xxxxx ———Title ———— xxxx

Student-1, Student-2 Student-3 & Student-4

Guide-1

Department of Electrical Engineering

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Government Engineering College Palakkad

Introduction

The first section of the poster should define the topic and show its importance. A good test is whether the poster can orient the audience to these two aspects in 20 seconds. For E.g. This poster presents the field oriented control (FOC) of three phase induction motor using hybrid pulse width modulation consists of conventional space vector.

Control Scheme

The second section of the poster might serve a number of purposes: background information, methods, or system design. An important point with posters is to rely on visuals rather than longs blocks of text to communicate. Block diagram of FOC using hybrid pulse width modulation is shown here. Along with conventional space vector following sequences are also used for better performance.

- Bus clamping 30
- Bus clamping 60

Pulses for driving the three phase inverter will be generated from this hybrid PWM, whereas the method to generate the PWM will be automatically selected based on the flux ripple analysis.

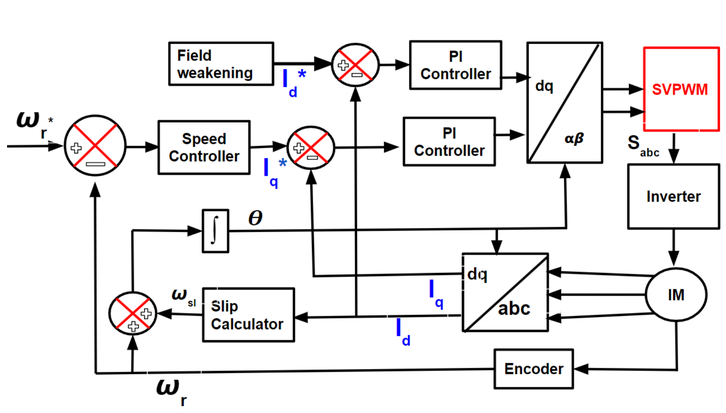

Figure 1: Block diagram of the speed control loop

System Design

Depends on DC bus voltage,device switching times,phase current and number of switching of the phase. Energy lost is proportional to fundamental current and number of switching of phase. Switching timing of active vectors and zero vector can be calculated using the following equations:

$$T_1 = \sqrt{3}\left(\frac{V_r}{V_d}\right) T_s \sin\left(\frac{S\pi}{3} - A\right) \quad (1)$$

$$T_2 = \sqrt{3}\left(\frac{V_r}{V_d}\right) T_s \sin\left(A - (S-1)\frac{\pi}{3}\right) \quad (2)$$

$$T_z = T_s - T_1 - T_2 \quad (3)$$

where 'A' is angle, S is sector, T1, T2 , Tz are the timings of vectors V1, V2 and Vz respectively.

Results and Observations

Depends on DC bus voltage,device switching times,phase current and number of switching of the phase. Energy lost is proportional to fundamental current and number of switching of phase.

