Overview of the Project

In this project,we generate three phase of 310Vpp by Intelligent Power Module (IPM) to drive a permanent magnet Brushless Direct Current (BLDC) motor in open loop mode through a microcontroller. We also use internet of things (IOT) to control and monitor the RPM, current, power and other important parameter of BLDC motor of machine.

INTRODUCTION

This project provides a technical review of position and speed sensorless methods for controlling Brushless Direct Current (BLDC) motor drives. The performance and reliability of BLDC motor drivers have been improved because the conventional control and sensing techniques have been improved through sensorless technology.The project study includes a deep overview of state-of-the-art back-EMF sensing methods, which includes Terminal Voltage Sensing,

1.1 PROJECT BACKGROUND

Due to the their efficiency, silent operation, reliability and compact form, BLDC motor

have been desired for small horsepower control motors. Nowadays, household appliance is

one of fastest-growing end-product market for electronic motor drive.

Over the last decade, continuing technology development in power semiconductors,

microprocessors/logic ICs, adjustable speed drivers (ASDs) control schemes and

permanent-magnet brushless electric motor production have combined to enable reliable,

cost-effective solution for a broad range of adjustable speed applications.

The household appliances include clothes washers, room airconditioners, refrigerators, vacuum cleaners, freezers, etc. these appliances have traditionally relied on historical classic electric motor technologies such as single phase AC induction, including split phase, capacitor-start, capacitor–run types, and universal motor. These classic motors typically are operated at constant-speed directly from main AC power without regarding the efficiency. Consumers now demand for lower energy costs, better performance, reduced acoustic noise, and more convenience features. Those traditional technologies cannot provide the solutions.

In the near future, automotive industry and HVAC industry will also see the explosive growth ahead for electronically controlled motor system, the majority of which will be of the BLDC type [3,4].

It is expected that demanding for higher efficiency, better performance will push  
industries to adopt ASDs with faster pace than ever. The cost effective and high  
performance BLDC motor drive system will make big contribution for the transition.

Actually, BLDC motor is one type of permanent magnet synchronous motor that can

be driven by DC voltage but current commutation is done by solid state switches. The

commutation instant are determined by the rotor position that will detected by position sensor

or by sensorless technique [1]. These position sensors may be a hall sensors, resolvers or

absolute position sensor. The most type of sensor that normally use is hall sensor and optical

encoders. These sensor especially hall sensors are temperature sensitive and limit.

Therefore, these sensors could reduce the system reliability because of the components

and wiring. Some advantages of BLDC motor compare to brushed DC motor and induction

motor is reliable, long operating life, high efficiency and also high dynamic response [2]. Due

to an advantages of BLDC motor, this project will focused on BLDC machine with trapezoidal

back-EMF and different parameters of speed controller.

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This simulation will be model by using MATLAB Simulink Software. Simulation is

the most important to evaluate, design and make an analysis of power electronic inverter that

apply such as at BLDC motor. The benefit by using MATLAB software because it provides

immediate access to thousand of fundamental and can be built-in graphing tools and GUI

builder to ensure that can customize data and model to help interpret data more easily for

quicker decision making.

Since 1970s PWM technology was already available and broadly apply because it

offer many advantages such as to minimize lower order harmonic while the higher order

harmonic will be eliminated by using filter. Thus, MATLAB also in affective tool to analyze a PWM inverter. In this project, the choosen switching device use in inverter will be use is

switch block because it more easy to control. In order to enhance and improve the

performance of electric motor, it can been done by using inverter topologies, control scheme

of the electric drive system and also the motor type that have been choosen to fullfil the

requirement needed.

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* 1. **PROJECT MOTIVATION**

A brushless DC motor (BLDC) is the most popular of applications for home appliance

and industries such as for medical, aerospace and also can be used in outdoor fan in air conditioner.

* The purpose of this project to build a universal smart and efficient electronic hardware to control the torque and RPM of high-power BLDC motors for industries and other domestic power efficient purpose.
* Ease of control should be possible in the starting, stopping, changing the direction of rotation and speed varying of BLDC motor.
* In some field, control of BLDC motor cannot be done directly.
* This led to derive the BLDC motor within a low power consumption.

1.3 PROBLEM STATEMENT

In many cases, the brushless DC (BLDC) motor can replace conventional DC motor.

BLDC motor are very suitable for air conditioning system application because of their small

size, high reliability, high efficiency and very excellent speed torque characteristics. Induction

machines more difficult to control and achieved torque speed range compare to the BLDC

motor. In term of efficiency, BLDC motor can operate at unity power factor but for induction

machines the best power factor only around 85 percent.

This motor have higher torque ripples compared to the other motor that have a

sinusoidal shaped back EMF. They are also cheaper and very suitable to use for general

application. The type of switching control of Pulse Width Modulation VSI has used to

complete the design. This is because six-step technique inverter normally used widely in the

speed of induction motor that can varies the output frequency. So the suitable technique in this

project is Hysteresis Current Controller VSI because of their characteristic depends on their

excellent dynamic response and easy for implementation. The software will use to analyze this

project is MATLAB Simulink. However, MATLAB software will uses a large amount of

memory in personal computer (PC) and also make the PC running slowly but it offers high

performance numerical computation, data analysis, and application development tools that will

help to finished this project.