



# International Journal of Multidisciplinary Research and Development



IJMIRD 2014; 1(7): 250-254  
www.allsubjectjournal.com  
Received: 13-11-2014  
Accepted: 06-12-2014  
e-ISSN: 2349-4182  
p-ISSN: 2349-5979

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## **Application of radio frequency identification (RFID) technology in container transportation in India's sea ports- an empirical study**

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### **Abstract**

The introduction of containerization in 1956 to the worldwide shipping industry marked a seminal point in the development of modern transoceanic commerce. The ability to load cargo into standardized metal boxes and then load those boxes onto large ocean-going vessels created an entire new way of moving freight. RFID is evolving as a major technology enabler for identifying and tracking goods and assets around the world. Poor setup of the RFID reader and tag will lower the feasibility of RFID adoption as well as increase the cost. In order to address the challenges of implementing RFID in the container transportation, this paper provides method of applying RFID technology in container transportation. This statement conferred that, this is the right time the Government of India and DGFT expert committee should investigate about the feasibility of apply the RFID technology in sea ports for developing the efficiency of container tracking system in future.

**Keywords:** RFID, Container, transportation, DGFT, sea ports.

### **1. Introduction**

#### **Preamble**

The introduction of containerization in 1956 to the worldwide shipping industry marked a seminal point in the development of modern transoceanic commerce. The ability to load cargo into standardized metal boxes and then load those boxes onto large ocean-going vessels created an entire new way of moving freight. Containerization has proved to be so successful that, today, 50 years after they were first introduced - containers move approximately 90% of the world's cargo. As countries around the world, especially developing nations, increase their ability to produce goods, and developed countries maintain their appetite for purchasing low-priced manufactured products, container traffic will continue to increase. RFID is evolving as a major technology enabler for identifying and tracking goods and assets around the world. It can help hospitals locate expensive equipment more quickly to improve patient care, pharmaceutical companies to reduce counterfeiting, and logistics providers to improve the management of moveable assets. It also promises to enable new efficiencies in the supply chain by tracking goods from the point of manufacture through to the retail point of sale (POS).

### **2. Origin of Rfid**

The first disturbing fact is that RFID is not a new technology. It was first used over sixty years ago by Britain to identify aircraft in World War II and was part of the refinement of radar. It was during the 1960s that RFID was first considered as a solution for the commercial world. The first commercial applications involving RFID followed during the 70s and 80s. These commercial applications were concerned with identifying some asset inside a single location. They were based on proprietary infrastructures. The third era of RFID started in 1998, when researchers at the Massachusetts Institute of Technology (MIT) Auto-ID Center began to research new ways to track and identify objects as they moved between physical locations.

### **3. Role of Rfid in Container Transportation**

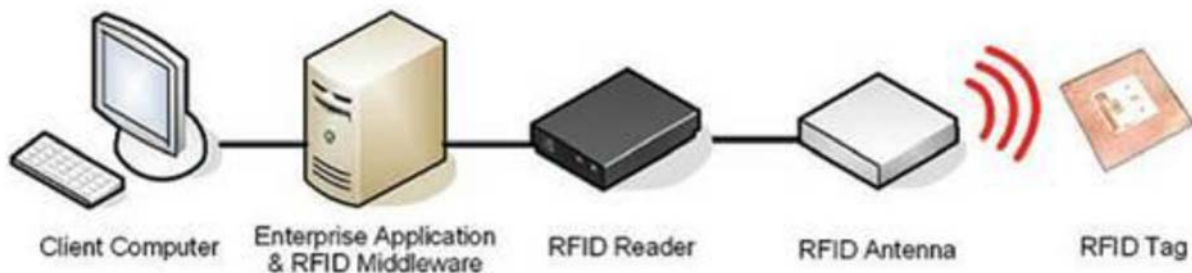
Container transportation plays an important role in modern transportation owing to its characteristics of high efficiency, convenience and safety. The informationization of container transportation management has become a necessary development of the container transportation. Radio Frequency Identification (RFID) is a useful technology to improve

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container transportation efficiency, safety and visibility. In this paper, RFID technology is briefly introduced at the beginning. Then, RFID application in container transportation management is mainly discussed based on a port container vehicle management case and instances. India has experienced fast-paced growth over the last decade. Though the growth has primarily come from the Services sector, manufacturing and exports have also risen substantially. Logistics as a function is being increasingly

outsourced by manufacturers. However, the Indian logistics sector in many ways still lags behind the global standards of performance. This is evident from the fact that we are ranked as low as 46th among 155 countries in the World Bank International Logistics Performance Index. Comparatively, our neighbor China got the 26th rank. The average logistics cost in India is around 13% of GDP. Given this, there is a substantial need to invest in, and improve efficiencies in, intermodal and multimodal logistics sector so that the friction costs do not impede the desired shifts.



