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Real Time Low Cost Automated Production System Using Internet Of Things

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ABSTRACT: The practice of dividing materials into distinct groups based on the constituent material of the thing under examination is known as material recognition. It is a major issue in a variety of disciplines, particularly in the industrial sector. Separating materials and packaging different materials is one stage in industries that employ production lines to make their products. A number of small and medium-sized businesses who can't afford full automation rely on manual data collecting and compilation to generate reports. Inconsistencies and inaccuracies are common in manual data processing. This leads to minor growth of such industries in the competitive market. Low cost automation using Inter of Things (IoT) is one solution especially for medium and small scale industries. An alternative to human data handling is an IoT-based automatic data collecting and processing system [1]. This paper discusses the advantages of using an automated data gathering and display system to save money, time, and effort. It enhances the accuracy of reports for management greatly. We applied deep learning to a water can product system and put it through its paces on the Flicker Materials Database (FMD). The system is self-contained, cost-effective, and precise, and it can be installed in any factory with few alterations and no loss of quality.

Keywords: Internet of Things, Low Cost Automation, Flicker Materials Database, Efficiency

1. INTRODUCTION

Production control is a benefaction for an enterprise in today's period of cutthroat competition. It is a necessity rather than a luxury, a wise investment rather than a waste of money. Automation is the development and application of technology to monitor and control the production and supply products and services as per the customers' need. For any industry to survive in the competitive market, must go for automation [1]. Large scale industries can afford and opt for the option of automation. But medium and small scale industries find it difficult. Automation at a low cost is the answer, especially for medium and small businesses. In the current age of technologies, it is possible to get a system automated with low investment. This can be achieved with Internet of Things (IoT). Internet of Things is no more a new theory. IoT can be simply defined as machine to machine communication [2] without human intervention. It finds its application in various fields including smart grid, agriculture, industries, health care, transportation, etc. Hardware and software include sensors

and smartphones. Cloud is an interface that processes the information securely [1].

The following is a breakdown of the paper's structure: Section II consists of a briefing on the existing problem and the suggested model. The suggested system is depicted as a block diagram in Section III. The system's working approach is discussed in section IV, and the software development process is explained in section V. The results of the suggested system are shown in Section VI. The paper concludes with future scope in Section VII.

2. PROBLEM FORMATION

Finance is one of the most important problem confronting small scale industries. The product and installation cost for automatic water jar filling machine that is employed in large scale industries ranges up to 5-6 lakhs and semi-automatic machine ranges from 3-4 lakhs. Whereas manual process employed in small scale industries costs only up to 2-2.5 lakhs. In small and medium scale industries manual data handling and compilation is carried out. Both discrepancies and inaccuracies are common in manual data processing. And also the process is time consuming. Setting up, expansion and modernization is challenging for medium and small scale industries.

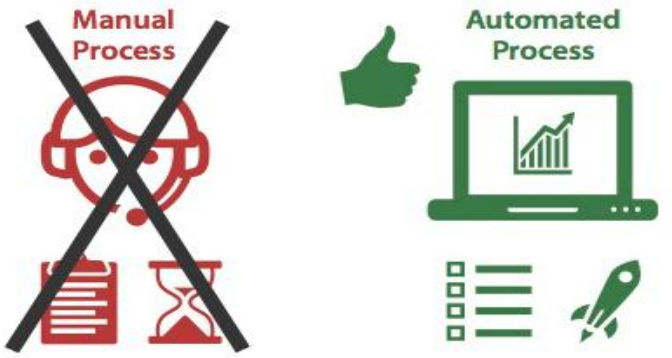


Fig.1. Manual process Vs Automation

There will be no use of technology if it failed to help the common man. This paper deals with the trend that how a manufacturer can be aided with modern and recent technology “Internet of Things” that helps him in the modernization and establishment of his business with minimum investment. The real time product management system with embedded arrangement and sensors connected to the internet [3] which keeps track of final product. In the proposed System, the increased man-power is replaced by using different type of sensors.

