

# RFID Based Product Identification in a Closed Box

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## ABSTRACT

The main aim of this project is to manage inspection efficiently within the stipulated time line with at most accuracy. The carton box containing the products with RFID tags is arranged accordingly. The efficient management system is developed to identify and sort out the quantity of products available in the box without unboxing. The box containing the product is placed in the conveyor once the box is placed a sensor senses the box and sends signal thereby switching ON the conveyor. The box then moves in the conveyor crosses the QR code scanner which reads the master data and sends it to the system the box then travels into the inspection chamber which has the two RFID reader antenna which emits signal and capture total number of RFID tags available in the box and similar tags hence sends the captured data to the system. If the total number of products, tags is matched with the master data the box moves to the selection section. In case if there is any mismatch found like different tags, product count with the master data the product is send for rejection during inspection of product if the product count is found to be less than the count mentioned in the master data a special operation is performed known as shake operation. Where the conveyor is moved back and forth continuously and again the product is inspected if it matches the master data it is sent for selection else the product is moved to rejection section by an arm.

**KEYWORDS:** RFID tags, PLC and Conveyer belt

## 1. INTRODUCTION

Radio Frequency Identification (RFID) is a technology that detects the passage of specific items and transmits content details to a server via a certain network context to handle data from a range of materials. Recently, the spectrum of RFID implementations has steadily extended to include a variety of fields such as connectivity, asset management and supply chain management. The general RFID device consists of RFID identifiers, editors, antennas and middleware. The tag has a unique code for each material that is recognized by the Radio Frequency (RF) signal from the reader and transmits the code information to the reader. The RFID reader then transmits the application details obtained from the RFID tags to the DB (Database) via the middleware. The most excellent characteristics of the RFID system relative to barcode systems used in asset management are read speed, reliability, and simultaneous identification functionality. RFID tags can be separated into two forms according to the power supply method: active form or passive sort, as seen in Figure 1. An active type tag can produce its own output, which can enhance RFID reading performance, but a passive tag cannot produce electric power of its own.

## 2. RELATED WORKS

The following techniques are used to produce the time in checking the product, RFID is an acronym for "Radio frequency identification". The RFID refers to a technology whereby digital data encoded in RFID tags or smart labels are captured by a reader via radio waves. The most notable advantage in our 5 packs is data can be read outside the line of sight. RFID belongs to a group of technologies referred as

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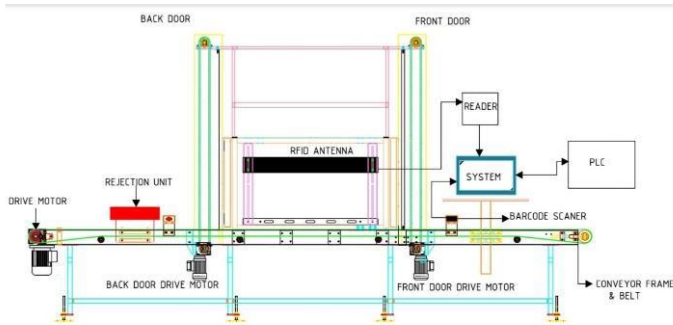
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Automatic Identification and Data Capture (AIDC). AIDC methods automatically identify objects collect data about them and enter those data directly into computer system. RFID tags contain an integrated circuit and an antenna which are used to transmit data to the RFID reader also called as interrogator. The electronic product code (EPC) global network as proposed an experimental method with specific standards in order that the RFID system of the conveyor belt system can be used anywhere in the world. The conveyor belt system can be applied to materials as diverse as liquids, metals and paper boxes. The most significant objectives of material distribution using RFID conveyor belt system are precise and prompt management of mass materials. The antenna control unit is designed in the direction of an antenna can be immediately returned into starting position when the reading operation is ended. The antenna control unit is attached at the top side of a gate and is controlled at the same speed of a conveyor belt. In this case where a fixed RFID antenna is used, the reading time is reduced by increasing the speed of the conveyor belt. The rejection unit will reject the box if it is not correct.

## 3. HARDWARE DESIGN

The main control objective is to maintain the pH check level in process tank by manipulating the varying inflow rate of acid and base tank. The controller is designed for the pH neutralization system using MATLAB software. The pH neutralization system consists of four cylindrical tanks of equal dimensions. Three rotameters are fixed at the inlet of each tank to measure the flow rate.



