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Machine performance protection system for small Industries

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ABSTRACT—

it is to implement a affordable and effective protective system that to integrate with conventional machinery in small scale industries which is to provide workers safety and to prevent the accidents in the Industries. This system is used to identify the over voltage, under voltage, heat produced, to identify any disconnections in the machinery, to detect faults, to identify any other distortions, to turn on/off the machinery through wireless communication. This system is implemented in both communication and embedded technologies. This system theme is based on Rural & urban development/ Engineering technology.

Introduction

For safety concern, all electrical and electronic devices must be powered at some voltage limits voltage fluctuations in electricity may cause an effective changes in the connected loads. this is a major concern which may leads the machine to damage or the efficiency of the machine is can be reduced the safety and well being for workers in small scale industries, so to ensure the safety management system we implemented a system with cost effective and efficiency efficient machinery which is used to indicate the false like voltage fluctuations which may lead the performance of the machine make low, over voltage may damage the machine parts or may overload the machines. then to identify under voltage which make the machine run inefficiently and to detect the disconnections of the machine which may causes the workers electrical shocks by overcoming this problem the safety management system is proposed with detecting The over/under voltage voltage fluctuations and other distortions and by monitoring the performance of the machine the safety is improved and the performance of the machine is updated through wireless connection to the mobile phone and make the safety of the workers high in small scale industries.

LITERATURE SURVEY

As in small scale industries in machines, Arc Voltage will produced in low voltage alternating current system. It is a major concern which is should be detected. Some times the arc voltage is kept undetected which may cause fire and damage to machine and cause human accidents and the over/under voltage is some time may cause damage. By using PIC microcontroller it can be controlled but the cost of the system is high and the arc voltage and overvoltage and under voltage is a major concern so it must be rectified in real time.
The arc fault detection mainly focused only in arc voltage detection which leads to damage the machine. The arc voltage is detected by analysing different domains like time -frequency, frequency -time and by machine learning. While these methods improve detection accuracy, but it has several drawbacks like it cannot detect the arc voltage in real time and kept undetected for some times and by using the PIC microcontroller the high/low voltage can be detected. It concern a major drawback which has a high cost and complex construction. Then the conventional machine often lack in protection against over voltage, under voltage, over heating or unexpected faults which results in severe damage and safety hazards.

METHODOLOGY

To address the limitations of existing system the proposed system integrates an improved safety indication and control mechanism for machines used in small scale industries. The Address the challenges of arc fault detection and high low voltage deduction by integrating real time detection over voltage

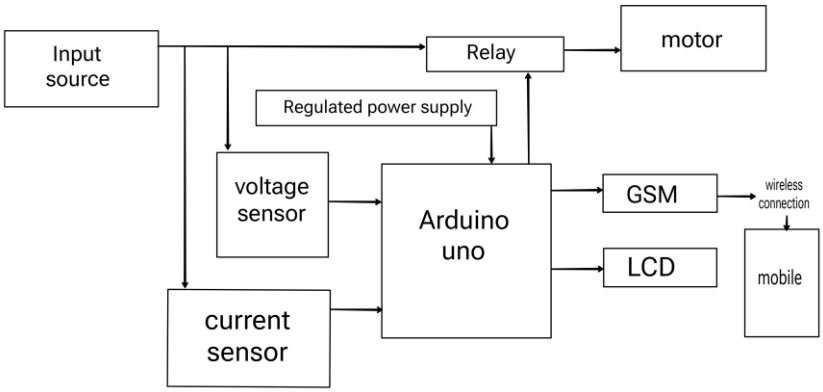
protection and, wireless monitoring, this system enhance safety, reduces accidents and improves the machine efficiency. The safety management system is cost effective and with real time safety measures force small scale industries

fig.1.block diagram

The block diagram illustrates the operation of a motor control and monitoring system. The input source provides the electrical power supply required for the entire setup, including the motor and sensors. This power is first regulated through a power supply unit to ensure a stable voltage suitable for the Arduino Uno and the connected sensors. Voltage and current sensors are used to monitor the input electrical parameters. The voltage sensor measures the supply voltage, while the current sensor tracks the current flowing to the motor.

These sensor readings are sent to the Arduino Uno for processing. The Arduino Uno serves as the central control unit of the system. It receives data from the voltage and current sensors and, based on the readings, makes decisions such as activating or deactivating the relay to turn the motor ON or OFF. It also generates status updates or alerts as needed. The relay, which is controlled by the Arduino, acts as a switch to control the motor's power supply. If abnormal readings like overcurrent are detected, the Arduino deactivates the relay to prevent damage to the motor.

The motor is the primary load device in this system and operates when the relay is engaged. To provide local monitoring, an LCD display is used to show real-time values of voltage, current, and the status of the motor. For remote monitoring, a GSM module is integrated into the system. It



communicates wirelessly with a mobile phone, sending SMS alerts or system updates. Finally, the mobile device receives these messages, allowing the user to monitor the system remotely and stay informed of its status.

