

# AUTOMATION IN MATERIAL TRACKING

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## ABSTRACT

It is really important to manage the materials used in various industries and to identify and collect the relevant information in real time. This helps in effective and efficient material tracking in the different projects. In existing times, most of the industries are dependent on manual labor work to transfer materials and to identify and sort them in required manner, which incurs more cost and has a greater time requirement. It is difficult to obtain high efficiency and to maintain the same efficiency at all times irrespective of the slight changes in the surrounding environment. Therefore, the objective of this paper is to present a system that can identify the logistics flow and location of the materials. The following system that is proposed uses RFID and wireless sensor networks such as ZigBee technologies, thus having a better performance. This system aims at having a greater efficiency, lower cost and time requirements. Since, existing R&D of RFID technology projects have focused on material identification and its logistics, they have many shortcomings and hence they are not fully accurate. Henceforth, the main aim of this review paper is to achieve a system that can identify the material flow having better efficiency with the help of technologies like RFID, wireless sensor networks and ZigBee. RFID is an efficient system tool that aids in better managing of supply chains, product sorting and finally delivering the product. This technology will also improve the management of the products in Warehouses and large inventories.

**Keyword:** - Material tracking, Database, Wireless communication, and Radio Frequency Identification (RFID) etc....

## 1. INTRODUCTION

In this era of 2018, automation is the core of every successful industry. But there are still some industries in which there is much of a complicated manual and labor work. These processes are full of hassle and thus it is necessary to manage materials along with the pre-fabricated components and to identify their information by collecting important data in real time for much effective and efficient material management in different project applications. Recently, there have been many researches and developments using many wireless technologies that include Radio Frequency Identification (RFID) for data acquiring of material tracking [5].

### 1.1 OLDER METHOD

The RFID warehouse management methodology stated in [1] was hectic. It has Supplier Department Process which requires more number of workers, as it is evident from the Fig. 1. There are labors at almost each stage. In our proposed methodology below, the labour count is significantly reduced and the entire process is thus automated.



Fig -1: Supplier Department Process

## 2. METHODOLOGY

All the pallets and packages are tagged with RFID tags and this information is stored in the database. [3] Database memorizes each commodity details. Fig. 2 represents the basic model where, each commodity is put on conveyor belt. This process is further followed by scanning each commodity by IR sensor and RFID reader detects its respective tags. As the conveyor belt starts, the system scans and then checks the data from the database of each commodity via PC wireless communication method and for this we are using ZigBee technology as the inventory is managed in the other room, wirelessly. When a new commodity is scanned and hence checked it gets sorted respectively with the help of a robotic arm which is placed at the end of conveyor belt and thus it is dropped in separate containers. In our model, we have one transformer, a PCB. Two supporters mounted with a conveyor belt and a motor to drive that belt over it. In the PCB, driver IC gives output as it is set to ground also the RFID reader is connected to PCB and LCD is mounted over the PCB where we get the display. Then comes' the conveyor belt where there is a motor and the belt is mounted on two supporters. As soon as the supply is given the circuit starts its implementation where we get the name of our project on the LCD and the conveyor belt starts rotating and the item placed on it is attached with a RFID tag. As soon as the item is passed over the rotating conveyor belt and crosses the RFID reader, the reader reads the RFID card and the card number is displayed on the LCD, if that is the required number that was entered then that item is removed from the belt by an rotating arm and if the number don't match to the required one then belt doesn't stops and allow the product to move forward. Also if any product is available in the inventory can also be checked in the checklist that is made and if any item is removed then it is been deleted from the checklist. This is how the inventory is managed and the sorting is done together. [13]

