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IMPLEMENTATION OF OVERLOAD PREVENTION SYSTEM IN FLY ASH BRICK MACHINE.

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Abstract

Fly ash, lime, gypsum and sand are all combined to make Fly ash brick. They have the benefit of being lightweight, more durable than conventional bricks, and capable of being made from waste materials, such as fly ash. Its use in manufacturing of bricks will lead to the control of pollution and proper disposal. New type of fly ash brick moulding machine is an automatic machine which in turn produces the high-density bricks using coal ash. It aids in environmental protection and save energy. In this developing world of technologies everything is controlled automatically and human work is almost zero in some sectors. A controller circuit has been designed in order to make the control of conveyor belt motors automated which will work on the basis of level of material in the tank/hopper of raw materials. An infrared Proximity sensor is used to detect the level of a mixture tank which in turn produces the output to the controller and the motor has to start and stop according to it. This design will control the starting and standstill conditions of the motor according to the level of the tank. It helps in increasing the production rate and reduces the human work and wastage of raw materials due to overloading.

Keywords: Brick making machine, Electronic controller, Sensor.

1. Introduction

Fly ash brick (FAB) is a type of building material which is specifically known as masonry units which consists of Class C or Class F fly ash and water. A fly ash brick is characterised by using industrial waste to replace clay brick, and it does not need to be burned and steamed after moulding processing, it can be used after natural curing. It is compressed at 28 Mpa and it is placed in a 66oC steam bath for 24 hours for curing. The fly ash brick reduces the dead load on

the structures and it also lowers the water penetration. Each fly ash brick consists of fly ash of about 60% of its mass and having a strength of about 7.5MPa – 10 Mpa. It has very high tolerance when compared to the other clay bricks. So, it can make full use of waste, save land and does not produce secondary pollution. Moreover, it is in accord with modern environmental protection and building materials industry development policy of emerging technologies.

Fly ash brick moulding machine is a new brick making equipment in the brick and tile industry which developed rapidly in recent years and effectively promotes the rapid development of the national economy. Due to the development of technologies in various fields the semi-automatic fly ash brick machine has now become fully automated hence it requires some of the features to be added to make it efficient. The hydraulic fly ash brick machine consists of the hydraulic press and electric motor in order for the movement of the conveyor belt and is able to produce a maximum of 2000 bricks/hour.

At present, motors with conveyor belts are fixed in order to fill the hopper (tank) with raw materials which in turn reduces the human work and time taken. But due to the fast filling of the raw materials in the tank, the motor needs to frequently stop and start and a manual control is needed over there. Due to this a human work is needed there which in turn will be the same as the standard method of filling.

2. Problem Statement

In the early method of making fly ash brick, a small moving body with a hydraulic press fixed in it moving across the area and hydraulic press the raw materials into a brick shape at a particular position. Later days it changed to fixing the machine in a place and the machine is attached with the conveyor belt on its input to get the raw materials filled in the tank and on its output to get the fly ash bricks from the machine. The conveyor belt is of 8mm thickness and its length is 25 feet. But loading of raw materials in the hopper (tank) is done by those belts but controlled manually and it requires human work and costs more time.

3. Review of literature

[1] Pravin P. Gadling, M.B. Varma had discussed concrete, steel, and bricks are common building materials, with bricks being the most commonly used constituent. Various types of brick manufacturing were investigated in this paper. The optimal percentage of fly ash is studied using various combinations of materials in the brick such as lime, cement, and clay, and their effect on different properties of bricks is discussed. The parameters considered in this study are compressive strength, water absorption, and durability of bricks with fly ash, which are compared to brick element coral provisions.

[2] Bhupendra Singh, Arun Kumar the Brick Molding Mechanism was the primary focus of this research. There are numerous methods for molding bricks, but we only used the hydraulic compression method because it is more efficient and reliable. This paper is primarily concerned with reducing unnecessary economic losses, providing safety for plant workers, and increasing

the efficiency of the bricks industry.

[3] Linda Hui, Manwoo Park et al. This paper describes a novel method for counting in place bricks in order to automate the brick site survey using digital videos. The most common method of measuring progress is through manual site surveys. These polls are time-consuming and tiresome. In previous research, the authors were able to count the number of bricks using single images. This method extends the image brick counting method to continuous video frame counting. When new bricks appear, it can compare the results of brick detection in successive frames and accumulate count.

[4] Amit Pal, Urandur Pavan Kalyan et al. This paper deals with the measurement of fly ash in the hoppers of the machine. The capacitor type sensor is used in this method and it has been detected using the dielectric strength of that materials. Through this paper it provides a knowledge about the hopper level measurement according to its dimensions and detecting the materials using sensors.

