

Automatic Monitoring and Control of Parameters in a DC motor

Preethi.R¹, Dhivya.N², Malathi.G³, Rajesh.K⁴

¹ PG Student Knowledge Institute of Technology, Kakapalayam, Salem.

² Assistant Professor Knowledge Institute of Technology, Kakapalayam, Salem.

³ Assistant Professor, Knowledge Institute of Technology, Kakapalayam, Salem.

⁴ AGM Electrical and Electronics, Steel Authority of India Limited, Salem.

Abstract: At present, industries are increasingly shifting towards automation. Today's industrial automations mostly based on programmable controllers and robots. In order to do the tedious work and to serve the mankind, automation is developed in industries. In this project the automation work is done in DC motor for monitoring and controlling the temperature. In the existing system, the work is done with the help of man power, where every time a person wants to monitor the temperature of the DC motor. If the temperature increases in the coil of DC motor the insulation coil will get fail and the machine gets stopped. To avoid this, the cooling fan is turned ON manually. In the proposed system monitoring and control of parameters in DC motor.

Key words: ARM1, Temperature sensor2, Cooling fan3, RS 2324.

1. Introduction

Now a day's there is advancement in technologies, in order to reduce the man power in industries, the industries are shifted towards automation. In the existing system, temperature was monitored manually; this manual monitoring can lead to in accuracy. The temperature of the cooling fan should maintain to 50° when the hot rolling mill is in stop condition. When the hot rolling mill is running the temperature of the coil should be maintained as 75° to 80°Celsius. If the temperature exceeds these level the insulation coil of the DC motor will get fault, so the cooling fan is turned ON to maintain the temperature of the coil of DC motor.

The process will be stopped, if the fault occurs in the coil of the DC motor. The coil in the DC motor is used for the insulation purpose. In the proposed system, this

was done automatically by using the ARM processor. The temperature sensor is used to monitor the temperature of the coil of the DC motor. ARM processor is used to control the process.

The RS232 is used to connect the processor with the PC to store the database of the temperature. The temperature was being monitored using the ARM Processor. The USLOT sensor is used to measure the speed of the DC motor. The pulse generated from the DC motor is used to measure the current. These measurements are used for the database. The database is used for monitoring the performance of the DC motor.

2. Literature Survey

[1].Md.MurshadulHoque describes in this paper the electrical device can able to control the input voltage as well as power. This control is done not only by the manual method but also through the automatic system. In the existing system most of the devices are controlled only through the manual method. In order to get the accurate result the voltage control technique is used to control the power to the electric devices. The output will vary depending on the variations in the surrounding temperature. The relay is connected to regulating coil to control the output voltage as well as power.

[2].In the paper [1] the temperature of the electrical devices was controlled by using the voltage control technique. In this paper Bogdalevarda describes, the temperature of the motor is controlled by using the PID controller, in this the PID controller offers the zero steady

state error if the load disturbances entered. It reduces the motor speed and save power.

[3].In the paper [2] the PID controller is used and it was not cost effective. In this paper Huang wen-tian, describes the temperature of the motor is monitored by using the LCD. If the temperature of the DC motor is increased the alarm will be indicated. The preset value of the temperature and time was displayed in the LCD display. It helps to monitor the condition of the DC motor regularly.

[4].In this paper [3] the temperature of the DC motor was only monitored and alarm will be indicated. In this paper PriyankaTupe describes the temperature of the DC motor will exceed the normal level, by using the relay the DC motor will be stopped and then the motor is reset to the initial condition. The motor is stopped, so there is a delay will occur and the production will be stopped.

[5].In the paper [4] the temperature of the DC motor was increased the relay is used to stop the motor. In this paper CH.Mounika describes, the LM35 integrated precision temperature sensor is used to measure the temperature of the DC motor. In this the output voltage is directly proportional to the Celsius temperature. The temperature conversion is done by using the ADC and transmitted by other node by using the CAN bus. The PWM technique is used to regulate the speed of the DC motor. In this the cooling device is connected, to control the temperature.

