Scope of RFID in Logistics and Transportation in India

Suhas Agawane[1], Suraj Yadav[2], Dr. Meenal Pendse[3]

P.G Students, Department of Management

under Faculty of Management

MIT World Peace University, Pune, Maharashtra 411038.

Abstract

Radio Frequency Identification is a non-contact reflex proof of identity technology, which will be the upcoming information storage extraction and processing technology. The literature on RFID is very extensive and diverse as it shows how this technology has been practical in many areas of human activity, only in logistics management and supply chain administration there are many examples of how RFID has been used in several activities within logistics. In this research paper we will see how RFID is implemented in fastag automatic toll system.

Keywords

Radio Frequency Identification, Fastag, Automatic toll system, Supply Chain, Logistics, Barcode.

1. Introduction

RFID and barcode technology are used in parallel ways to track inventory, but three important alterations make each one a better high-quality in certain situations:

- RFID tags do not involve a direct line of vision to be read.
- Data stored in an RFID tag can be restructured in real-time. In dissimilarity, bar code data is read-only and cannot be changed.
- RFID tags require a power source. In contrast, bar codes only need the technology reading the bar code to have a power source.

1.1. How RFID works

Every RFID system contains of three components: a scanning antenna, a transceiver and a transponder. When the scanning antenna and transceiver are joint, they are mentioned to as an RFID reader or interrogator. The RFID reader is a network-connected device that can be movable or permanently attached. It uses radio frequency waves to transmit signals that trigger the tag. Once triggered, the tag sends a wave back to the antenna, where it is decoded into data.

The transponder is situated in the RFID tag itself. The read range for RFID tags varies based on factors together with the type of tag, type of reader, RFID frequency and interfering in the neighboring environment or from other RFID tags and readers. Generally speaking, tags that have a stronger power source also have elongated read range.

1.2. Types of RFID tags

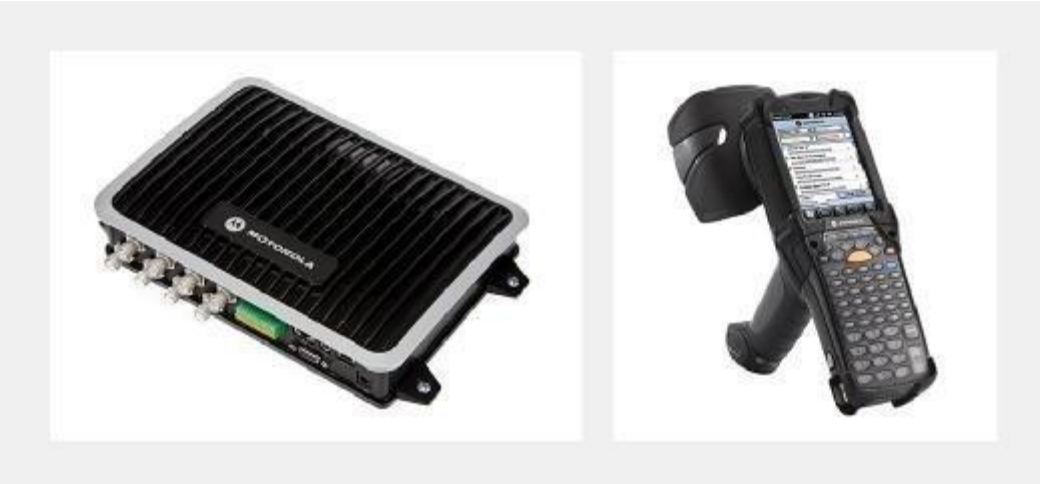
RFID tags are ended up of an Integrated Circuit (IC), an antenna and a substrate. The part of an RFID tag that encodes categorizing information is called the RFID inlay.

There are two key types of RFID tags: active RFID and passive RFID. An active RFID tag has its individual power source, often a battery. A passive RFID tag, on the other hand, does not need batteries; slightly it obtains its power from the reading antenna, whose electromagnetic

wave makes a current in the RFID tag's antenna. There are also semi-passive RFID tags, meaning a battery runs the circuitry while communication is power-driven by the RFID reader.