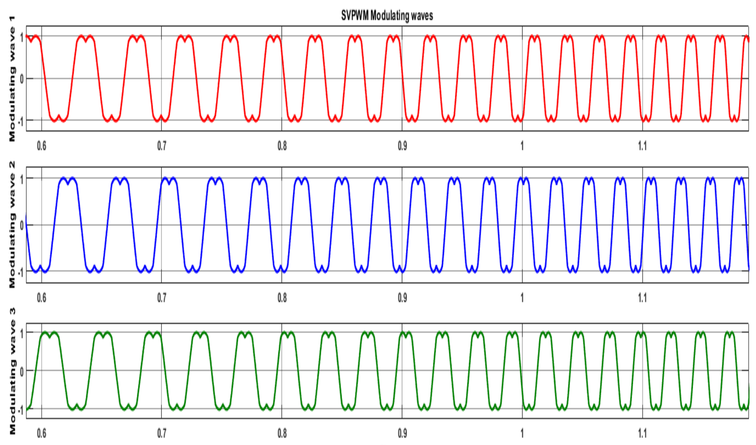

Figure 2: Modulating wave of SVPWM

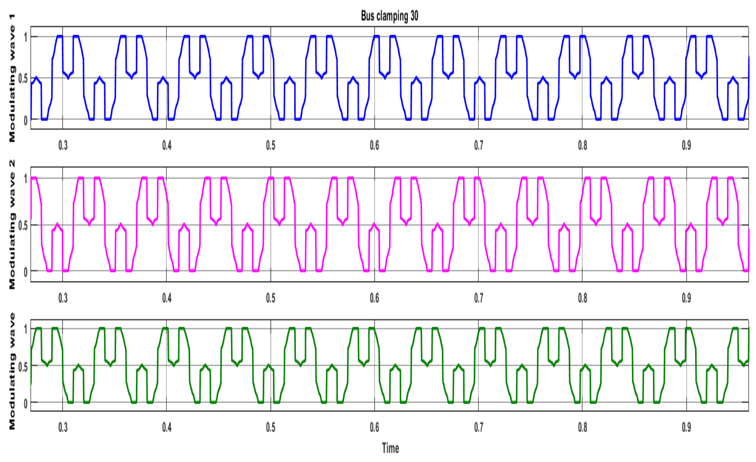

Figure 3: Modulating wave of Bus clamping 30

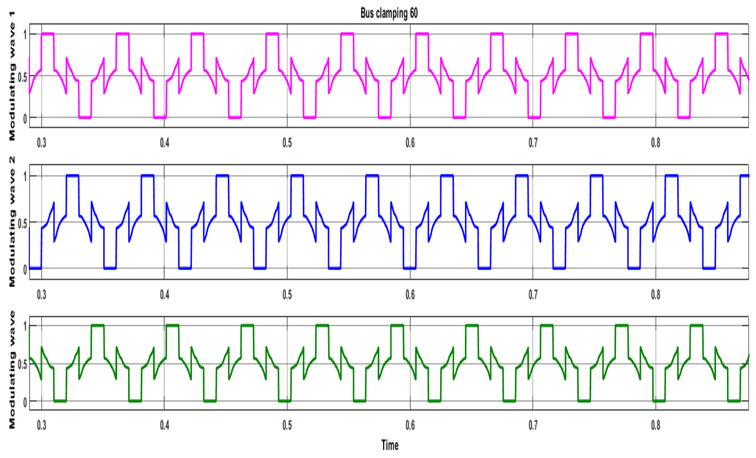

Figure 4: Modulating wave of Bus clamping 60

Depends on DC bus voltage,device switching times,phase current and number of switching of the phase. Energy lost is proportional to fundamental current and number of switching of phase.

$$E_{sub,ph} = n_{ph}\frac{|i_{ph}|}{i_m} = n_{ph}\sin(wt + \phi) \quad (4)$$

Normalised energy loss is calculated by using peak fundamental current im.

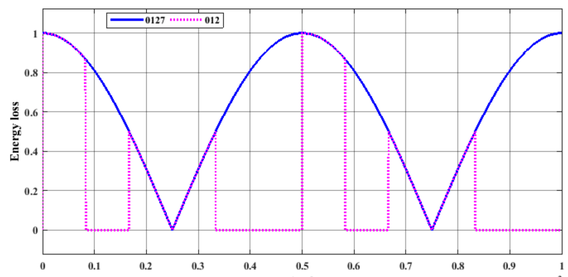

Figure 5: Switching loss of CSVPWM and BC30

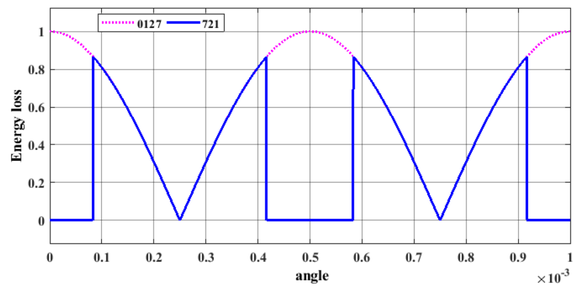

Figure 6: Switching loss of CSVPWM and BC60

Field oriented control of three phase induction motor using the hybrid PWM has done.In CSVPWM switching losses and ripples are minimal compared to conventional method.At each angle of space vector each PWM sequence is better.