[5] Shifeng Wu, Weike Zhou et al. In this paper, the system working principle and key points hydraulic systems of the hydraulic brick machine are analysed, as well as a detailed introduction to the system validation and verification method. A new type of fly ash brick molding machine is an automatic machine used to produce high density bricks from coal ash. It benefits both energy conservation and environmental protection.

4. Designs

4.1 Method of design process

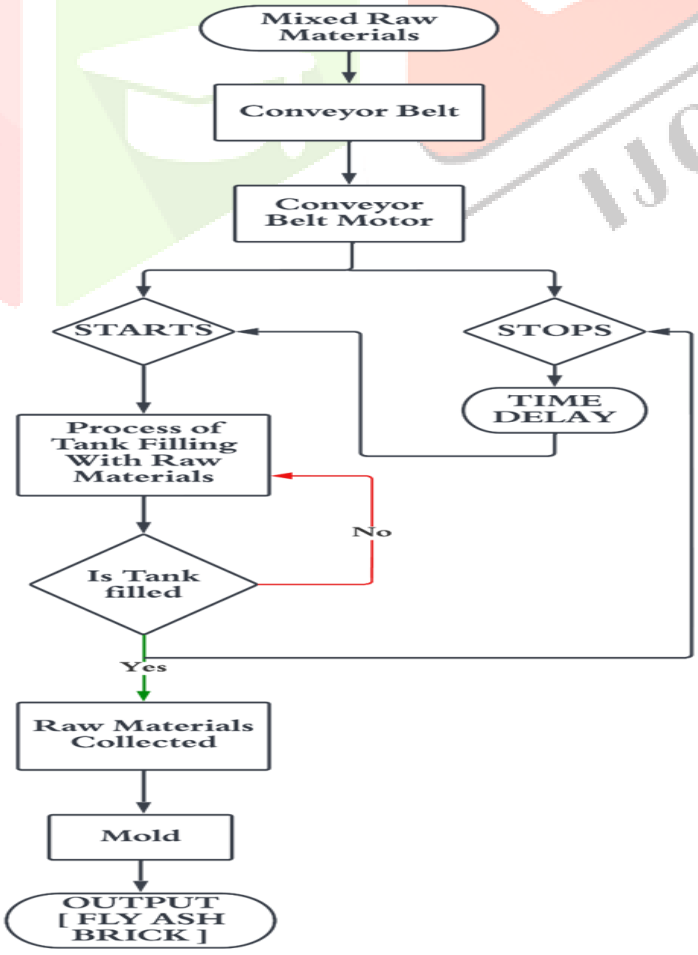

Fig. 1. General flowchart of the proposed methodology.

The mixed raw materials which consists of fly ash, slug, cement, and crusher powder on the required composition. Then the mixture is fed onto the conveyor belt which moves in the upward direction in order to fill the tank. The conveyor starts filling the tank and the sensor starts detecting whether the tank is filled or not and gives the output according to the materials filled. According to whether the output is high or low the motor continues to run or comes to standstill condition. If the tank is filled then the motor is stopped and the filled material is collected in the tray and it is moved on to the mould which moves to production of brick. If the tank is not filled then it will loop on to the tank filling process and the process continues until we stop the machine.

5. Components

5.1 ATMEGA8 Microcontroller

Fig. 2. ATMEGA8 Microcontroller

It consists of 28 pins on each of the sides 14 pins are present. ATMEGA 8 is a 28 pin AVR microcontroller. It is popular because it is one of the cheapest microcontrollers and provides many features in lesser pins. It has a program memory of 8k bytes for which application is very versatile. Because of its size it can be put in many small boards. With a Watchdog timer to reset under error, it can be used on systems with minimal human interference. These features added together in one controller make the ATMEGA8 popular. The ATMEGA8 is a low power CMOS 8-bit microcontroller based on the AVR RISC architecture.

5.2. IR Proximity Sensor

Fig.3. IR Proximity Sensor.

The model of the sensor used is E18-D80NK. The sensor consists of three wires: Yellow is for the output, Green is for the ground and Red is for the input of +5V. IR, in short for infrared, detects the presence of an object by emitting a beam of infrared light. It works similarly to ultrasonic sensors, though instead of using sonic waves, IR is transmitted. Infrared proximity sensors consist of an IR LED that emits, and a light detector for detection of reflection. It has an in-built signal processing circuit that determines an optical spot on the PSD.

