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A REVIEW ON PMSM DRIVE SYSTEM

[1]Pawara Chhotulal,[2] Jamadar Mahesh, [3]Landage Kishor, [4]Metkar Omkesh

[1]UG Scholar, Department of Electrical Engineering. JSPM's Polytechnic, Wagholi, Pune
2UG Scholar, Department of Electrical Engineering. JSPM's Polytechnic, Wagholi, Pune
3UG Scholar, Department of Electrical Engineering. JSPM's Polytechnic, Wagholi, Pune
4UG Scholar, Department of Electrical Engineering. JSPM's Polytechnic, Wagholi, Pune
gchotulal08@gmail.com
maheshjamdar056@gmail.com

ABSTRACT:- In this paper, an ideal converter drive strategy for Permanent Magnet Synchronous Motor (PMSM) with a 3-level inverter is examined regarding misfortune minimization. The 3-level inverter can change an activity mode between two tweaks in particular, PWM and 1'pulse balance at a chose point. In this paper, we examine the trade point for the two adjustments subject to the absolute loss of PMSM drive framework concerning the engine speed. In the first place, the examination on convergence point among PWM and 1'pulse tweak is illustrated, and afterward the outcomes show, that the engine drive framework accomplishes the most noteworthy effectiveness with PWM before the convergence point. On one hand, execution of 1'pulse tweak can accomplish the most elevated effectiveness.

KEYWORDS:- Data anonymization, Top down approach, Bottom up approach, Map Reduce framework, Cloud, Privacy Preservation.

1. INTRODUCTION

As of late, electric vehicles (EV) are effectively evolved because of the popularity of CO2 emanation decrease from car industry. Requesting on the engine drive frameworks for the EVs are to highlight little size, lightweight and high productivity. The commonplace engine that applied in EVs is known as Permanent Magnet Synchronous Motor (PMSM).Then inverter is applied to control the force in a wide scope of variable speed. The inverter in an EV framework is ordinarily determined by two balances, that is, PWM at low speed locale and 1-beat regulation (square wave balance) at center or high velocity area. PWM can stifle the force swell in light of the fact that the symphonious segment is moderately low. On the other hand, implementation of 1-pulse modulation can reduce the switching loss comparing to PWM and increases the fundamental amplitude of the output voltage. Hence, the 1- pulse modulation is often applied to extend the operational region of speed in the motor. In addition, pulse width of the 1- pulse modulation can be varied in a 3-level inverter unlike a 2- level inverter because the 3-level inverter can output zero voltage level. Thus, it can arbitrarily decide the fundamental amplitude of output voltage and it is called as 1'pulse modulation in order to distinguish from the standard 1-pulse modulation that has constant voltage amplitude. Therefore, the interchange point from PWM to 1'pulse modulation can be decided arbitrarily. However, the interchange point needs

II. LOSS ANALYSIS OF PMSM

4.1. Development of PMSM Model

The motor loss can be classified: the copper loss by wiring resistance, the iron loss occurring in the core or the magnet and the mechanical loss. In this section, the mechanical loss is ignored because the loss depends only on the motor speed. The motor loss is analyzed by two-dimensional finite element method electromagnetically field analysis (FEM). FEM analyzes the magnetic field occurred in the motor, and then the losses are calculated based on the results. At first, the two dimensional model of the motor is developed. Next, the analysis is performed by inputting the current waveform which is obtained from the simulation into motor phase. Table II shows the analysis conditions. The time interval per 1step is decided by considering the effect on the motor loss by the carrier frequency.

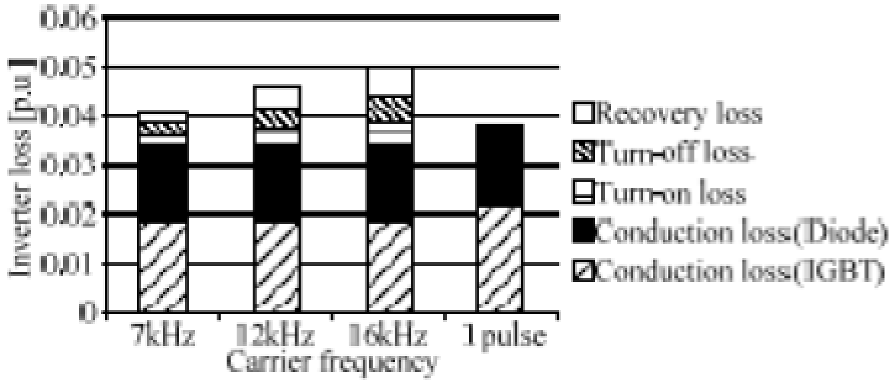
4.2. Loss Analysis Results of PMSM

Fig. shows the breakdown of the motor loss, similar to Fig. 3, the results are standardized by the rated motor power. From the results, the copper loss and the iron loss at the stator are dominant in the motor loss. The loss at 1'pulse modulation shows to be the largest because the harmonic components in the output voltage and current are larger than that of PWM. As the result, the eddy-current occurred in cores and the magnetics becomes higher, and the eddy-current loss is also increase.

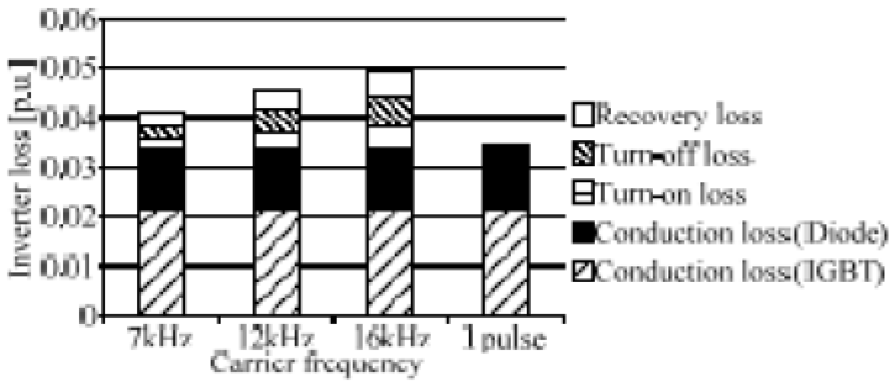
III. DISCUSSIONS TO MINIMIZE TOTAL LOSS

From the determined inverter misfortune and the investigation of the PMSM misfortune, the complete loss of the drive framework can be illustrated, and next will consider the ideal activity strategy for 3-level inverter as far as the minimalize misfortune. The complete loss of the engine drive framework Ploss is communicated in where Pcon is the conduction misfortune, PCu is the copper misfortune, PFe is the iron misfortune and Pmec is the mechanical misfortune.

Here, 1'pulse balance can lessen the exchanging and recuperation misfortune than PWM drive.



(a) Speed is 0.1 p.u. at PWM and 0.2 p.u. at 1'pulse modulation



(b) Speed is 0.3 p.u..

Figure 1. Inverter loss analysis results

Psw_PWM and *Prec_PWM* are the switching loss and the recovery loss, respectively, Δ*Pcon*, Δ*PCu* and Δ*PFe* are the difference between PWM drive and 1'pulse modulation of the conduction loss, the cupper loss and the iron loss, respectively. The mechanical loss *Pmec* is ignored because the loss at PWM drive equals to that at 1'pulse modulation in order to depend only on a motor speed. In addition, the switching loss *Psw* and the recovery loss *Prec* at 1'pulse modulation are ignored because these are vanishingly lower than that at PWM drive. Furthermore, it assumes that the current harmonic component at PWM drive is vanishingly smaller than that at 1'pulse modulation. In addition, the difference between PWM drive and 1'pulse modulation of the iron loss Δ*PFe* is formulated by the analysis result of the FEM. Under these conditions,