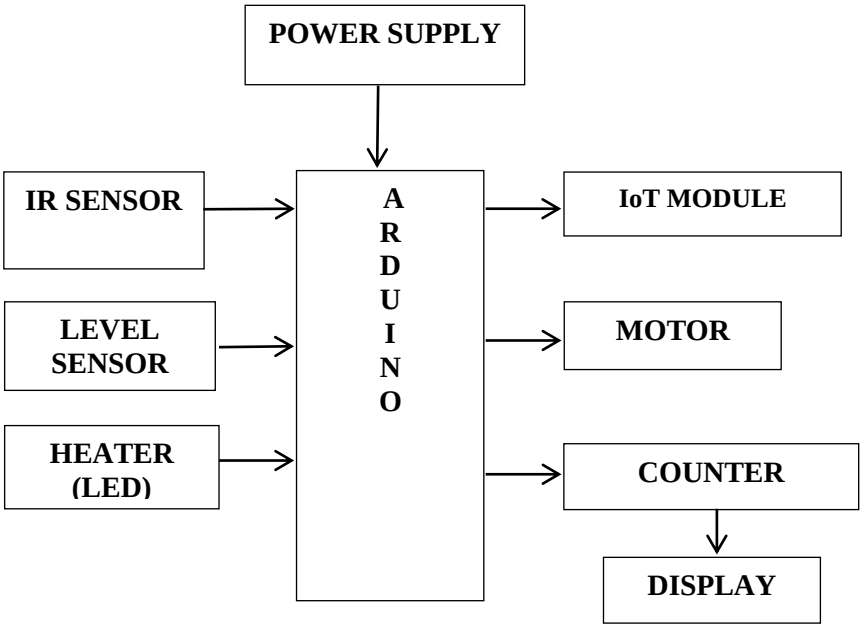
- IR Sensor - Used for count-down the water bottles,
- Water Level Sensor - Used for

water level monitoring as well as to start & stop the Motor.

- Heater – Used for sticking the Label on bottles.
- By using IoT (Internet of Things), the whole system is controlled & monitored from anywhere.

The brief description of the proposed model is given as follows.

3. BLOCK DIAGRAM OF WORKING



4. WORKING METHODOLOGY

The various components used in the system and their workings are explained as follows:

1. IR (Infrared) Sensor

An infrared sensor is an electrical device that emits infrared light in order to detect certain features of its environment. An infrared sensor can detect motion as well as measure the heat of an item. Almost all items emit some type of thermal radiation in the infrared range . The emitter is a simple infrared LED (Light Emitting Diode), and the detector is a simple infrared photodiode that detects infrared light of the same wavelength as the IR LED [4]. When infrared light strikes the photodiode, the resistances and output voltages change in response to the intensity of the IR light. The following components make up this circuit:

- IR transmitter and receiver pair LM358 IC 2
- Resistors in the kilo ohm range
- Variable resistors are a type of resistor that may be changed.
- LED ((Light Emitting Diode)

Depending on the application, IR sensors are divided into distinct categories. The speed sensor is used to keep the speeds of many motors in sync. The temperature sensor is used to control the temperature in industrial settings. PIR sensors are utilized for automatic door opening, whereas Ultrasonic sensors are used to measure distance. IR sensors are utilized in a variety of sensor-based projects as well as electronic devices that detect distance.

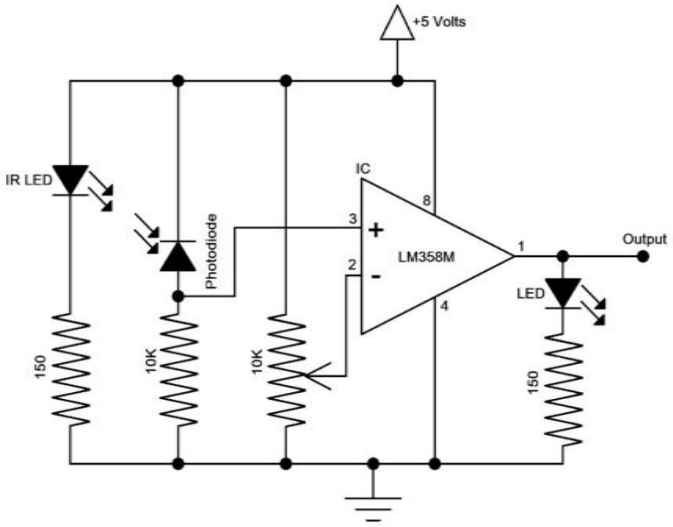


Fig.2.IR sensor circuit

To ensure that a minimum of 10 mA current travels through IR LED Devices such as Photodiode and conventional LEDs, resistors R1 (100), R2 (10k), and R3 (330) are employed. The output terminals are adjusted with the resistor VR2 (preset=5k). The circuit diagram's sensitivity is controlled by the resistor VR1 (preset=10k)

IR Imaging Devices

The infrared picture device is one of the most common uses of infrared photons, owing to its invisibility. Thermal imagers, night vision equipment, and other gadgets utilize it. As an example, IR radiation is emitted by water, rocks, soil, vegetation, the atmosphere, and human tissue. Thus IR sensor will detect the product that increases the count and keeps the track on product lines.