Basic Components of an RFID System (Kwok, Tsang & Cheung, 2008)

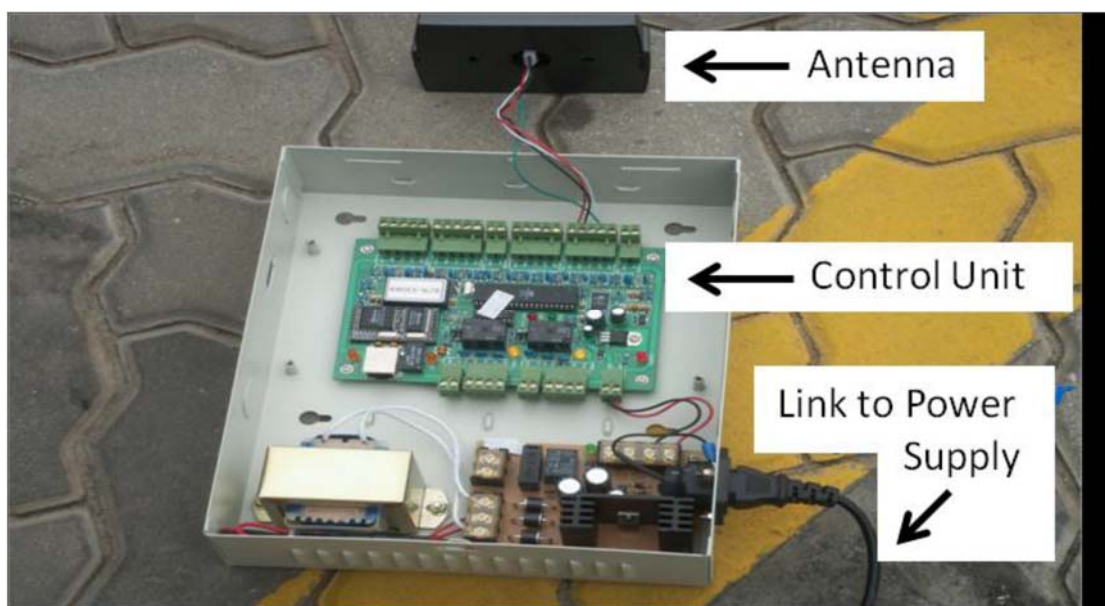
**4. What Is Rfid Really?**

RFID is the reading of physical tags on single products, cases, pallets, or re-usable containers that emit radio signals to be picked up by reader devices. These devices and software must be supported by a sophisticated software architecture that enables the collection and distribution of location-based information in near real time. The complete RFID picture combines the technology of the tags and readers with access to global standardized databases, ensuring real time access to up-to-date information about relevant products at any point in the supply chain. A key component to this RFID vision is the EPC Global Network. Tags contain a unique identification number called an Electronic Product Code (EPC), and potentially additional information of interest to manufacturers, healthcare

organizations, military organizations, logistics providers, and retailers, or others that need to track the physical location of goods or equipment. All information stored on RFID tags accompanies items as they travel through a supply chain or other business process. All information on RFID tags, such as product attributes, physical dimensions, prices, or laundering requirements, can be scanned wirelessly by a reader at high speed and from a distance of several meters.

**5. Current Issues in Container Security**

Globalization, and the increase in trade that it has brought about, has helped to create wealth in developing countries, build a manufacturing base and middle class in places where previously none existed, hastened the spread of cultures, ideas and the principles of democracy and liberty.



Architecture of RFID communications

## 6. Objectives of the Study

The major objectives of the present study are

To observe the application of RFID technology in container transportation in India.

