator and rotor parameter of reference frame. It additionally fashions all the differential voltage, currents and flux linkages between the stationary stator as nicely as the shifting rotor. This paper presents a step-by-step MATLAB/Simulink perpetration of an induction machine.

Keywords: Induction Motor, Modelling and Simulation, Model, Speed, Torque, MATLAB /SIMULINK.

I. INTRODUCTION

The dynamic evaluation of the symmetrical induction machines in the arbitrary reference body has been intensively used as a preferred simulation strategy from which any unique mode of operation may additionally then be developed. MATLAB/Simulink has an gain over different motor simulators in modelling the induction motor usage of dq0 axis transformation.

Generally modelling of these equations is viewed challenging so that in this paper they are introduced in their simplified form. The transformations used at a number steps are based totally on easy trigonometric relationship bought as projections on a set of axes. The dynamic mannequin is used to gain transient responses, small sign equations, and a switch characteristic of induction motor. Dynamic fashions (mathematical models) are employed in to higher recognize the behaviour of induction motor in each transient and regular state.

The dynamic modelling units all the mechanical equations for the inertia, torque and velocity versus time. It additionally fashions all the differential voltage, currents and flux linkages between the stationary stator as properly as the transferring rotor. This mathematical mannequin has been accomplished with the aid of the use of MATLAB /Simulink which will signify the three-section induction motor inclusive of a three segment to d-q axis transformations.

The important gain with MATLAB Simulink is that in the electromechanical dynamic mannequin can be performed in a easy way and it can be simulated quicker the usage of characteristic blocks.

II. METHOD AND MATERIAL

1. Simulation and Modelling of a 3 Phase Induction Motor

The mannequin built in accordance to the equations has been simulated with the aid of the usage of MATLAB/SIMULINK. A 3-phase supply is utilized to traditional mannequin of an induction motor and the equations are given by:

Stator

$$V_{gs} = r_{sigs} + W\lambda_{ds} + d/dt (\lambda_{gs}) \text{ -----1}$$

$$V_{ds} = r_{sids} - W\lambda_{gs} + d/dt (\lambda_{ds}) \text{ -----2}$$

$$V_{os} = r_{sios} + d/dt (\lambda_{os}) \text{ -----3}$$

Rotor

$$V_{gr} = r_{sgr} + (w - w_r) \lambda_{dr} + d/dt (\lambda_{gr}) \text{-----4}$$

$$V_{dr} = r_{sdr} - (w - w_r) \lambda_{gs} + d/dt (\lambda_{dr}) \text{-----5}$$

$$V_{or} = r_{sior} + d/dt (\lambda_{or}) \text{-----6}$$

Flux Linkage Equations

$$\lambda_{gs} = (i_{gs}L_s + L_{migr}) \text{-----7}$$

$$\lambda_{ds} = (i_{ds}L_s + L_{midr}) \text{-----8}$$

$$\lambda_{gr} = (i_{gr}L_r + L_{migs}) \text{-----9}$$

$$\lambda_{dr} = (i_{dr}L_r + L_{mids}) \text{-----10}$$

Put equation 7 and 8 in 1 to find the value of i_{gs}

$$i_{gs} = \int (1/L_s) (V_{gs} - i_{gs}r_s - L_m d/dt(i_{gr}) - W L_{sids} - W L_{midr})$$

Put equation 7 and 8 in 2 to find the value of i_{ds}

$$i_{ds} = \int (1/L_s) (V_{ds} - i_{ds}r_s - L_m d/dt(i_{dr}) + W L_{sigs} + W L_{migr})$$

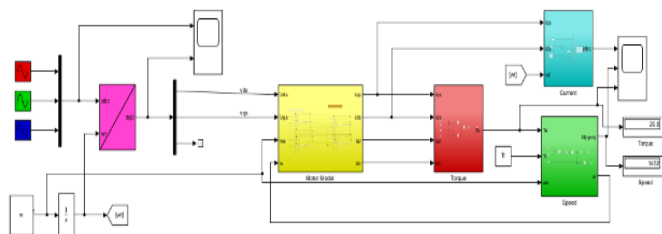
Put equation 9 and 10 in 4 to find the value of i_{gr}

$$i_{gr} = \int (1/L_r) (V_{gr} - i_{gr}r_r - L_m d/dt(i_{gs}) - W L_{ridr} - W L_{mids})$$