In existing system the temperature of the coil of the DC motor is monitored manually. The insulating coil is present in the center of the DC motor, if the temperature gets increased to 50 degree the insulation coil will be damaged and function of the machine will be stopped. This 50 degree is maintained when the rolling mill is in stop condition.

3. Block diagram

In proposed system the temperature will be monitored and controlled using the temperature sensor. Thermistor is used to measure the temperature. The relay is used to switch ON the cooling fan automatically when the temperature is increased. The current and the speed of the DC motor can be obtained. The speed is calculated using USlot sensor. The current and the voltage can be measured

by the pulse generated from the DC motor. The temperature, speed and DC voltage and current measurement are stored as a database in PC. RS232 is used as an interfacing with PC and the ARM.

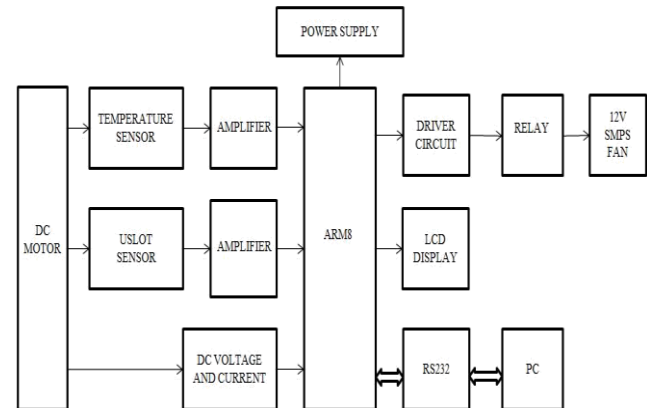


Figure1. Block diagram of Automatic Monitor and Control in DC motor.

4. Block Diagram Explanation

In this project work, the temperature sensor is used to measure the temperature of the coil of the DC motor. The signal from the temperature sensor is amplified by using the amplifier. The USlot sensor is used to measure the speed of the DC motor. The DC current and voltage is measured by the pulse generated from the DC motor. The signal from the amplifier is given to the ARM processor, the processor process the signal. The driver circuit is used to control the components in the circuit. If the temperature of the coil is increased to 50° when the hot rolling mill is in stop condition, the cooling fan is turned ON. The RS232 is used as an interfacing unit. PC is used to display the simulation result.

5. Hardware Description

5.1DC Motor

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. The internal

configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

5.1.1 Separately Excited DC Motor

The separately excited DC motor is excited by a field current and an armature current of flows in the circuit, the motor develops back emf. The field current is independent of the armature current. Each winding are supplied separately, any change in the armature current has no effect on the field current. The field current is normally much less than the armature current.

5.2 Temperature Sensor

A temperature-sensitive resistor is called a thermistor. The resistance of most common types of thermistor decreases as the temperature rises. A typical negative temperature coefficient thermistor is made using semiconductor metal oxide materials. As the temperature rises, more charge carriers become available and the resistance falls. Although less often used, it is possible to manufacture positive temperature coefficient, thermistors. These are made of different materials and show an increase in resistance with temperature.

5.3 U SLOT Sensor

The circuit is designed to monitor the speed of the motor. The holes type pulley is attached in the motor shaft. The pulley is rotated across the USLOT. The USLOT consists of IR transmitter and receiver. Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other.

5.4 ARM

ARM is a family of instruction set architectures for computer processors based on Reduced Instruction Set Computing(RISC) architecture developed by British company ARM Holdings. A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical CISCx86 processors in most personal computers. This approach reduces costs, heat and

power use. A simpler design facilitates are more efficient in multi-core CPUs and higher core counts at lower cost, providing improved energy efficiency for servers.

