

REAL TIME LOW COST AUTOMATED PRODUCTION SYSTEM USING INTERNET of THINGS

Dr.C.Nayanatara¹,P.Sharmila²

^{1,2}Assistant Professor, EEE Department, Sri Sairam Engineering College, Chennai.

ABSTRACT

Material recognition is the process of classifying materials into different categories based on the constituent material of the object under study. It is a very important problem in many fields and especially in the industrial field. In factories that use production lines to manufacture their products, one step is to separate materials and package different materials. A number of small and medium scale industries that cannot afford complete automation are utilizing manual methods of data collection and compilation for producing reports. Manual data process leaves room for both inconsistencies and inaccuracies. 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. The IoT based automatic data collection and processing system is the alternative to manual data handling. This paper presents the benefits of automated data collection and display system that saves money, time and increases efficiency. It significantly improves the accuracy of the reports for the management. We utilized the advances in deep learning to water can product system, and we tested it on the Flicker Materials Database (FMD). The system is self-contained, economical and accurate that can be portable in any factory with minimal changes with no compromise in quality requirements.

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

I. INTRODUCTION

In the present era of cut-throat competition production control is a boon for an enterprise. It is a necessity and not a luxury, a profitable investment and not an expense. 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. Large scale industries can afford and opt for the option of automation. But medium and small scale industries find it difficult. Low cost automation is the solution especially for medium and small scale industries. 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 without human intervention. It finds its application in various fields including smart grid, agriculture, industries, health care, transportation, etc. Hardware and software includes sensors and smartphones. Cloud is an interface that processes the information securely.

The paper is organised as follows: Section II deals with problem formation briefing about existing problem and proposed model. Section III contains block diagram of the proposed system. The working methodology of the system is explained in section IV and section V contains the software development process. Section VI contains result obtained from proposed system. Section VII concludes the paper with future work.

II. 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. Manual data process leaves room for both inconsistencies and inaccuracies. And also the process is time consuming. Setting up, expansion and modernization is challenging for medium and small scale industries.

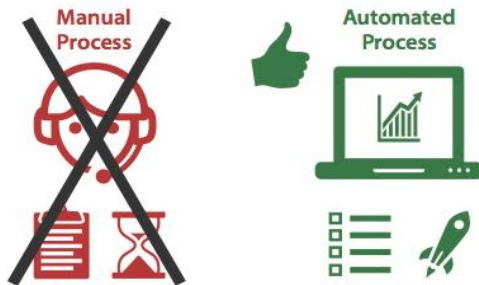


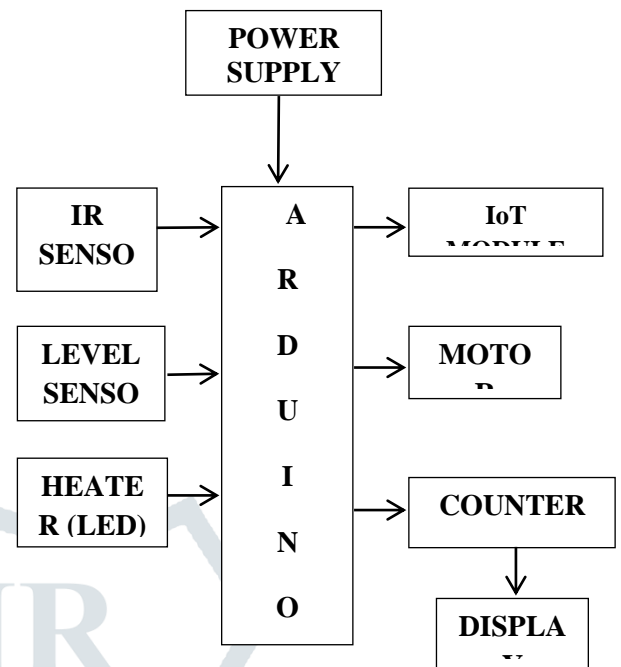
Fig.1 Manual process VS Automation

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 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.

III. BLOCK DIAGRAM OF WORKING



IV. 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 electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received. This circuit comprises of the following components

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo ohms.
- Variable resistors.
- LED (Light Emitting Diode).

IR sensors are classified into different types depending on the applications. The speed sensor is used for synchronizing the speed of multiple motors. The temperature sensor is used for industrial temperature control. PIR sensor is used for automatic door opening system and Ultrasonic sensor are used for distance measurement. IR sensors are used in various Sensor based projects and also in various electronic devices which measures.