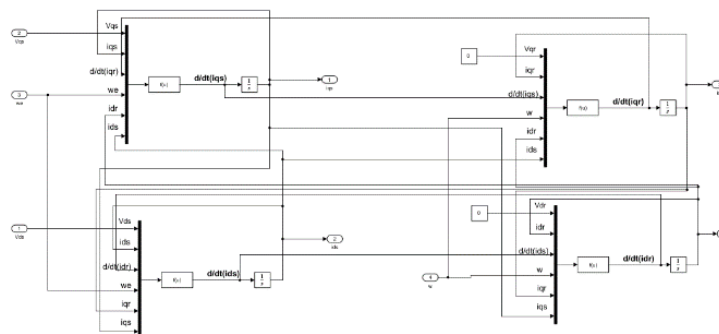
Put equation 7 and 8 in 5 to find the value of i_{dr}

$$i_{dr} = \int (1/L_r) (V_{dr} - i_{dr}r_r - L_m d/dt(i_{ds}) + W L_{rigr} + W L_{migs})$$

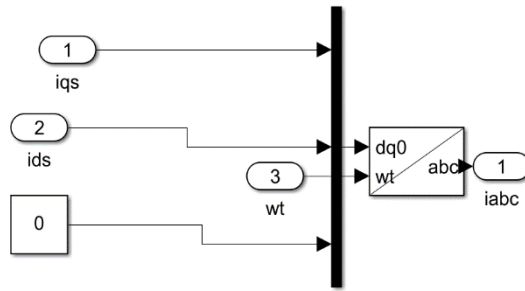
2. Simulink Model



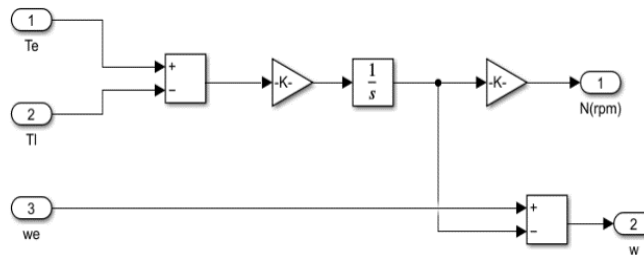
Simulink Model Of IM



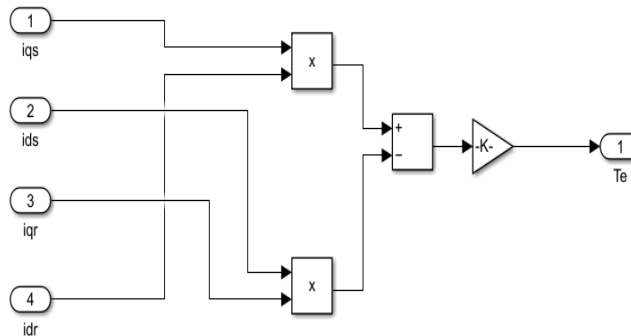
Internal Structure of Motor model



Subsystem of Current Model



Subsystem of Speed Model



Subsystem of Torque Model

III. MATLAB/SIMULINK RESULT

Three Phase induction motor was tested in MATLAB Simulink. Hence The results of the MATLAB simulation are given below the following specifications:

Input Parameters

Rs	1.4050
Rr	1.3950
Ls	0.1780
Lm	0.1722
Lr	0.1780
J	0.0131
P	4
W	314.1593
T	26.50