Components:

Components used in system is the essential components to build the system

1. Arduino uno[smd ch340]: Arduino Uno [SMD CH340] is a budget-friendly version of the classic Arduino Uno board. A popular board for beginners, using the ATmega328P microcontroller. The microcontroller is soldered onto the board and can't be removed.CH340: A cheaper USB-to-serial chip.
2. SIM 800L*:* The SIM800L is a compact GSM/GPRS module that allows microcontrollers (like Arduino) to connect to mobile networks. It can be used for making Calls, sending SMS, and using mobile data (2G).
3. 2 ch relay module : The 2-Channel Relay Module is a simple and useful component that allows an Arduino (or other microcontroller) to control two high-voltage devices like lights, fans, or appliances.
4. Ac voltage sensor: An AC Voltage Sensor is a module used to measure alternating current (AC) voltage in a safe way and send the data to a microcontroller like an Arduino.
5. LCD: An LCD (Liquid Crystal Display) is a screen module used to show text, numbers, and symbols in Arduino and electronics projects.
6. Capacitor: A capacitor is a passive electronic component that stores and releases electrical energy.
7. Ic7805 regulator: The IC 7805 is a popular voltage regulator that provides a fixed 5V output, used to power microcontrollers and other 5V devices

Power supply circuit:

This circuit is a basic AC to DC power supply with an LED indicator. It begins with a 230V AC input, which is stepped down to a lower AC voltage using a transformer. A bridge rectifier then converts this AC voltage into pulsating DC. Next, a capacitor the pulsating DC to reduce ripple and produce a more stable voltage. This smoothed voltage is passed through a voltage regulator (like a 7805), which maintains a constant output voltage. The regulated DC output is used to power a load, which in this case is an LED with a 1K resistor to limit current. The LED lights up to show the circuit is working properly.

ELECTRICAL ACCIDENTS INDUSTRIES

In Industries electrical accidents are a major Concern which Causes fire and other accidents so to Rectify the electrical accidents a Safety management System should be developed.

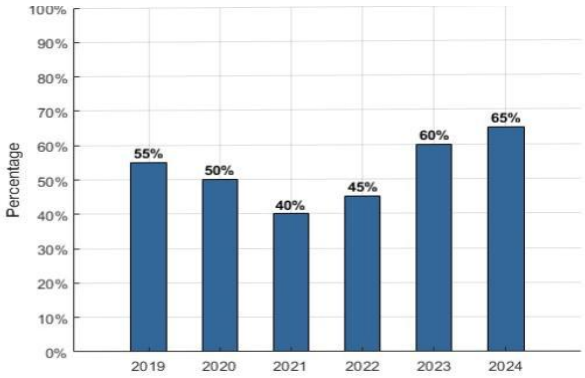


Fig.2 graph of electrical accidents

It's commonly used in 5000 lives per Year which leads the Workers safety by low and Facilities Loss is nearly 13 electrocution per day and the Average Electrical accidents are about Electrical accidents also leads to Productivity losses And financial consequences for the business. Electronics for filtering, smoothing timing, and coupling signals.

V.ADVANTAGES

- Increased Worker Safety: Reduces risks associated with electrical faults and machinery failures.
- Real-Time Monitoring: Allows continuous supervision of motor conditions.
- Improved Efficiency: Wireless control enables rapid response to faults, minimizing downtime.

VI.RESULT & CONCLUSIONS

The expected result is to detect the Voltage detection, to detect faults, to detect heat energy and to detect other dissortions.

In conclusion, the proposed safety indication and control system for motors in small-scale industries provides a practical and efficient solution to the prevalent safety challenges posed by conventional machinery. By incorporating real-time fault detection, overvoltage protection, and wireless control capabilities, the system not only enhances worker safety but also improves the operational efficiency of industrial setups. The integration of embedded and communication technologies ensures minimal downtime and maximum protection with cost-effective implementation. This project stands as a significant step toward modernizing traditional industrial environments with smart, responsive safety mechanisms tailored for small industries.

VII.OUTPUT COMPARISON

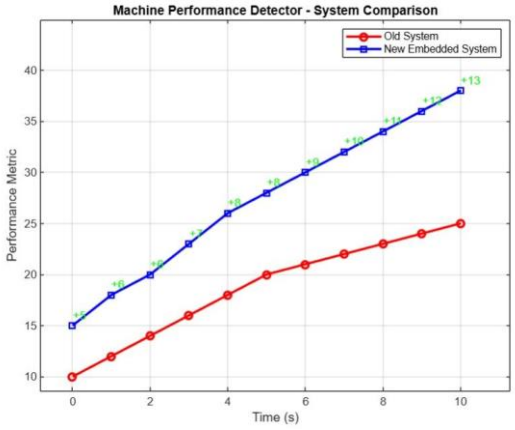


fig.3.Outpu graph

This System has higher efficiency and higher real time voltage detection compared to the existing system. Which has a low efficiency and lack in real time fault detection. This System integrates with compact equipment and a cost effective system to detect the faults like voltage detection and other disconnections. It also integrates with voltage optimization for required
machinery in the industry which is compact and portable.

Reference papers from journals:

- Low voltage alternating Current series arc fault detection using periodic background subtraction and linear dividing lines: this paper is based on the method detecting the arc voltage and to indicate the problem it is published in IEEE journals on 2024.

- Over voltage and under voltage protection system using IoT: it is a voltage detection system method by using the IoT application which is published on 2022.

- Development of an under voltage & over voltage device using PIC microcontroller : it is a high and low voltage detection method which is build by the PIC microcontroller. It is published on (2022).

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