

AUTOMATION IN FURNACE IN COMBINATION WITH IOT

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ABSTRACT

Nowadays we all use electric furnaces for heat treatment. When we work in this furnace, it involves putting a piece of work in the furnace by hand. To achieve various mechanical properties, set the correct temperature and time and then periodically inspect the inside of the furnace and remove the work piece when the process is complete. All these processes are done manually. After the heat treatment process is completed, the work piece must be cooled to obtain the required physical properties and mechanical properties such as stiffness, strength, elasticity, etc.

To automate all of the above operations using the forklift mechanism which will be useful in automation of operations. Also the quenching process is carried out automatically with the help of rack and pinion system. We're using the ESP8266 node MCU Wi-Fi model and the Arduino board to keep the Internet of Things afloat if the furnace is off at night. After this we can control the furnace via mobile. In this we are monitoring and controlling the furnace directly via mobile using various sensors like thermocouple, proximity, thermistor and IR sensors. With this we have been able to overcome the cause of the furnace malfunction, all this we have done with the help of the Internet of Things (IOT).

Keywords: IoT, Sessors, Actuators, Wi-fi, MCU

PROBLEM STATEMENT

A variety of knives and blades are manufactured at Omkar Engineering Works. These blades must have mechanical properties such as high stiffness, high strength and high wear resistance. Blades and knives are hardened to achieve these desired properties. An induction furnace is used to harden knives and blades. In the hardening process, the components are heated and then quickly cooled using oil quenching for the purpose of cooling the material.

When handling materials in the company for heat treatment of steel, the material is brought from the raw material storage place to the heat treatment furnace, after which the material is loaded into the furnace. And finally after the heat treatment process is completed it is taken out of the furnace, and immersed in oil. All these processes are done by hand. In this project we will create automated material handling process to eliminate some of the disadvantages through manual handling.

Existing method:

All this process is carried out manually in 3 stages which consists of:

- Feeding of material: Placing him material into the furnace with proper arrangement.
- Removing of material: Taking out the heat treated material from the furnace for further processing.
- Quenching of material: Rapid cooling of heated material into oil to obtain required material properties.

Disadvantages of manual processing are dangerous for the workers and the company environment, they provide the same strength and rigidity to the components but it is impossible to get the data in real time for the purpose of improvement. We know that any heat treatment process takes 4 to 5 hours of operation to reach its specified temperature. The company needs automation to use night work hours and improve productivity.

OBJECTIVE

The objective of this project is to overcome the problems faced by industry while heat treatment process. The main objectives of the project include. The purpose of this project is to overcome the problems faced by the industry during heat processing. The main objectives of the project include:

- Automation of operations: The main objective of the project is to automate operations to reduce human error.
- Safety of workers: One of the main objectives of the project is to provide protection to workers from fire hazards.
- Improved quenching: uniform heating and cooling of the material. Improving quality with proper mitigation and proper handling of materials.
- Reduce labor costs.
- Increase productivity: Earlier the company was working in only two shifts. So this project has now succeeded in starting the night shift. As a result, the company's productivity has increased.
- Supervisory control operations: Supervised control via IOT directly via mobile application.

Data Collection and Storage: With the help of IOT, real time data and storage can be obtained.