A. Current in A, B, C Phase of IM:

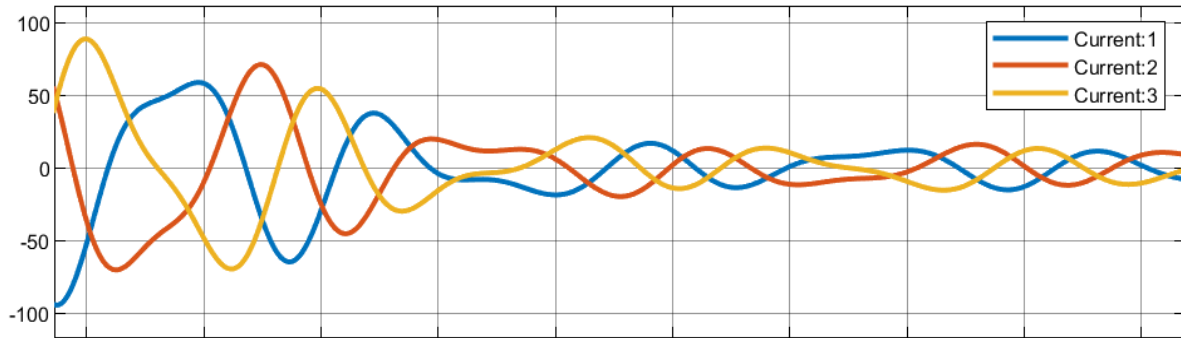


Fig1 Current in A, B, C Phase of IM

B. Speed Performance of IM:

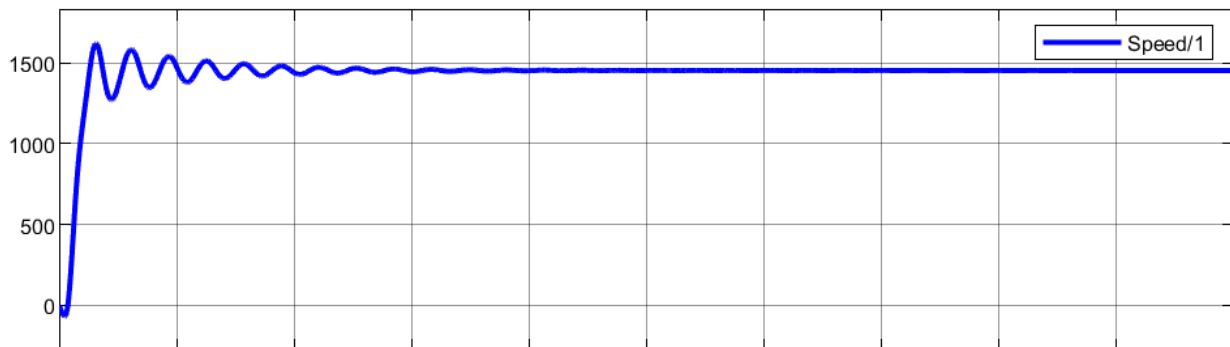


Fig 2 Speed Performance of IM

C. Torque Performance of IM:

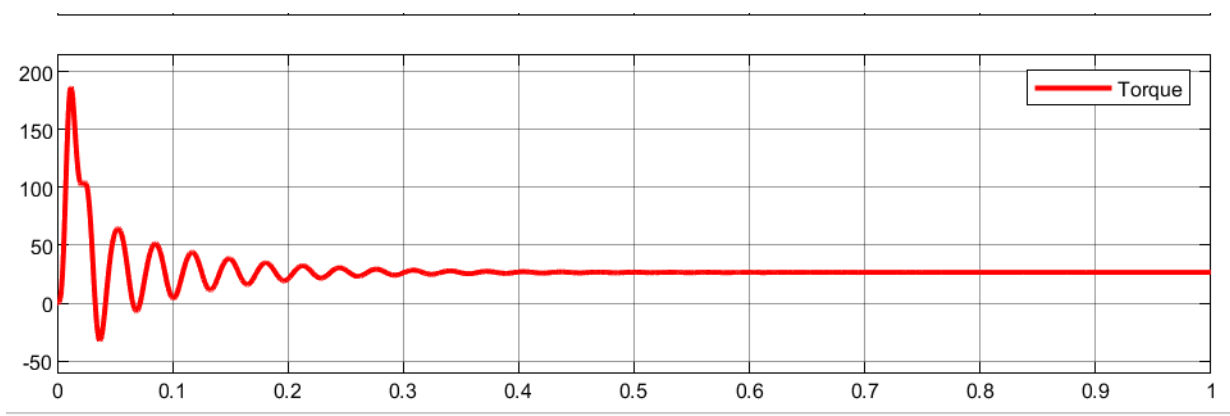


Fig 3 Torque Performance of IM

D. Speed Of IM:

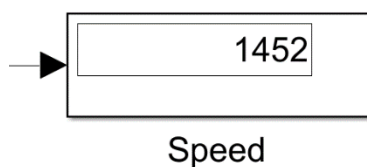


Fig 4 Speed Of IM

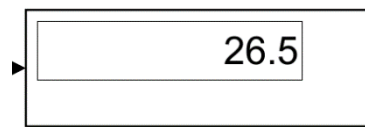
E. Torque of IM:**Torque**

Fig 5 Torque of IM

IV. CONCLUSION

In this paper, work describe a modelling of 3 phase induction motor in a step-by-step manner and the simulation has been introduced. The model was tested on a Simulink circuit designed for 3 phase induction motor. This research provides a knowledgeable connection between hardware and software circuit of induction motor. The simulated machine has a give smooth response in terms of the torque and speed characteristics so this concludes that MATLAB Simulink Is a well-founded and smooth way to scanning and prognosticate the etiquette of 3 phase induction motor.

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BIOGRAPHY

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