IV. EVALUATION BY EXPERIMENTATION

The drive system of PMSM was implemented to compare the total loss with the implementation of spoken operation method. In this section, the total loss that measured by the system is showed. Fig. 6 shows a configuration of the developed drive system. The power consumption of the inverter is measured by the power meter (WT1800/YOKOGAWA). The measured power points for the inverter are between the DC bus capacitor and the output of inverter. In addition, the torque meter is put between the test motor and the load motor. The operation conditions are output torque T = 2.0 Nm and carrier frequency fc = 10, 12 and 16 kHz for PWM. The motor control method uses a vector control with id = 0 and applied a balance control because voltage of two DC capacitors should be equalized [13]. Furthermore, switching devices are selected with IGBT (2MBI50P 140/Fuji electric) in order to confirm that the validity of (9). Besides, the tested motor is the same as table II. The loss of the motor is separated as follows. Firstly, the motor loss is the difference between the output power of the inverter and the shaft power of the motor. The copper loss is

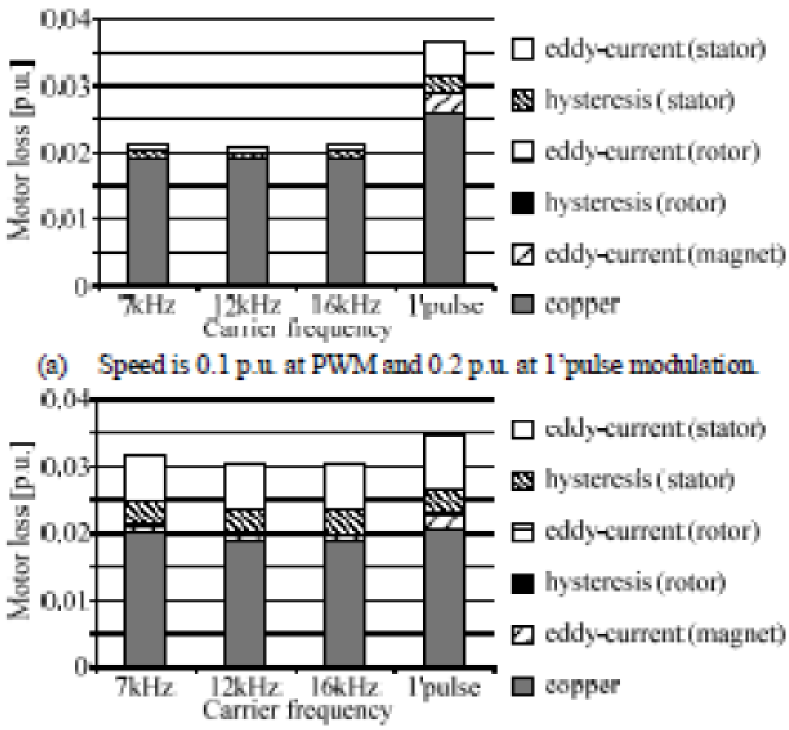


Figure. 2. The total loss of a PMSM drive system

V. CONCLUSION

In this paper, the misfortune limited activity strategy for a 3-level inverter was considered to accomplish a high productivity engine drive framework. As the outcome, it very well may be acquired that the all out misfortune diminishes when the activity strategy is exchanged at where the bend of PWM misfortune crosses with 1'pulse regulation. Likewise, if the pace of the inverter misfortune is lower, the utilization of a 3-level inverter isn't advantage and a 2-level inverter has an expense advantage with that sort of framework. Moreover, the engine drive framework by an unbiased point-clipped 3-level inverter was tested and the losses of the system were measured and compared with analysis results at each carrier frequency. As the result, when a rate of a motor loss in total loss is lower, it is high efficiency that a carrier frequency is lower. In the future work, the 3-level inverter will be operated with 1'pulse modulation and the loss will be compared at PWM and 1'pulse modulation. Furthermore, calculation of a motor loss will be simplified.

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