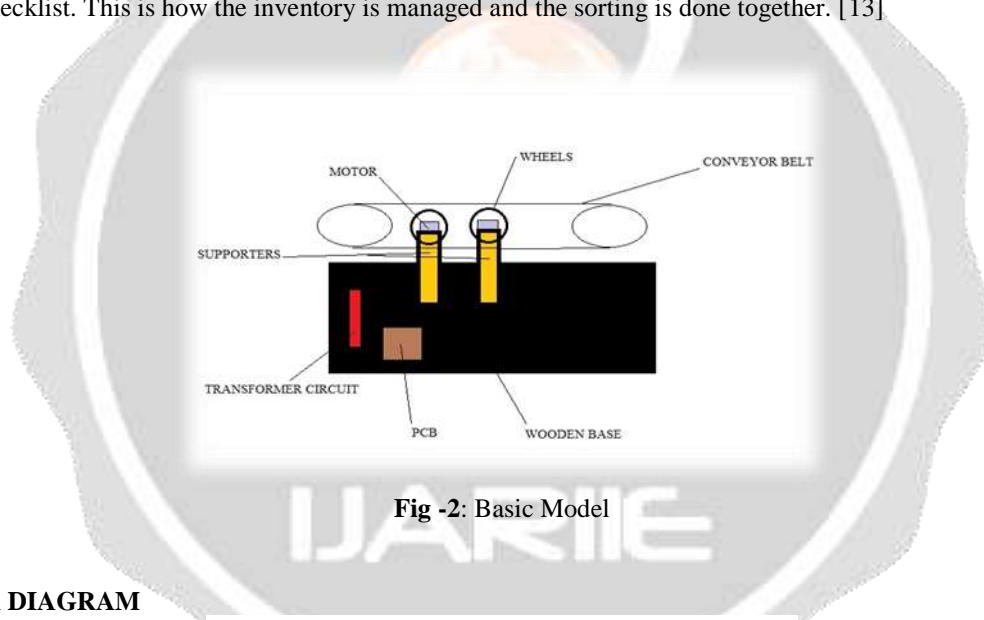


Fig -2: Basic Model

## 3. BLOCK DIAGRAM

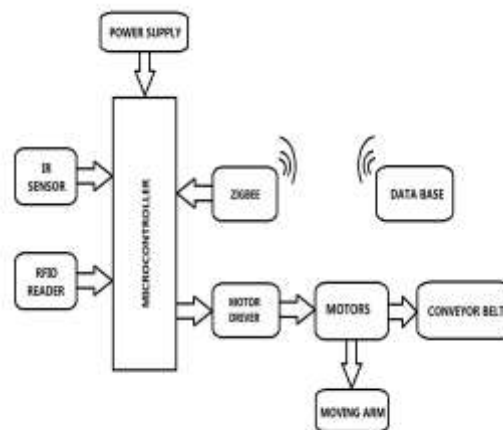


Fig -3: Block Diagram

The components used are:

- IR sensor 1-5 m distance
- RFID card 13.56MHz max.
- RFID reader upto 12m
- Motor driver IC 12V
- Motors 10 rpm
- Microcontroller 2550 [6]–[8]
- Conveyor belt
- ZigBee technology

Fig. 3 illustrates the block diagram. When the RFID reader detects the RFID card in front of it, it generates a magnetic flux, and this magnetic flux induces a current in the RFID card. The RFID card consists of a chip which is mainly a Trans receiver. So, when the magnetic flux is induced, it turns on the chip and thus sends its respective code number to the RFID reader. This code number is then picked up by the RFID reader and the same is displayed on the LCD screen. [9] In this we are using ZigBee wireless technology. ZigBee technology is the most popular standard for short range wireless personal area networks (WPANs) such as for medical device data collection, and other low-power low-bandwidth needs, and also for small scale projects which need to communicate wirelessly. Hence, ZigBee is a low data rate and low-power, with close proximity (i.e. personal area) wireless networks. XBEE sensors are used. ZigBee Sensors [2] are available in many versions depending on different usage scenario. The XBee-ZigBee-RF Module [4] is designed to operate within the protocol of ZigBee as it holds some unique needs such as low-power-wireless-sensor networks that have low-cost. The XBEE module requires low power and it provides reliable delivery of information between devices remotely. The technology defined by the ZigBee specification is cheap and simple as that of the other technologies. Using wireless personal area networks also called as WPANs and more wireless networking such as Bluetooth or Wi-Fi. This can be used for many applications like wireless light switching home energy monitors, traffic management systems, and industrial equipment that requires short-range low-rate wireless data transfer, small area communication like walkie-talkie etc. It has low power consumption that limits transmission for 10–100 meters [10]; ZigBee devices can have transmission of data over long distances easily. ZigBee is typically used in low data rate applications and hence require longer battery life and secure networking keys using some kind of encryption. Depending upon power output and environmental characteristics, it usually has a transmission rate of 250kbps with the help of the mesh topology. The wireless standard IEEE 802.15.4 ZigBee is designed to be very resistant to noise interference, thus making it a very optimum standard for smart automated homes. This is governed by the ZigBee Alliance. [11]

#### 4. BENEFITS

- RFID tag scanning caters the verification that the right item has been picked, and thus it is instantly deducted from the database.
- Increased employee productivity with no to less error in entry and billing, as the system is automated. [12]
- Provides the proper information needed for first come first serve basis of the inventory management [13], which leads to significant positive strike for the company's profit and tax risks.
- Lesser labor costs as their workforce needed is reduced for tracking and warehouse management.
- Access to real time data checks that the shipment is delivered to its respective recipient.
- It is a frictionless-running business that knows precisely what and where inventory is, hereby decreasing emptiness of stocks as it is highly accurate system with an updated data base.
- Access to the order database provides the real time visibility to cross check the incoming material for packing, shipping and thus delivering the customer orders.

#### 5. CONCLUSIONS

- The hardware required occupies lesser area and lesser cabling as it communicates wirelessly.
- This method is cost efficient than many existing systems.
- Labor requirement in the industry is significantly reduced. Inventory is updated in real time and is appreciably accurate with the correct status of the stocks.

- Time required for the completion of this process is much less, as everything is automated.
- Labor cost and maintenance cost is much reduced.
- Ultimately, this procedure offers the ease of use to the industry and has great efficiency.

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