

# DESIGN AND DEVELOPMENT OF SPEED MONITORING BRUSHLESS DC (BLDC) EQUIPMENT AND CONTROLLER BASED ON ARDUINO

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**Abstract:** Because the BLDC motor (Brushless Motor Direct current) does not have a brush, it sounds noisy, and maintenance is more comfortable and has a higher efficiency than induction motors. The design of monitoring and motor speed controller starts with a 5 volt DC voltage from the power supply used to supply the Arduino Pro mini. In the Arduino Pro mini potentiometer as the input circuit to accelerate or slow down the motor rotation, then Arduino will control the BLDC motor through the driver circuit. When the BLDC motor runs the speed sensor circuit will read the speed of the BLDC motor is then by Arduino will be displayed to the LCD. From the test performed can be seen form PWM (Pulse Width Modulation) it and can set the form of PWM by changing the voltage using a potentiometer in the circuit.

**Keywords:** BLDC, Arduino Promini, Speed Sensor, PWM, potentiometer.

## 1. INTRODUCTION:

Now a direct current machine has developed, especially for small devices, including as a control motor, or servo motor [1]. The favorite electrically powered drive engine is a brushless direct current motor (BLDC motor) because it has advantages compared to other types of electrically powered propulsion engines. The power of a BLDC motor is that its efficiency is higher than that of an induction motor, the dimensions are smaller than conventional direct current motors. Also, in the absence of a brush, maintenance becomes light, almost no noise, and can be operated in a flammable environment. Another advantage of induction machines is that the response is faster, longer service life, and has a wide speed range [2]

## 2. LITERATURE REVIEW:

### a. BLDC motor

The BLDC motor does not use brushes for commutation and has a synchronous speed between the rotating field of the stator and the rotor. The BLDC motor rotor is a permanent magnet, so there is no need for an amplifier coil and no load current flows it. There are two kinds of BLDC motor speed control methods, namely, supply voltage settings and phase advance angle. In setting the phase angle acceleration, optimal speed can be obtained when current and emf together in time or other words phase [3].



**Figure 1.** Specification of Motr BLDC

### b. Arduino Promini

This Arduino pro mini has fourteen digital input output pins where six of them can be used as PWM outputs. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) from 20-50 kOhms. In addition there are also six analog inputs, a reset button, an on-board resonator, and a header pin hole. This six pin header can be connected to an FTDI cable or Sparkfun board breakout to be used as communication

for the board and provide power to the Arduino. There are two versions of this Pro Mini Arduino. First, Arduino Pro mini that runs at 3.3V and 8 MHz, the second, runs at the voltage level at 5V and 16 MHz [4].

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Figure 2. Arduino Promin

### 3. METHOD OF SYSTEM.:

In the design of the system there is a comprehensive part of the section to facilitate the work of the equipment. In the monitoring system and BLDC motor speed control, a speed sensor is used as input for the microcontroller and a potentiometer as a BLDC motor speed control. At the time the resistance value of the potential decreases, the motor speed will increase. The results of the BLDC motor speed will be displayed on the LCD display.

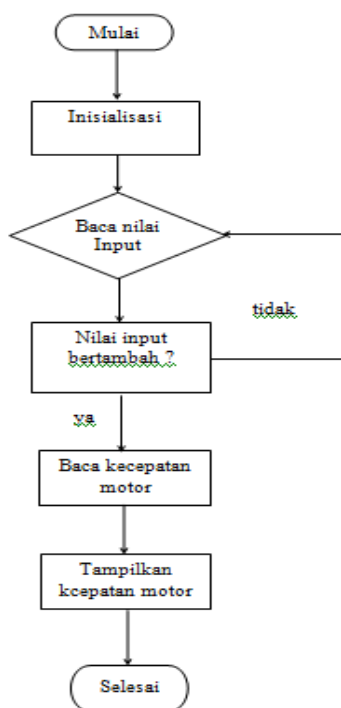


Figure 3. . Flowchart System

In the Flowchart there is a program flow process in carrying out a series of tasks to match the expected results. In making this tool there is a groove stage starting from reading the value of the sensor in the form of voltage as input then reading the speed of the rotating motor.

Start means that the power supply is connected to the source, Initialization means that for accurate sensor readings, the speed is set with the initial condition of 0, or  $V = 0$ , and then perform the test as needed then go to the speed sensor. Read the Input value which means what is meant here is the Speed Sensor, which reads the value of the motor speed by the speed sensor. If the input value is not increased, it will be repeated back to the speed sensor to read. And if the input value increases by the speed sensor, the microcontroller will read, and then after the microcontroller reads the motor speed, the motor speed will be displayed on the LCD.

**4. ANALYZED RESULTS:**

Microcontroller testing with the determination of the life of the LED on the microcontroller. The results displayed on the test circuit above the Led will light up periodically every 1 second. The following is a picture of the results of the tests carried out.

**Table 2. Results of microcontroller testing**

No	Times (second)	Status Led
1	1	On
2	2	Off
3	3	On
4	4	Off
5	5	On



**Figure 4. Testing of Wire**

The picture above is testing the microcontroller, which is by turning off the LED's life on the microcontroller every second. The picture above explains that the test when the microcontroller LED lights up.

In the table above there are 6 experiments in units of rad / s for 6 different types of voltage in each voltage to be carried out in the average value in the experiment to get a fixed value of each voltage. The experiment is done by adjusting the potentiometer and the voltmeter will show the output voltage. And the LCD will show how much the motor speed (rad / s). After that, you will get 6 times the motor speed with different results. From the experiments conducted, we will get the average speed of the motor in rad / s.

**5. CONCLUSION:**

From the research that has been done, it can be concluded that the Arduino-based control system implemented can work as planned.

1. Monitoring the Arduino-based BLDC motor speed
2. Control the speed of the BLDC motor by regulating the input voltage through the potentiometer installed in the research tool
3. Make a practical tool to determine the rotation speed of Arduino-based BLDC motors.
4. The speed sensor can only read motor speed up to 3000 rad / s (potentiometer at medium position).

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