5.5 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism, but other operating principles are also used. Relays find applications where it is necessary to control a circuit by a low-power signal, or where several circuits must be controlled by one signal. Relays found extensive use in telephone exchanges and early computers to perform logical operations.

A type of relay that can handle the high power required to directly drive an electric motor is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device triggered by light to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protection relays.

5.6 LCD

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly. They are used in a wide range of applications including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. LCDs have displaced cathode ray tube displays in most applications. They are usually more compact, lightweight, portable, less expensive, more reliable, and easier on the eyes. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they cannot suffer image burn-in.

5.7 RS232

In telecommunications, RS-232 is a standard for serial binary data interconnection between a DTE (Data terminal equipment) and a DCE (Data Circuit-terminating

Equipment). It is commonly used in computer serial ports. The standard does not define such elements as character encoding or the framing of characters in the data stream. The standard does not define protocols for error detection or algorithms for data compression.

6. Flowchart and Algorithm

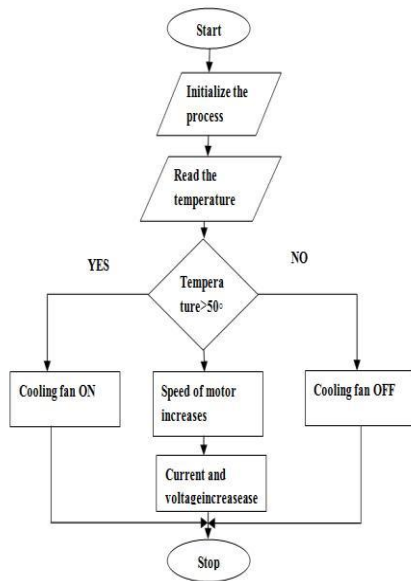


Figure2. Flow chart for Automatic Monitor and Control in DC motor.

Step1: Start the process

Step2: Initialize the process

Step3: Read the temperature from the temperature sensor

Step4: If the temperature is greater than 50°the speed, current and voltage increases

Step5: The cooling fan will be turned ON to reduce the temperature

Step6: Stop the process

7. Software Description

LabVIEW programs are called virtual instruments, or VIs, because their appearance and operation imitate physical instruments, such as oscilloscopes and multimeter. LabVIEW contains a comprehensive set of tools for acquiring, analyzing, displaying, and storing data, as well as tools help to troubleshoot code.

In LabVIEW, it can used to build a user interface, or front panel, with controls and indicators. Controls are knobs, push buttons, dials, and other input mechanisms. Indicators are graphs, LEDs, and other output displays. After the user interface is build, the coding will be added by using VIs and structures to control the front panel objects. The block diagram contains this code. LabVIEW can be used to communicate with hardware such as data acquisition, vision, and motion control devices, as well as GPIB, PXI, VXI, RS232, and RS485 instruments.

8. Simulation Result

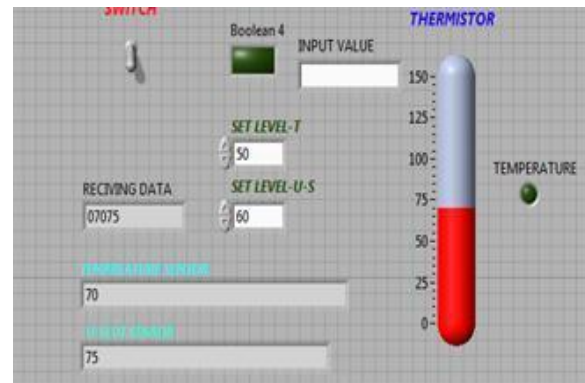


Figure 3.Temperature measurement using LabVIEW

The Figure 3 shows the simulation result from the LabVIEW, it represents the temperature of the coil of the DC motor.

