

IOT BASED MOTOR MONITORING AND SPEED CONTROL OF SINGLE-PHASE INDUCTION MOTOR

ABSTRACT:

This IoT-based system for real-time monitoring and control of a single-phase AC induction motor leverages an Arduino Uno as the central controller, interfaced with various essential components. The system integrates an LCD display for immediate feedback, a Wi-Fi module for remote access and management, and a PZEM module to monitor electrical parameters such as voltage, current, and power. A temperature sensor tracks the motor's thermal conditions, while a IR sensor provides accurate rotational speed data. Additionally, a relay facilitates motor operation control. This comprehensive setup ensures efficient, remote management and operational reliability, enhancing motor performance and safety through continuous, data-driven insights.

INTRODUCTION:

The rapid advancement of Internet of Things (IoT) technology has enabled enhanced monitoring and control capabilities for various electrical devices. This project presents an IoT-based system designed for the real-time monitoring and control of a single-phase AC induction motor using a combination of Arduino Uno, LCD display, Wi-Fi module, PZEM module, Temperature sensor and IR sensor. The primary objective of this system is to provide an efficient and user-friendly solution for managing motor performance and power consumption.

The Arduino Uno serves as the central microcontroller. PZEM module is used to measure the voltage, current, vibrations, active power and power of the AC induction motor. IR sensor is used to measure the speed of the AC induction motor. Temperature DS18B20 sensor is used to measure the temperature of AC induction motor. All these sensors along with motor connected to the Arduino microcontroller to collect data on the motor's operational parameters will be displayed onto the LCD module and also will be upload into the Thingspeak cloud along with date and time through ESP8266 WI-FI module. If the Arduino detects high temperature, the motor supply will be automatically cut OFF using Relay. Here relay works as a switch to cut OFF

the supply of the motor. This system provides a robust and scalable solution for industrial and residential applications, demonstrating the potential of IoT in optimizing motor management and contributing to energy conservation efforts. To achieve this task Arduino loaded program written in embedded C language.

Problem: Single-phase induction motors, widely used in industrial and residential applications, often face challenges in terms of real-time monitoring and control. Traditional systems may lack the capability for remote management, making it difficult to promptly address issues such as overheating, electrical faults, or performance inefficiencies. This can lead to unexpected downtime, increased maintenance costs, and reduced operational efficiency. Additionally, without real-time data, operators may struggle to optimize motor performance and prevent potential failures.

Solution: The proposed IoT-based system addresses these challenges by integrating an Arduino Uno with a range of sensors and modules to provide comprehensive real-time monitoring and control. The PZEM module tracks critical electrical parameters, such as voltage, current, and power, while the temperature sensor monitors the motor's thermal state, and the IR sensor measures rotational speed. The LCD display offers immediate feedback on these metrics, and the Wi-Fi module enables remote access, allowing operators to monitor and control the motor from anywhere. The relay system enables precise control over the motor's operation, facilitating timely responses to any detected issues. This integrated approach enhances operational efficiency, reduces downtime, and ensures proactive maintenance, ultimately leading to improved performance and reliability of the motor.

Features:

1. Tracks motor voltage, current, speed, temperature using DS18B20 sensor and power in real-time using sensors.
2. Shows data on LCD screen for immediate visual feedback.
4. Utilizes Wi-Fi for Thingspeakcloud connectivity and data transmission.
5. Records and displays operational parameters for analysis.
6. Relay Based switching mechanism.
6. Provides insights for optimizing motor performance and power usage.

The main blocks of this project are:

- Power supply.
- Arduino UNO.
- ESP8266 WI-FI module.
- LCD display.
- PZEM module.
- IR sensor.
- Buzzer
- Temperature DS18B20 sensor.
- Relay with driver.
- Single phase Induction motor.

Software's used:

1. Embedded C programming.
2. Arduino IDE compiler for dumping code into Micro controller.
3. Express SCH for Circuit design.

Block diagram:

