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Automatic Threading and Metal Cutting in Smart Industries Using IoT

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Abstract. The key objective of the project is to automate an industrial process of threading and metal cutting. The main objective of the project is that it uses IOT in industries with Artificial Intelligence to monitor and control the industrial processes thus increasing productivity and to reduce cost and man power. The system uses a microcontroller for processing all user commands and EEPROM chip to save data. Digital voltmeter, ammeter, wattmeter and IR cam etc., can be linked to the same IOT device without any additional circuits.

Keywords. IOT, RFID, WIFI module.

1. Introduction

In recent years industrial IOT applications have been developed and implemented effectively. It begins with Radio Frequency Identification (RFID) technology, which allows microchips to transmit the identification information through wireless communication to a reader. With the help of RFID readers, people track and monitor automatically using RFID tags. Wireless sensor networks (WSN) helps to interconnect the suitable sensors to sense and monitor the processes like environmental monitoring, industrial monitoring and traffic monitoring. The upcoming technology is the combination of Industrial Internet Of Things (IIOT) with Artificial Intelligence (AI). IIOT is the best way of connecting industrial hardware and sensors, to collect information from these connected devices to process data in a useful way by internet. [2]IOT supports data accession, collection, interpretation, and visualization. IOT includes computers, intelligent devices, wired and wireless communication and cloud computing. RF (radio frequency) and Bluetooth technologies are used to control and monitor the industrial applications manually but the major drawback is, it cannot cover wide range and operator should be in that particular range. In this proposed paper short distance communication using IOT is carried out in industrial environment from anywhere in the world.

2. Existing Methods

In the existing system, all machines are operated by person and at the same time it is monitored by them. All meter readings are recorded in manual method.In industries, traditional method is followed to count the number of production rate as they are pasting bar code in every product and the bar code is scanned to count the number of products produced per day, by doing this, the production rate is viewed.

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3. Proposed System

A mobile app is developed to control and monitor. This app contains many modules namely OPS (Overload Protection Services), PCR (Power Consumption Recorder), Timer, Scheduler, etc.[1] This mobile app is connected to the microcontroller board over internet. Through GUI (Graphical User Interface) the program in microcontroller is changed for real time status. And thus, the modem decodes information and transfers it to the microcontroller for further processing. These relays operate in a range of 10A-15A. Here, machines are designed to run on specific RPM (Rotation Per Minute) with +/- 30V from 220V. So small change in volt up to 30 has no effect.

3.1. Major Units

3.1.1. Distribution Unit

The work piece which are to be supplied to different units are collectively available in this units. The work piece is supplied to the respective unit through conveyor belt. The iron & steel plant in the form of metal sheets with size ranging from 5mm to 10mm as lot depending upon requirements or Car Company.

3.1.2. Metal Cutting Unit

The metal sheets are cut in required size using metal cutter machine then the corners are grinded for smooth finishing. Door is made in which a multitude of panels each is split in two or three parts and braces will be either welded or bolted.

3.1.3. Specifications

1. Supply Input: 230V AC
2. Load: up to 500W

3.1.4. Threading Unit

As assembly area is the threading unit of workers to assemble all the instrumentation materials like interior lights, door and trim panels, wiring systems, seats, and glasses where the threading takes place.

3.1.5. Testing Unit

In this way the assembly plants can predicts that the products arriving at their receiving ends are Statistical Process Control approved. In advanced assembly plants has small RF transponder that is attached to the floor pan and chassis.

3.2. Working of Proposed System

Here in proposed system[2] the metal cutting and threading unit is controlled and monitored using IOT. As the mobile app is interfaced with the loads any input can be given in the mobile app itself. The input is received by the Wi-Fi antenna in the microcontroller board then it is sent as a command to microcontroller.

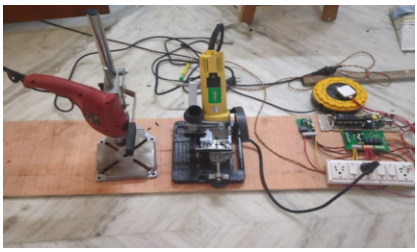

Figure 1. Working of proposed system

After producing output, the output data is transmitted to memory through the Wi-Fi antenna of microcontroller board. Then, this output data is received and shown in the display of mobile app.

3.3. System Framework

The Amazon AWS is used to store or send data; the user can operate from any place since cloud server is used. Through LTE modem the data is connected to the router which in turn connected to the Wi-Fi module. An IP (Internet Protocol) address or FQDN (Fully Qualified Domain Name), The biggest advantage of this system is the user can operate from any location. If the user is near the load, local intranet can be used. If the user is far away from the load, cloud server can be used to operate the loads.

3.4. Number of Input /Output

- *Input:* Input Single input power supply of 230 V
- *Output:* one output from threading machine controller another from metal b cutting machine controller.

3.5. Factors to be controlled

1. Power
2. Voltage
3. Energy

4. Software Description

4.1. PCR Module

In PCR module the recorded data can be imported to android mobiles over Wi-Fi network/4G. The data will be saved to download folder in .csv file which can be opened using MS excel for detailed analysis.

4.2. OPS Module

Maximum current, maximum power, minimum power values can be set here to protect the loads. OPS module executes itsfunction before operating the relays. So, the relays switch according to the set value.

5. Hardware Description

5.1. IOT Main Board

In the IOT main board we have use the model of 6F5CN74639.

5.2. Metal Cutting Machine Controller

This circuit controls the output of the AC motor linked to[2] the IOT device. Once user command is received from App signal is sent to the microcontroller and motor start rotating.

5.3. Screw threading machine controller

This circuit has two parts. One will control High Torque 12v Dc motors and the second will control AC motor linked to the IOT device.

5.4. LM324N Circuit

LM324N operates on a single power supply and with wide range of voltages. The amplifier goes to ground and it also allows direct sensing ground. LM324N is suitable with all forms of logic circuits.

5.5. CEP50N06

Zit is an N-Channel HEXFET Power MOSFET that comes in a TO-220AB package and operates on 55V and 110A. Here in this project IRF3205 is used since it falls under the category of ultra-LOW on-resistance. Fast switching rate and operating temperature around 175°C.

6. Results and Discussion

Table 1. Result Value

Factor	*Expected Output*	*Existing*	*Proposed*
Threading	*5mm*	*5mm+/- 1mm*	*5mm*
Voltage	*Auto off if V>250*	*240+/- 20*	*240-250*
Total Load	*Auto off if P>2500*	*2500-/- 1000*	*2500*

From the table we come to know that the expected value in order to increase the efficiency is achieved.

Figure 2. Output of Screw Threading

Figure 3. Output of Screw Threading

7. Conclusion and Future Scope

With appropriate measures this will fulfill our requirement partially. Sometimes there will be delay in this process and it will harm to the property and life, if any malfunction occurs on Motors or sudden High short circuit in power line which leads to fire. To overcome the existing drawback a new system is proposed for metal cutting and screw threading. Using IOT and Artificial Intelligence, intelligent decisions are made in the Industrial Automation.

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