2. Level Measurement

Liquids such as water, chemicals, and solvents are employed in a variety of industrial operations. By measuring the level of liquid in a container or vessel, the volume of such liquid held can be determined. The level of substances such as liquids, slurries, granular solids, and powders is detected using level sensors. Continuous or point values can be used to measure the level. Level sensors are used to monitor the level of free-flowing fluids, as their name suggests. In conclusion, level sensors are one of the most significant sensors that are used in a wide range of consumer and industrial applications. Higher and lower level sensors are utilized to detect the level of water in the storage tank and turn on and off the AC motor.

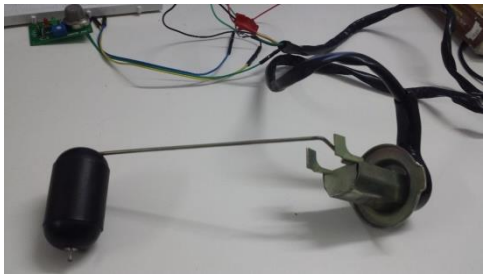


Fig.3. Level sensor

3. AC Motor

Three-phase transformers with a shorter and freely rotating secondary winding are frequently referred to as induction motors. The difference between the rotating speed of the air gap field and the shaft speed is used to compute slip. Permanent magnets, as well as brushes and commutators, are not found in IMs. As a result, they are tough, able to withstand high temperatures and are resistant to mechanical shock and vibration. Induction motors are therefore widely used in many applications [5]. The equivalent circuit of three phase induction motor is given below. In this project 1 HP AC motor is used and its speed is 2100 rpm respectively.

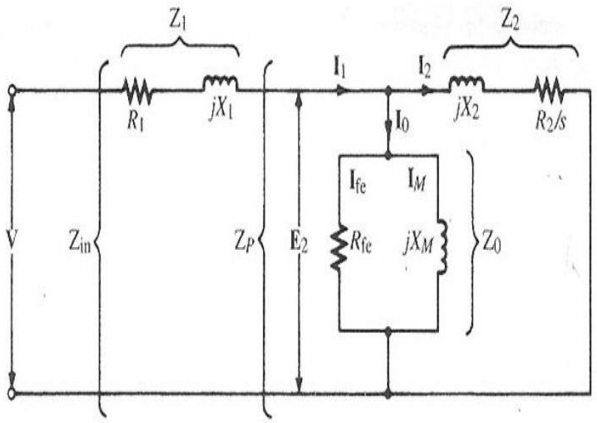


Fig.4.Equivalent circuit of three phase Induction motor

4. Heater

Heater is used for sticking the label to the bottles. A 6kW heater is generally employed for this purpose. Usually the heater is kept in ON position which consumes more power. So it is suggested to ON the heater just before the arrival of product, here bottles, to reach the thrust temperature needed for sticking labels. When the product is sensed by the IR sensor, the heater is switched on else it is kept in off position.

5. Seven segment display

Seven segment displays are the simple display units to display numbers, characters and alphanumeric values. The data is processed in cloud and updated which can be followed using smartphones or laptops. Security and privacy are the important aspects of any industry. Not everyone can able to access the information due to privacy issues. Therefore a general seven segment display can be employed so that the minimum required information like bottle count; Motor status etc is available to common workers. CD4026B decade counter with decoded seven segment display is used for this purpose.