**Fig.1 Block Diagram of RFID Conveyor**



**Fig.2 Hardware Setup of RFID Conveyor**

The level of liquid in the process tank interacting system is measured by pH transmitter whose output is in the form of a 4-20 mA current signal. The pH transmitter is interfaced to a PC, with the help of Data Acquisition System (DAS). The current signal in the range of (4-20) mA from DPT is sent to the DAS, in which ADC converts the analogue data to digital data and feed it to the PC. The PC acts as controller and as well as data logger for acquiring real-time data. This controller considers the process variable as feedback signal and takes the manipulated variable as the output, based on the predefined set point. The DAC module of the DAS converts this manipulated variable to analogue form into (4-20) mA current signal. The I/P converter converts this current signal to pressure in the range of (3-15) psi, and then it could be fed to the control valve to take corresponding control action. Based on the above working principle, the servo and regulatory operations could be achieved using proposed controller under SISO configuration of pH neutralization system.

**4. SOFTWARE DESIGN**

**PLC**, programmable logic controller (PLC) is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability, ease of programming and process fault diagnosis. programmable controller is to emulate the functions of electro-mechanical relays. Discrete inputs are given a unique address, and a PLC instruction can test if the input state is on or off.

**DOT NET**, Microsoft recognized these factors and they introduced the Dot Net considering all these factors. All unwanted complexities are eliminated and a pure object-oriented programming model was introduced. This makes programmer's life very easy.

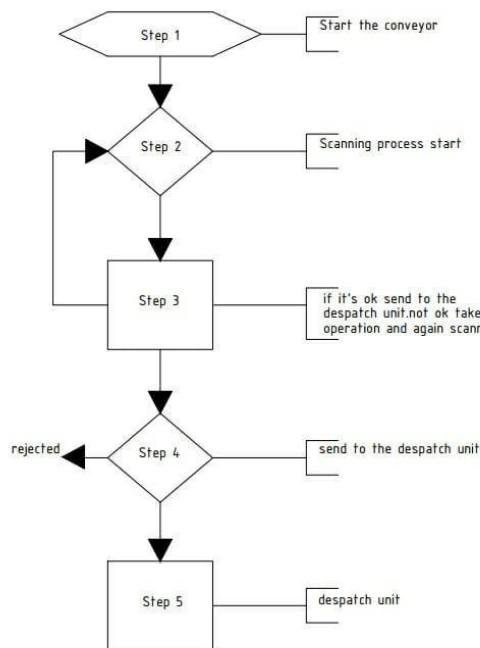
Dot Net is said to be Microsoft development model in which software becomes platform and device independent and data becomes available over the internet. Due to this vision Microsoft Dot Net is also called Microsoft strategy for connecting systems, information and devices through web services so people can collaborate and communicates effectively

**5. SYSTEM IDENTIFICATION**

The main objective is to reduce the processing time and increasing the production quality. The hardware design of RFID system process fully automated.

**6. WORKING AND OPERATION**

The working principle of the automatic machine is to check the product with the RFID reader without unboxing it the tag has a unique code for each material, recognized by a Radio Frequency (RF) signal from the reader, and then transfers the code information to the reader. Then the RFID reader transmits the code information received from the RFID tags to a DB (Database) through middleware. When the box is infeed to the conveyor the barcode will get the master data get from the box .box will travel to the middle sensor front door will close and the back door also closes and then the reader and scanner scan it and check the product and move to outfeed and the boxes are continues placed in the conveyor in case the box has any difference in quantity and miss match product the rejection unit will reject the box from the conveyor. The machine automatically check the product if it is not correct or the product count is less the special operation called shake operation is applied in this operation the conveyor in which the box is placed is moved forward and backward and then the product check in case the data is doesn't match with the master data the product is rejected and the product is rejected by the rejection unit which is placed near the back door. if it is ok box will pass the despatch unit.



**Fig.3 Flow chart**

### 7. RESULTS AND DISCUSSIONS

The experimental setup parameters output is listed. We have conducted as a three types of operation hand operation using RFID hand redder, Manuel operation and fully automated RFID conveyor system.