METHODOLOGY

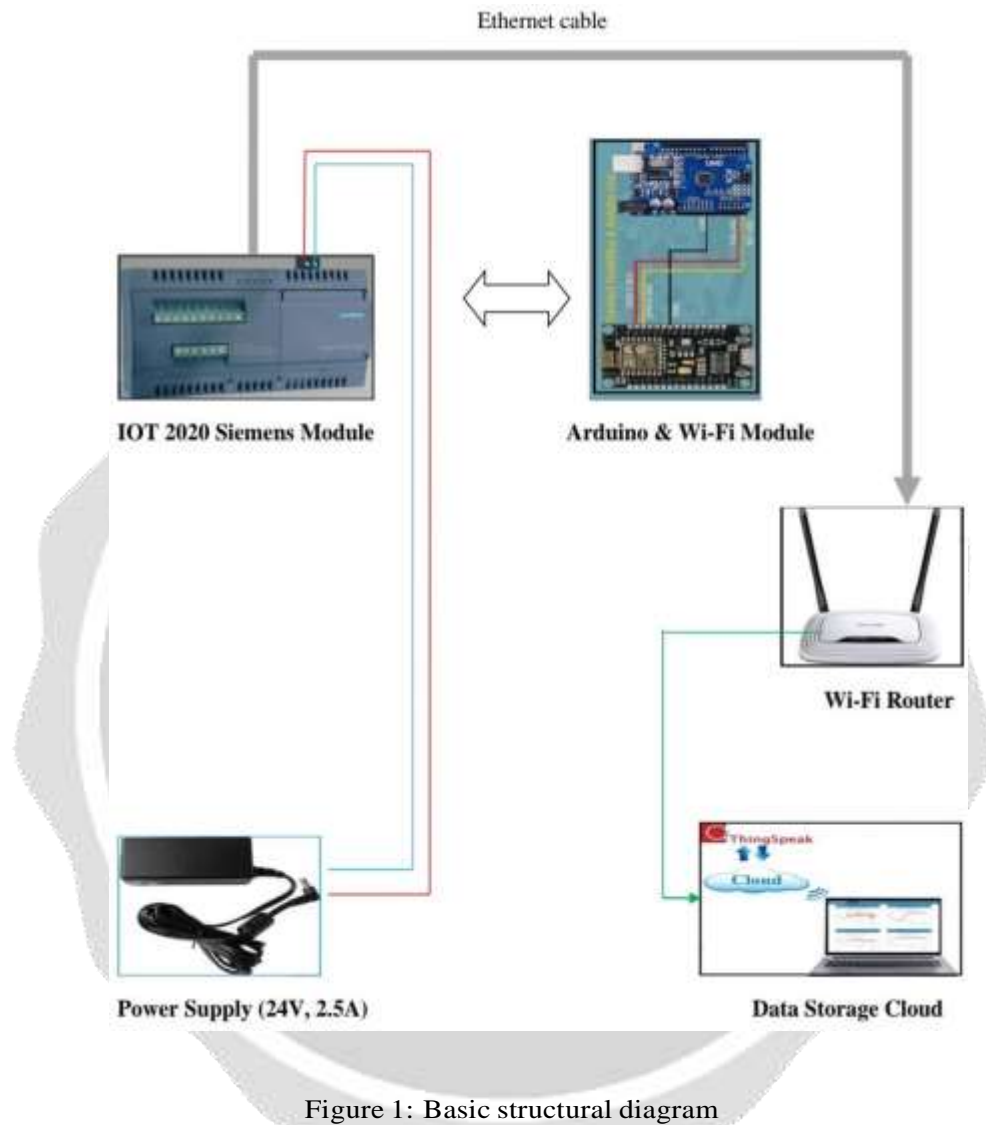


Figure 1: Basic structural diagram

Figure 1.1 shows the basic structure of automation process. Where the process starts from feeding the material ends with quenching of material. A 24V, 2.5A power supply is given to Siemens IOT 2020 module. Which has inbuilt Arduino UNO and this Arduino board is interface with Node MCU ESP8266 4 Channel relay. ESP8266 is Wi-Fi module which is connected to Data storage cloud (Thing Speak) from where we can operate the furnace.

