

# Under voltage and Overvoltage Fault Protection of Motor Using Microcontroller

Prof. Rahul Ghanmare<sup>1</sup>, Mr. Akash Itankar<sup>2</sup>, Mr. Joshua Daniel<sup>3</sup>, Mr. Pavan Gedam<sup>4</sup>, Ms. Pranali Dharmik<sup>5</sup>  
<sup>1,2,3,4,5</sup> Department of Electrical Engineering, DBACER, Nagpur University

**Abstract-** Industry without motor we cannot imagine. For smooth working of that motor there must zero fault condition but practically this not happen. In the motor broadly the faults are classified into two category external and internal faults. Due to environmental condition the external faults may be occur while the internal faults are due to circuit faults. This paper provides an overview of the internal faults of the motor. While considering the internal faults on faults related to the voltage are considered for the hardware implementation. At normal voltage level the motor work smoothly but if the voltage level goes up or down may cause faults in the motor. There are two conditions of the voltage one is overvoltage and another is under voltage. The overvoltage in motor occurs due to overloading of motor. For controlling of the faults relay is used which sensing the faulty condition. This operation is monitored by the Microcontroller. In the protection scheme ARDUINO Nano controller in used.

moisture will affect the performance of induction motor. Vibrations of machine, due to any reason such as installation defect, foundation defect, etc. This protection system is use to control the overvoltage and under-voltage faults by using microcontroller and sensor.

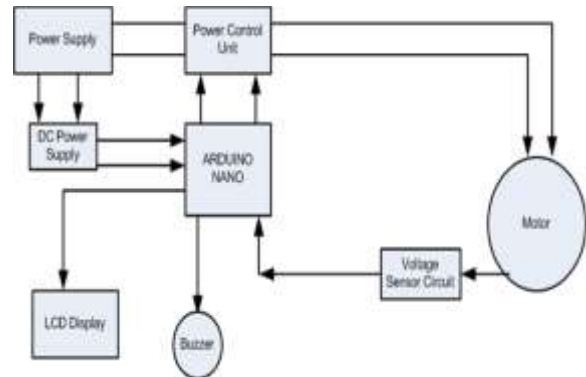


Figure: - 01 System Block diagram

## INTRODUCTION

This paper is about the fault occurring in motor. Motor is the backbone for every industry. However like any other machine, they will eventually fail because of heavy duty cycle, poor grounding environment, installation and manufacturing factors etc.

Normally in the motor the faults are cause due to electrical circuit problem, working that is mechanical problems and working condition of the motor. Electrical-related faults: Faults under this classification are unbalance supply voltage or current, single phasing, under or over voltage of current, reverse phase sequence, earth fault, overload, inter-turn short-circuit fault, and crawling. Mechanical-related faults: Faults under this classification are broken rotor bar, mass unbalance, air gap eccentricity, bearing damage, rotor winding failure, and stator winding failure. Environmental-related faults: Ambient temperature as well as external

## BLOCK DIAGRAM

The system block diagram mainly consists of Arduion Nano, voltage sensor, LCD display, and power control unit and power supply.

Arduino Nano: - Arduino Nano is a small, compatible, and flexible and breadboard friendly Microcontroller board, based on ATmega328p. It comes with exactly the same functionality as in

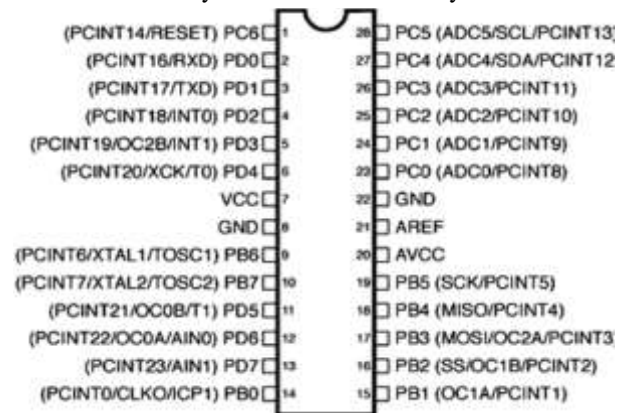


Figure:-2 Pin Diagram of Arduino Nano  
 Arduino UNO but quite in small size. It comes with an operating voltage of 5V, however, the input voltage can vary from 7 to 12V.

Arduino Nano pin diagram contains 14 digital pins, 8 analog pins, 2 reset pins & 6 power pins each of these Digital & Analog Pins are assigned with multiple functions but their main function is to be configured as input or output.

DC power circuit:- For rectifier circuit diode is used. In circuit diode 1N4007 diode is used. The basic function of the diode is allow the current flow in Anode to cathod direction. The cathod terminal is identified by ring of grey in colour.

Voltage monitoring relays are the protective relays which is operated automatically when any one of the phases of the supply is faulty. The relays are operated under abnormal condition, defined under voltage value and per defined percent of phase imbalance to protect equipment against voltage fault conditions.



Figure:-3 VOLTAGE DETECTION SENSOR  
 The above pictorial diagram shows the module which is used a voltage divider to reduce an input voltage. In this system 25V voltage is allow to use the analog input of a microcontroller ATmega 328p to watch voltage higher than its capable of sensing

Function of sensors:- Sensors are basically a device which can sense or identify and react to certain types of electrical or some optical signals.

Implementation of voltage sensor and current sensor techniques has become an excellent choice to the conventional current and voltage measurement methods.

A voltage sensor can in fact determine, monitor and can measure the supply of voltage. It can measure AC level or/and DC voltage level.

Both faults that is under and voltage faults are occur due to improper voltage level. Under voltage is due to variation in the supply voltage, which will cause

excess amount of line current which is responsible for the increase in temperature of the winding while overvoltage causes stress on insulation. This faulty condition is eliminated by using over and under voltage relays.

Power control unit: what ever the faulty condition occur in the system this unit closed the power supply the motor.

LCD display: It is used to see the value of the voltage on the screen. This is help to monitor the working voltage value. For alert the buzzer is used. This alarm system operated under and over voltage condition.

### RESULT

Hence Overvoltage and under voltage Fault protection of motor is successfully overcome by using voltage monitoring relays.

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