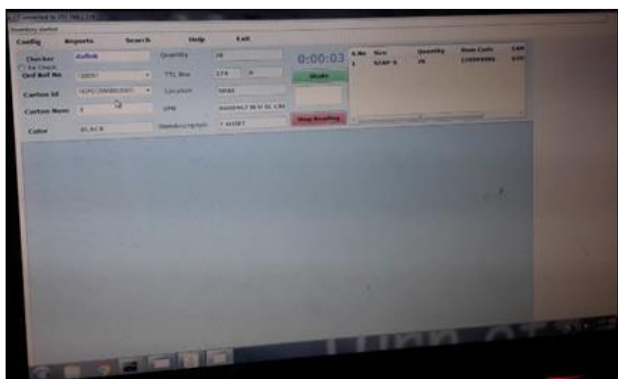


Fig.4 Master data page

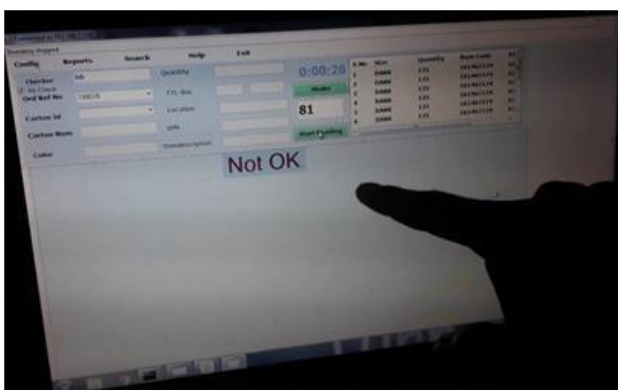


Fig.5 RFID scanning NOT OK product

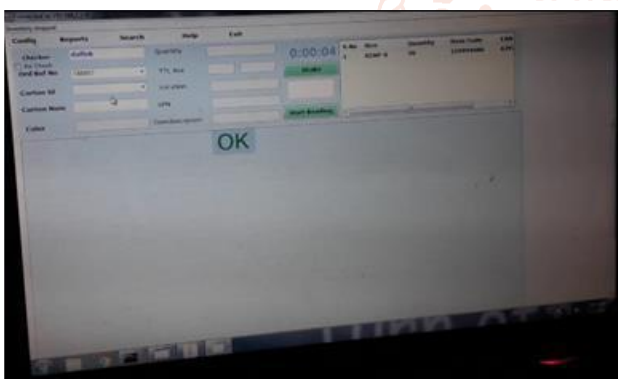


Fig.6 RFID scanning OK product

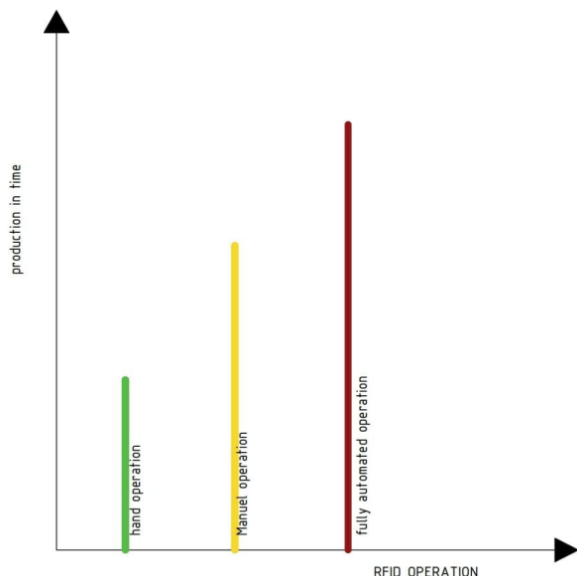


Fig.7 Production output three types

### 8. PERFORMANCE ANALYSIS

The performances of the RFID System calculating time duration and production

Table - Performance Analysis RFID System

Parameter	Hand operation	Manuel operation	Automatic operation
Time (minutes)	4	2	1
Production (1hour)	15	30	60

### 9. CONCLUSION AND FUTURE SCOPE

This paper presents the automatic machine conveyor with the concept of utilizing by an RFID reader and Scanner and Controlling the boxes by the conveyor method to produce the product and in this conveyor. Belt is used to move the boxes and the RFID are placed inside the automatic machine and Scanner also placed in it. This machine used to check the quantity of the products in the box. RFID system comprising the RFID tags, reader, scanner and middleware. The most outstanding features of the RFID system are reading distance of the box, durability. The proposed system has the potential to open a new regime for the design and use of RFID conveyor belt system.

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