6. Flow Chart

6.1 Block diagram of proposed system

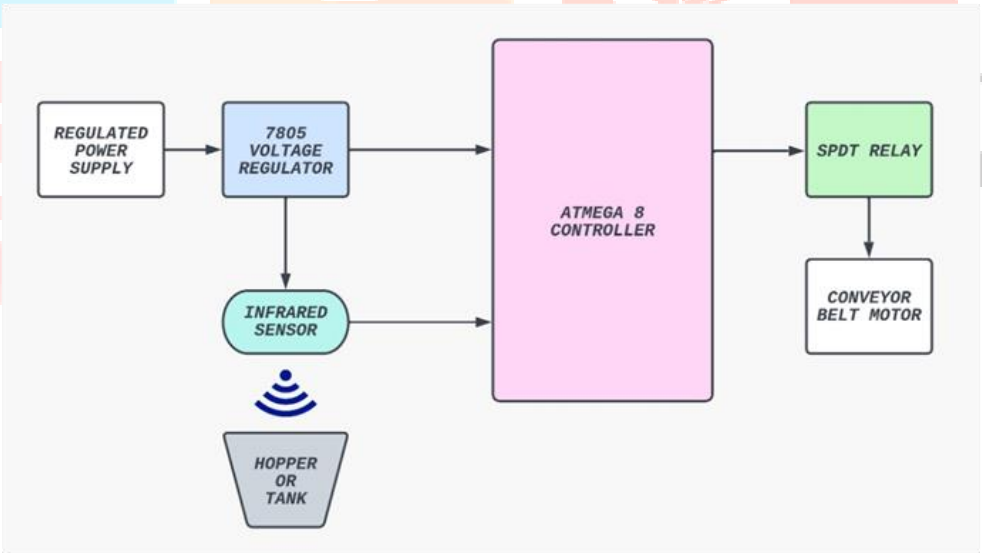

Fig. 4. Working of Two-Wheeler

The ATMEGA 8 controller is the heart of the system where the control of the motor by relays and the timing delays are programmed. In this proposed system a voltage regulator is used to reduce the voltage of 12V DC supply and to 5V to energise all the electronic components like ATMEGA controller, Infrared Proximity sensor, Relays. The IR proximity sensor deducts the fly-ash in the hopper of the fly ash brick machine using the infrared rays. A relay is used to control the ON and OFF states of the motor. If the sensor detects the fly ash, it sends the digital low output to the controller. This low output in turn trips the relay. Tripping of relay results leads to standstill condition of the motor. There is a delay of a particular time period provided in the controller. The delay is provided in order to empty the tank of the

machine and also the motor needs some time to switch on again. Continuous turn on and off of the motor will leads to damage in rotor windings. Until the sensor senses the fly ash it gives the low output to the relay. After the delay if the sensor detects and there is no fly ash present it will give the digital high output to the controller. The controller turns on the relay again and the motor will start to run again. This is a continuous process and the loop will run several times. This process leads to the prevention of overloading of fly ash mixture.

7. Conclusion

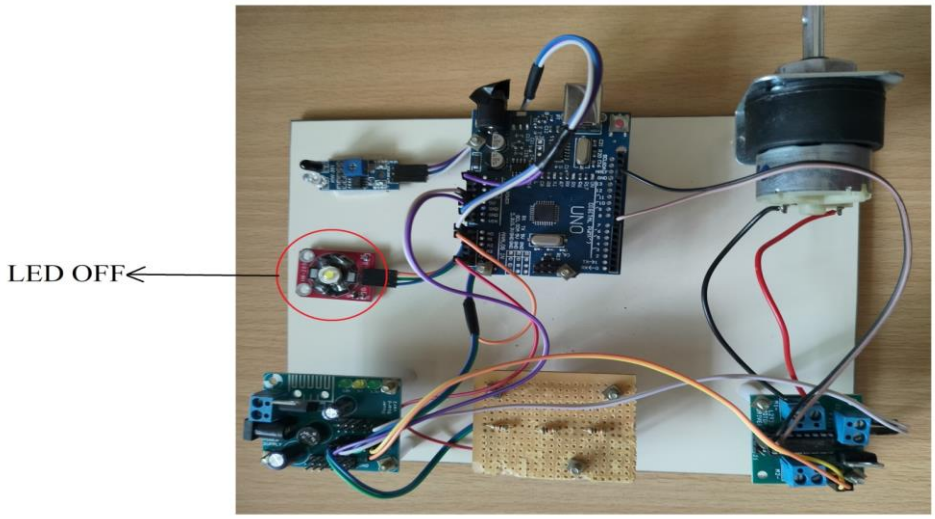

Fig.5. Hardware Setup

The sensor does not detect any Fly ash, so the LED doesn't glow which makes the motor run normally. The sensor detects the Fly ash which is indicated by the LED turned ON. This makes the motor come to standstill condition. The outcome of the proposed system is that it can able to produce 120 bricks at extra and can also reduce the human work which results in no labour costs. The efficiency has been increased and the time consumed.

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