Low power, embedded non-volatile memory plays a vital role in every RFID system. RFID tags classically hold less than 2,000 KB of data, with a unique identifier/serial number. Tags can be read-only or read-write, where data can be additional by the reader or current data overwritten.

The read range for RFID tags differs based on factors counting type of tag, type of reader, RFID frequency, and interference in the neighbouring environment or from other RFID tags and readers. Mostly speaking, active RFID tags have a lengthier read range than passive RFID tags due to the robust power source.



RFID readers can be static (left) or movable (right).

1.3. RFID frequencies

There are three key types of RFID systems: low frequency (LF), high frequency (HF) and ultra-high frequency (UHF). Microwave RFID is also obtainable. Frequencies vary importantly by country and region.

- Low-frequency RFID systems range from 30 KHz to 500 KHz, however the typical frequency is 125 KHz. LF RFID has rapid transmission ranges, generally anywhere from a few inches to less than six feet.
- High-frequency RFID systems range from 3 MHz to 30 MHz, with the distinctive HF frequency being 13.56 MHz. The standard range is somewhere from a few inches to quite a few feet.
- UHF RFID systems range from 300 MHz to 960 MHz, with the distinctive frequency of 433 MHz and can normally be read from 25-plus feet away.
- Microwave RFID systems run at 2.45 GHz and can be delivered from more than 30-plus feet away.

The frequency used will hang on on the RFID application, with actual attained distances sometimes varying significantly from what might be expected. For example, when the U.S. State Department proclaimed it was to issue electronic passports enabled with an RFID chip, it said the chips would only be able to be read from roughly four inches away. However, the State Department was soon challenged with evidence that RFID readers could skim the information from the RFID tags from much beyond than 4 inches, some claiming upward of 33 feet away, proving the difference among advertised and actual range can differ immensely.

If read longer ranges are desirable, using particular tags with extra power can boost read ranges to 300-plus feet.

2. Literature Review

Ray Y. Zhonga 2013 (1) - Radio frequency identification (RFID) has been extensively used in backup the logistics management on manufacturing shop floors where manufacture resources involved with RFID facilities are transformed into smart manufacturing objects (SMOs) which are able to intellect, relate, and purpose to create a universal environment. Within such environment, huge data could be collected and used for secondary additional decision-makings such as logistics planning and scheduling.

Ramakrishnan Ramanathana 2014 (2) - Logistics has become a important part in the supply chain. Many logistics facility providers have realised the importance of implementation of technologies that can help manufacturers, warehouses, and retailers to interconnect with each other more efficiently. Among many logistics technologies, radio frequency identification (RFID) has been documented as an important technology to improve logistics operations and supply chain management, and thus is progressively acquisition both practitioners' and researchers' attention.

C.K.M. Leea 2010 (3) - The planned system is expected to have an significant impact on the performance of logistics networks by quality of its abilities to adjust unexpected supply and demand changes in the volatile market with the exclusive feature of responsiveness with the advanced technology, Radio Frequency Identification (RFID). The benefits of the future system include power regulator over inventory so as to respond to customer's wants rapidly. The development in efficiency will not purely come because the RFID devices can move data faster. The interlinking of the system, which will lead to improved data transmission and identify the demand pattern, has helpful effect on the entire supply network.

Egils Gintersa 2013 (4) - One significant component of the gross domestic product (GDP) is logistics services the quality and added worth of which is growing due to the application of modern information and communication technologies and electronics. RFID use rises the performance of logistics objects identification, however some errors, which could cause considerable damage and losses, remain. It is probable to achieve functional and perspective system by integration these technologies together.

Zheng Mingxiu 2012 (5) - RFID is a non-contact automatic identification technology, which will be the future information storage extraction and processing technology. In current years the ordinary of the large-scale development has revealed the situation. RFID is the key technology of three-party logistics information and automation. RFID-based logistics system can enlarge the logistics operation capacity, and improve labour productivity to reduce logistics operations mistakes RFID is a non-contact automatic identification technology, it is through radio frequency signal automatically detect target signal and entree to relevant information, and the backup backing for the information processing software and applications of the technology.