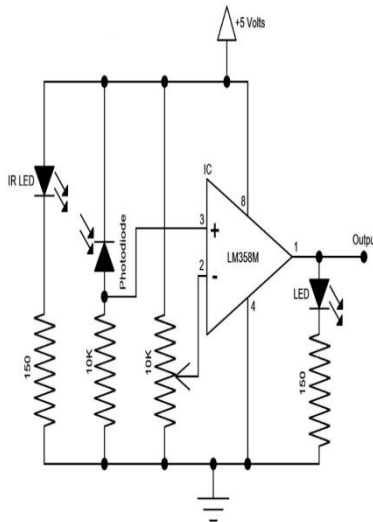


Fig.2.IR sensor circuit

Resistor R1 (100 Ω), R2 (10k Ω) and R3 (330 Ω) are used to ensure that minimum 10 mA current passes through the IR LED. Devices like Photodiode and normal LEDs respectively. Resistor VR2 (preset=5k) is used to adjust the output terminals. Resistor VR1 (preset=10k) is used to set the sensitivity of the circuit Diagram.

a) IR Imaging Devices

IR image device is one of the major applications of IR waves, primarily by virtue of its property that is not visible. It is used for thermal imagers, night vision devices, etc. For examples Water, rocks, soil, vegetation, an atmosphere, and human tissue all features emit IR radiation. Thus IR sensor will detect the product that increases the count and keeps the track on product lines.

2. Level Measurement

In industry, liquids such as water, chemicals, and solvents are used in various processes. The amount of such liquid stored can be found by measuring level of the liquid in a container or vessel. Level sensors detect the level of substances like liquids, slurries, granular materials, and powders. The level measurement can be either continuous or point values. Quite obvious from its name, level sensors are used to measure the level of the free-flowing substances. In short, level sensors are one of the very important sensors and play very important role in variety of consumer/ industrial applications. In this project higher and lower level sensors are used to detect the level of water in storage tank to on and off the AC motor.

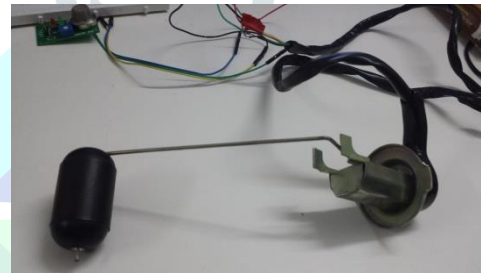


Fig.3. Level sensor

3. AC Motor

Induction motors are commonly understood as three phase transformers with shortened and freely rotating secondary winding. Slip is calculated as the difference between the rotational speed of the air gap field and the shaft speed. IMs do not have any permanent magnets, nor brush and commutators. Hence they are rugged i.e., they can endure high temperature and are robust to mechanical shock and vibrations. Induction motors are therefore widely used in many applications. The equivalent circuit of three phase induction motor is given below. In this project 1 HP AC motor is used and its speed is 2100rpm respectively.

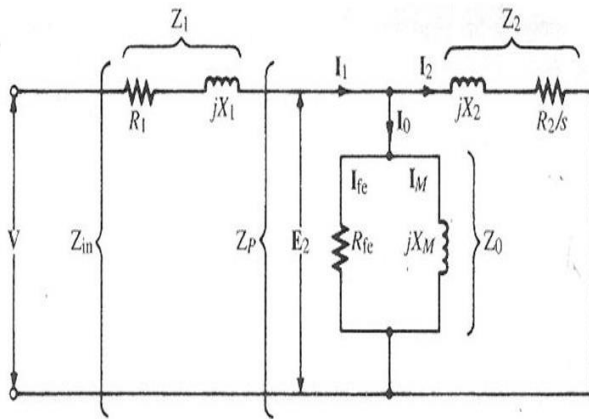


Fig.4. Equivalent circuit of 3phase induction motor

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.