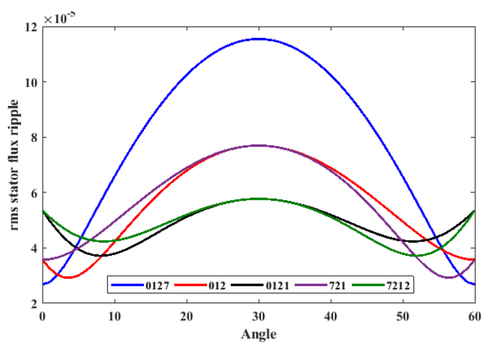

Figure 7: Stator flux ripple analysis

Time integral of errror voltage vector is the stator flux ripple vector. Slope of trajectory changes only during switching.

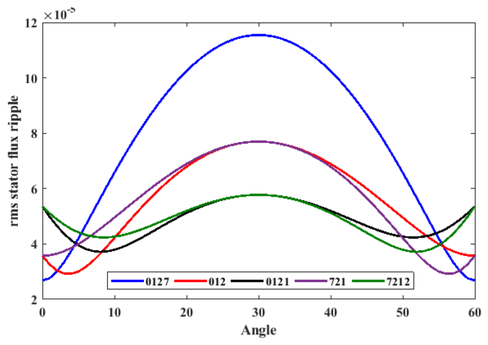

Figure 8: Stator flux ripple analysis

Based on stator flux ripple system automatically select apppropriate pwm method according to the table given below.

PWM Method	Angle
CSVPWM	(0-3)(57-60)
BC30	(3-8)
BC60	(52-57)
ABC30	(8-30)
ABC60	(30-52)

Hardware Setup

Hardware setup of the project is shown below.1500 rpm,0.75 kW motor, TMS320F28379D launchpad, LA55P current sensor,LV25P voltage sensor and 600 PPR encoder are used here.

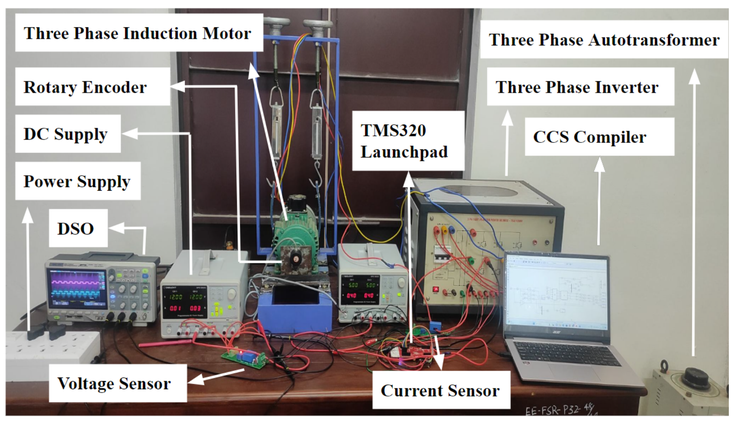

Figure 9: Hardware setup

Conclusion

Field oriented control of three phase induction motor using the hybrid PWM has done.In CSVPWM switching losses and ripples are minimal compared to conventional method.At each angle of space vector each PWM sequence is better.

References

[1] Sabeel P, and V. Chellappan, "Dynamic modeling and current control of a solar powered battery storage systems," in 2nd Asian Conference on Innovation in Technology, 2022, pp. 1–7.