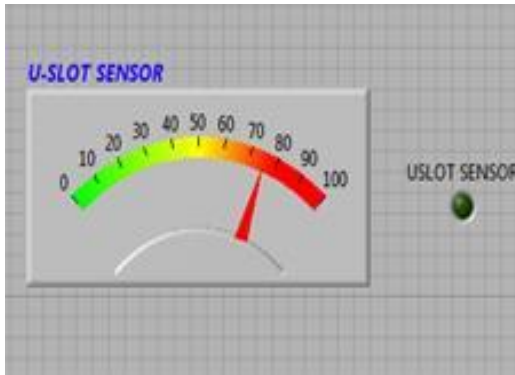


Figure 4. Speed measurement using LabVIEW

The Figure 4 shows the simulation result from the LabVIEW, It represents the speed monitoring in the DC motor.

9. Conclusion

In this work, the automatic monitor of temperature in DC motor is done and is implemented using the LabVIEW. This help to reduce the man power and save the time. In future work, the database will collect and store in PC by using LabVIEW and the graphical representation will be help to monitor the conditions of DC motor. The speed of the cooling fan is controlled according to the temperature of the DC motor. The speed of the cooling fan can be controlled by using the relay.

REFERENCES

- [1]. MurshadulHoque Md. and SharifulAlam, "A Temperature Based Automatic Power Controller for Electrical Devices", International Journal of Advanced Science and Technology Vol.63,(2014).
- [2]. Bogdalevarda and Cristina Budaciute, "Design of Temperature Control System using PIC18F4620" International Computer Science and Technology Conference 2010.
- [3]. HuanWen-tian, "Design of intelligent temperature control system", Second International work shop on Education Technology and Computer Science Education 2010.
- [4]. Salim, Sunil Kumar, "LabVIEW based DC motor

and Temperature Control Using PID controller", International Journal of Advanced Research in Computer Science and Software Engineering Vol.3, Issue 5, 2013.

- [5]. HuiChen, "Resistance Temperature Characteristics Measurement System for Automotive Temperature Sensor Based on μ C/OS-II", International Conference on Information Science and Technology March 26-28 Nanjing, Jianguo, china.
- [6].
- [7]. CH.Mounika, K.S.Roy, MahaboobAli "Motor Speed Control Based On Temperature Using CAN Protocol", International Journal of Engineering Trends and Technology Volume4Issue4- April 2013.

BIOGRAPHIES



R.Preethi is pursuing, PG in the discipline of Embedded System Technologies at Knowledge Institute of Technology, Salem, under Anna University, Chennai, India. She received her UG degree in the discipline of Electronics and Communication Engineering at Vivekananda Institute of Engineering and Technology for Women under Anna University, Chennai, India .She has published and presented a number of technical papers in National Conferences and Technical symposiums. She is the Vice president of Embedded Club at Knowledge Institute of Technology, Salem. She is highly appreciated by the Head of the Department.



N.Dhivya is currently working as an Assistant Professor in the Department of Electrical and Electronics Engineering at Knowledge Institute of Technology, Salem. She received her UG degree in the discipline of Electrical and Electronics Engineering from Nandha Engineering College under Anna University, Chennai and got PG degree in Embedded System Technologies discipline from Vellalar College of Engineering and Technology under Anna University, Chennai. She has presented papers in National and International level conferences. She has guided number of project for students. Her research interests lie in the field of Embedded System.



G.Malathi is currently working as an Assistant Professor in the Department of Electrical and Electronics Engineering at Knowledge Institute of Technology, Salem. She received her UG degree in the discipline of Electrical and Electronics Engineering from Sona College of Technology under Anna

University, Chennai and got PG degree in Power Electronics and Drives discipline from KSR College of under Anna University, Chennai. She has presented papers in National and International level conferences. She has guided number of project for students. Her research interests lie in the field of Embedded System.



K.Rajesh is currently working in Salem Steel Plant as an AGM in the department of Electrical and Electronics. He received his UG degree in Government Engineering College, Trissur, Kerala under the University of Calicut. His discipline in UG is B.Tech (Electrical and Electronics). He has 19 years of

working experience in SAIL