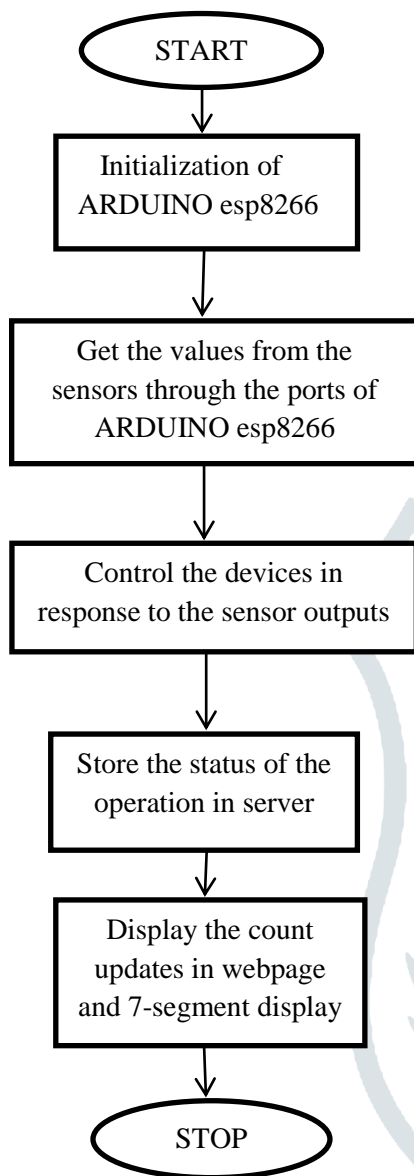
V. SOFTWARE DEVELOPMENT - ARDUINO

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer. 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.

VI. 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.

Flowchart of working



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

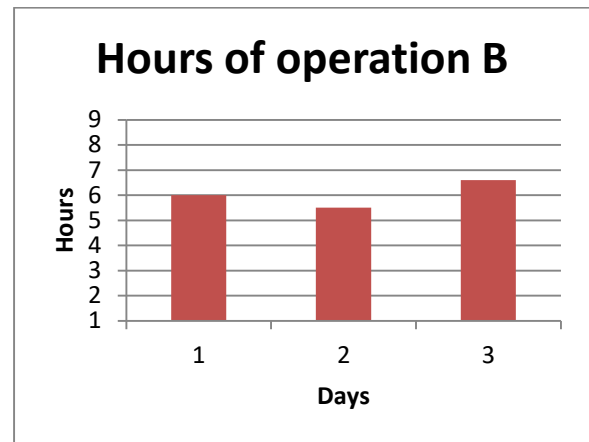


Fig.6 Hours of operation of heater after automation

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)

Conclusion

Iot applied is an essential tool in industries for both management and production team. Iot collects and controls unadulterated production information at levels along the production process without any human intervention. Data collection is crucial and this could be collected by using a Production management system. Runtime faults in operation can be rectified instantly. With limited resources available on the industrial shop floor, the practice of using real time production management system is crucial. 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.

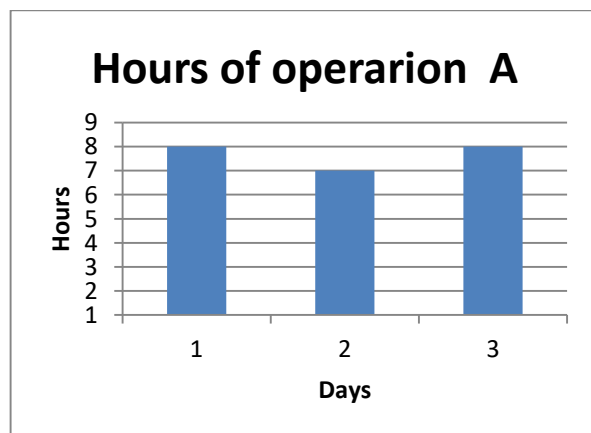


Fig.5 Hours of operation of heater before automation

A. References

- 1.Siva Kumar a/l Subramaniam, SitiHuzaimahbintiHusin, YusmarnitabintiYusop and Abdul Hamid bin Hamidon, 2009, SMS or E-mail alert system for centralize mail compartment, Proceedings of the 8th International Conference on Applications of Electrical Engineering,Page(s): 52-56.
- 2.Tom Pherson, June 2006, 'Overall Equipment Effectiveness & Real-Time Visual Management Critical Lean Tools' Intelligent Manufacturing Solutions, Page(s):1-18.
3. Smoots, Gregory C., Andreas Garstenauer, and Timothy Blackburn. "Measuring System Usability during Requirement Engineering: Requirements Engineering." 2016 International Conference on Information Systems Engineering (ICISE). IEEE, 2016.
4. Pablo, Pico-Valencia. "Business intelligence applied to monitoring and meta-monitoring scenarios." Information Systems and Technologies (CISTI), 2016 11th Iberian Conference on. IEEE, 2016.
- 5.Nayanatara. C, Baskaran. J & Kothari, D.P, 'Approach of hybrid PBIL control in distributed Generation parameters for IEEE and real time Indian utility system', IET Renewable Power Generation,2016 11,(2), pp. 255-263.
- 6.Nayanatara.C, Baskaran.J & Kothari. D.P, 'Hybrid Optimization implemented for Distributed Generation Parameters in a power System network', International Journal of Electric Power and Energy systems,2016, Elsevier, 78,pp. 690-699.