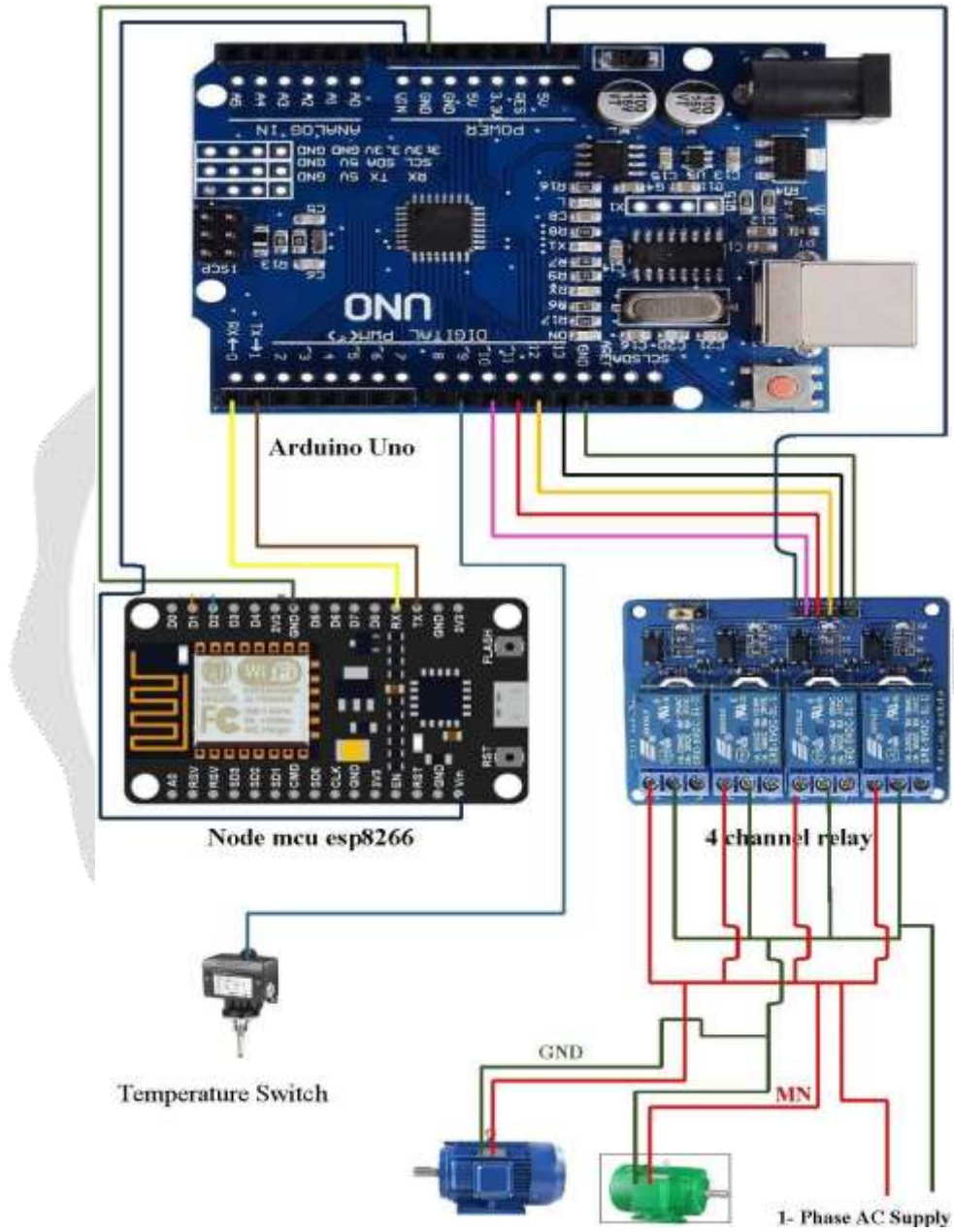


Figure 4.1: Detail circuit diagram

CONCLUSION

The project successfully studied the various stages of assembly line components used in the

assembly line and their working style.

The model of fixtures and assembly lines is complete. The design of the racks and pinions is well done. The original design of the fixture and its optimization has been successfully completed. The Wi-Fi model has been successfully tested. The program is loaded in Arduino Uno and is running properly. In addition, various tests of the entire project have been successfully passed.

The design and testing of various parts of the project has been completed in the presence of Omkar Patil (CEO) of the company. The final stage of project is completed successfully.

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