Sobhi Mejjaouli 2015 (6) - The use of RFID for Improving decision making of producer's organizations is well – documented in the literature. Also, nevertheless of the application domain, the use of WSN many times provided better operations or design capabilities. This work offers an integrated model system in which RFID abilities are combined with the WSN technology to serve as consistent decision-making inputs when materials, products an information are moved across the supply and demand chain. By traveling together with them, the WSN monitors the material and products that are distributed in individual RFID-tagged pallets or cases.

3. Objective

To study RFID impact in Logistics.

To study cost assessment and benefits of using RFID in Logistics.

Development of RFID-based Reverse Logistics System.

Study to determinate the viability of RFID in a logistics.

4. Methodology

The study is based on **Secondary Data** collected from various sources such as Research Papers, News Articles, Reports and other Online Databases.

The Paper will showcase the impact of RFID in Logistics, Recent development in RFID based reverse logistics system, Study of cost assessment and benefits of using RFID in logistics, to determinate the impact of RFID in logistics. According to the data collected from various sources, RFID in logistics will be analysed and accordingly its advantages, disadvantages, limitations and conclusion will be drawn. As we have researched about the trends and development happened and going to happen, we make sure the facts and figures showed in the paper are accurate. We will analyse all aspects of RFID in development in logistics sector.

Data Collection – Secondary

Research Strategy – Case Study

Research Approach – Deductive

5. RFID applications and use cases

RFID dates back to the 1940s; it was used more often in the 1970s. For a long time, however, the high cost of the tags and readers prohibited prevalent commercial use. As hardware costs have decreased, RFID implementation has also increased.

The most common RFID application is used for tracking and management. This includes pet and livestock tracking, inventory management and asset tracking, freight and supply chain logistics, and vehicle tracking. RFID can also be used in retail for advertising customer service and loss control; in the supply chain for superior visibility and distribution; and in security situations for access control.

Multiple industries use RFID applications, including healthcare, manufacturing, retail, business and residence use.

HONEYWELL

Passive RFID tags do not need batteries. In this example of passive RFID from Honeywell, battery-free tags in vehicles are used to collect tolls on highways.

RFID vs. barcodes

Using RFID as a substitute for barcodes is increasing in use. Among its benefits, RFID can identify individual objects, animals or people without direct line of sight, can identify many items -- often a thousand or more -- concurrently, and can scan items wherever from inches to feet away depending on the type of tag and RFID reader. Read time for RFID tags is typically fewer than 100 milliseconds.

Barcodes, on the other hand, need direct line of sight and closer proximity than an RFID tag. They also take more time to read, generally 0.5 second or more per tag. Because barcodes represent a product type against an individual object represented by an RFID tag, additional information cannot be gleaned from them. In addition, barcodes are not read-write, and because they are printed on the outer surface of the

object are limited in terms of reuse thanks to wear and tear. RFID tags are much more rugged and better protected, often in a plastic cover. However, RFID tags cost more than that of printed barcode.

6. RFID challenges

RFID is subjected to two main issues: reader collision and tag collision. Reader collision, when a signal from one RFID reader interferes with a second reader, can be prohibited by using an anti-collision procedure to make RFID tags take turns transmitting to their right reader.

Tag collision occurs when there are too many tags confuse an RFID reader by transmitting the data at the same time. Choosing a reader that gathers tag info one at a time will avoid this issue.

7. RFID standards

There are a number of guidelines and specifications for RFID technology, with the main ones being the International Organization for Standardization (ISO), Electronics Product Code Global Incorporated and International Electrotechnical Commission (IEC).

Next-generation RFID use

RFID systems are becoming popular and widely used to support internet of things deployments. Combining the these technology with smart sensors and/or GPS technology allow sensor data including temperature, movement and location to be wirelessly transmitted.

8. Conclusion

A FASTag is basically a tag that you attach to the windshield of your car, from the inside. This is Radio-frequency Identification (RFID) enabled and is linked with the registration details of your vehicle. All user has to do is Recharge their Tag Account and drive through FASTag Lanes at the toll plazas, and appropriate toll would automatically be deducted from your balance. SMS alerts will be sent on the registered mobile number giving information on toll fee deducted and low balance. automatic toll collection system not only helps user to save his fuel and time but it reduces pollution to large extent and heavy traffic jams near toll collection centres.

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