To identify the application of RFID technology in various business.

To find out the problems faced by the container transporter in related to RFID technology.

## 7. Statement of the Problem

Maintaining the security of the global supply chain and of ocean-going containers is of the utmost importance in today's world. The moving goods and services from one country to another country is very complex process in marine trade. There is countless number of challenges faced by the exporter, importer, CHA, Clearing and forwarding agents, liners, freight forwarders and customs brokers are involving with the cargo transportation from production place to consignee place or country. Day to day, there are plenty of technology advancement coming to reduce the cargo transportation problems in all over the world. At the same time, the application of RFID technology in container transportation is complex process. This present study is attempt to focus towards observe the application of RFID technology in container transportation in India.

## 8. Significance of the Study

Before the invention of the shipping container, it was almost unbearable to recount the supply chain problems of most firms, especially when businessmen struggle to transport raw materials and finished goods. It is difficult to believe that even after World War II freight transportation was a nightmare for businessmen. The economic globalization has promoted the international flow of trade, investment, technology and financial capital as a result of which the globalization of the international shipping market has been accelerated further. The global sea trade will continue growing with the help of advanced technology like RFID for tracking container, ship, vessels and cargo. This RFID technology will facilitate the container transportation improvement in terms of speed, accuracy and identify the location of the container. So, researchers are tried to observe the importance of RFID technology in container transportation in India.

## 9. Purpose of the Study

Numerous studies discuss that Radio Frequency Identification (RFID) technology can provide better container handling efficiency; however, relative lack of research concerns the tracking and monitoring the movement of vehicle in the container transportation. Thus, this study aims at observe the application of RFID technology in cargo transportation in India.

## 10. Research Methodology

This study makes use of a series of application of RFID technology in container transportation in India. The possibility and accuracy of using RFID in container transportation also investigated in this study based on the existing research article.

## 11. Method of Data Collection

This present study nature is desk research; the researcher are collecting the published data through various sources like

books, articles, journal and magazine as well as renowned web site for the purpose of collecting data related to RFID technology.

## 12. Research Gap

There is wide research gap going on related to application of RFID technology in cargo transportation in India. The existing research only covering the RFID technology uses in various businesses field in all over the world. It is not concentrating towards any concern department or sector application of RFID technology.

## 13. Limitations of the Study

With the development of world economy and technology as well as international trade will continue growing in after adopting the liberalization, privatization and globalization policy in India since 1991. Although, some unstable factors like overseas demand, container traffic, port traffic, road connectivity problem and locating the containers are going on in marine trade. In this present study is portrait towards only RFID technology application in container transportation In India based on the secondary data sources. It is not included the RFID technology users opinion or experience in container transportation.

## 14. Application of Rfid Technology in Various Fields

Logistics and distribution:

Tracking parcels from shipment to end customer

Tracking goods from manufacture to retail

Retail:

Supply chain management

Stock taking

Reducing loss through shrinkage

Reverse logistics

Product availability

Maintenance:

Plant & Equipment

Fixed assets

Product security:

Tamper evidence

Product authentication

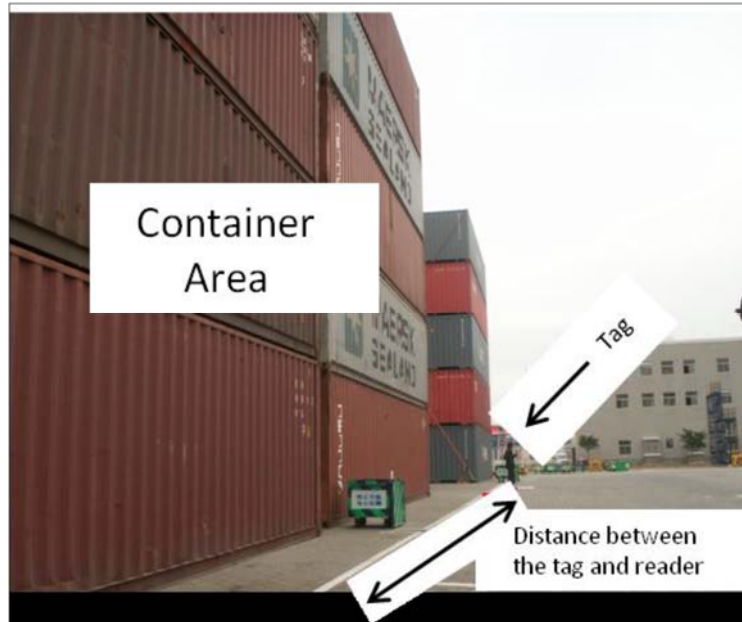
Anti-counterfeiting

Key Issues for Consumers

The benefits offered by RFID provide a compelling case for deployment within the supply chain. However, organizations must be mindful of privacy issues surrounding the technology. Today, most RFID deployments are supply-chain applications such as tagging for shipping containers or pallets. These do not associate personally identifiable information (PII) with tag identification (EPC) numbers. But with 'item-level' tagging, unique identification numbers in EPC global tags might become associated with an individual at the POS when the tagged product, such as an item of clothing, is acquired.

## 15. Sea Ports

India has 12 major and 187 minor and intermediate ports along its more than 7500 km long coastline. These ports serve the country's growing foreign trade in petroleum products, iron ore, and coal, as well as the increasing movement of containers. Inland water transportation remains largely undeveloped despite India's 14,000 kilometers of navigable rivers and canals.



Setup of distant test in containers area

terminal area. However, in other area such as sea side and

### 16. RFID Business Benefits

Use of RFID technology can increase business productivity and reduce associated costs. To ensure that companies benefit from the advantages RFID provides it is important to understand how to adopt this technology. By analyzing current practices and procedures eight main areas of benefit can be identified. These are:

- Improved Productivity and Cost Avoidance.
- Decreased Cycle Time and Taking Costs Out.
- Reduced Rework.
- Reduced Business Risk & Control of Assets.
- Improved Security and Service.
- Improved Utilization of Resources.
- Increased Revenues.
- Exception Management.

### 17. Applications of RFID

Applications fall into two principal categories: short range applications in which the reader and tag must be in close proximity (such as in access control), and medium to long applications in which the distance may be greater (such as reading across a distribution center dock door). A sample of applications is shown here:

Access control for people: There are many areas in which RFID tags are carried by people to allow them to gain access to facilities or services:

- Secure access to work place
- Safety access to dangerous/secure equipment
- Access to a computer or vehicle
- Access to travel on trains/buses
- Access to leisure facilities

Access control for vehicles:

- Secure access on site
- Road tolling
- Instant payment for fuel

### 18. Major Findings

The observation results indicate that the RFID communication is good at the containers area which occupies nearly all the area in the container transportation and

free area, the performance is not good in 100% readability only achieved in 5m and 10m in free area and sea side respectively.

Originality/value: The container terminal environment, which consists of different transport vehicles for onward transportation, will affect the performance and application of RFID readability. Poor setup of the RFID reader and tag will lower the feasibility of RFID adoption as well as increase the cost. In order to address the challenges of implementing RFID in the container transportation, this paper provides method of applying RFID technology in container transportation.

### 19. Recommendation

The Indian port association and ministry of shipping should apply the RFID technology in all the major sea port, minor port, container yard and dry port for reducing the cargo traffic delays, container waiting times and labors cost as well as minimize the transaction time in the sea port. Through this technology the sea port terminal manager can view the each vehicles and its position with the yard. So, the RFID readers should install throughout the yard in order to maintain the quality services to the marine trader. It will improve the export and import volume of Indian sea port industry. It will lead to achieve the positive Balance of payment position in future.

### 20. Conclusion

Awareness of RFID technology and the benefits it delivers is increasing across the industry. By playing a key role in developing the infrastructure required for RFID, Microsoft is contributing to the momentum of mass deployment. As per the 7th international conference on container infrastructure India in the year 2012-13, container traffic at Indian ports grew by less than 1 per cent over the previous year. In fact, major ports witnessed a drop of almost 1 percent in container traffic handled during the year, while non-major ports witnessed a growth of only 6 per cent. This was due to the continuing impact of the economic slowdown. The traffic outlook for ports remains somewhat uncertain for 2013-14. This statement conferred that, this is the right time the

Government of India and DGFT expert committee should investigate about the feasibility of apply the RFID technology in sea ports for developing the efficiency of container tracking system in future.

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