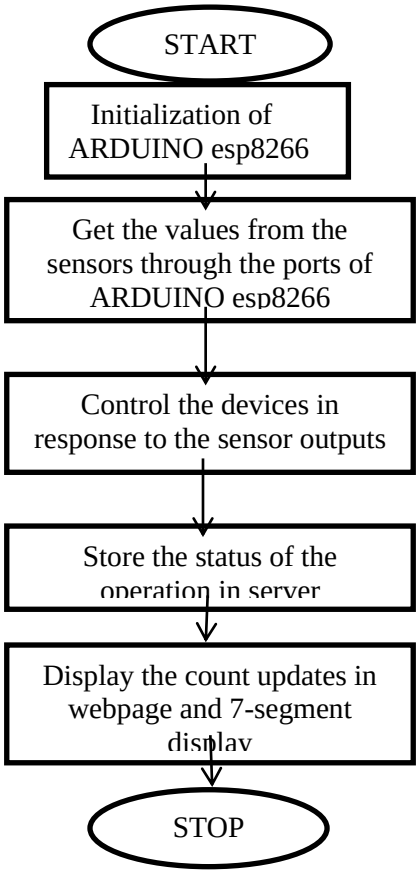
5. SOFTWARE DEVELOPMENT – ARDUINO

Arduino is a programming language that allows you to create computers that can sense and control more of the physical environment than your typical desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, as well as a software development environment for the board. A computer,

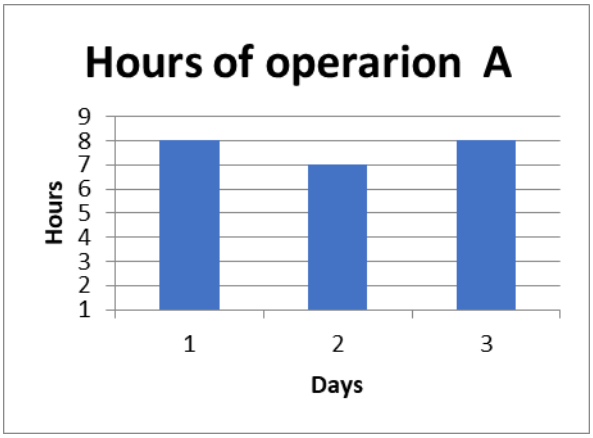
another Arduino, or other microcontrollers can all be communicated with using the Arduino Uno. On digital pins 0 (RX) and 1 (TX), the ATmega328 supports UART TTL (5V) serial connection (TX). When data is transmitted via the USB-to-serial chip and USB connection to the computer, the RX and TX LEDs on the board will flash. To connect the processor, some easy steps are followed: opening Arduino IDE; selecting COM port; Selecting required arduino board from tools; Write the sketch to IDE; compile and upload the sketch to Arduino board.

6. RESULT

The hours of operation of heater before automation VS after automation is compared in a chart below. Fig.4 represents hour of operation of heater before automation and fig.5 represents hour of operation of heater after installation. Also the comparison table containing the operation cost is given below.



From the table it is observed that the operation cost of heater is considerably reduced after automation.



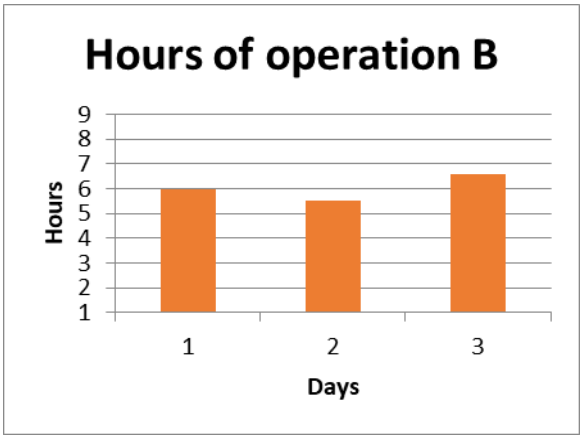


Fig.5 Hours of operation of heater before automation Fig.6 Hours of operation of heater after automation

Parameters	**Hours of operation**	
	A	**B**
KWh per day	**35.79**	**26.84**
Cost per day	**220.47**	**165.35**
Cost per mnth	**6706.96**	**5030.22**
Cost per year	**80483.55**	**60362.66**

A- Before Automation
B- After automation
(Cost in INR value)

7. CONCLUSION

In industries, IoT applications are a must-have tool for both management and production teams. IoT captures and controls raw production data at various stages of the manufacturing process without the need for human intervention. Data collection is essential, and this may be done with the help of a production management system. Runtime faults in operation can be rectified instantly. Due of the limited resources available on the factory floor, employing a real-time production management system is critical. The most effective way of resource utility with automated functioning at low cost is the one which is always needed for every entrepreneur that in turn leads to better production. The set of interrelated management activities with combination of inputs, which are involved in manufacturing certain products, is called as production management. PMS helps in achieving overall equipment efficiency. Production management is applicable in a number of fields and IoT is the emerging technology which plays a major role in low cost automation. Financial management and manufacturing operations are some of the two processes where you can apply production management theory.

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