

# The application of RFID technology in a Port

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## Introduction

While much of the attention has recently been focused on the role of Radio Frequency Identification (RFID) in retail logistics, there is much more to RFID than the current generation of disposable tags. RFID has been successfully used in transportation and manufacturing since the mid-80s and its use is growing rapidly as costs come down and benefits are recognised.

The primary advantage to RFID in a port/terminal application is that it is an 'automatic' data collection technology. That is, no operator intervention or action is required.

Whereas other forms of data collection, whether bar code or manual methods, depend on employees to record information, RFID relieves them from this time-consuming and error-prone process. The two direct benefits of this are:

- Accurate and complete data collection; and
- Better utilisation of employees' time.

In addition, security measures can be significantly enhanced through the use of RFID.

There are five major areas where RFID can be effectively used in a port cargo terminal:

- Access Control;
- Container Security;
- Container Identification and Location;
- Activity Tracking;
- Regulatory Compliance.

Some of these applications offer benefits to the terminal/port operator; either directly or as added services for shippers. Other benefits must be seen more as a means of simplifying compliance with increasing governmental security regulations and record keeping requirements.

While many of the applications cited in this article will require the cooperation of ship owners, shippers, carriers and terminal operators in employing RFID and may, therefore, seem to be excessively forward-looking, the regulatory environment will likely encourage adoption in a much shorter timeframe than might be evident at this moment.

## Terminology

A basic understanding of the types of RFID systems available is in order. However, a full discussion of all the types and capabilities of RFID is beyond the scope of this article. For more information on RFID technology, please visit [www.rfid.org](http://www.rfid.org).

Briefly, the two types of RFID tags that are of primary interest are active and semi-active.

Active RFID tags contain a battery to boost reading range. Active tags can have a range up to 100m. These tags have a relatively large memory capacity to store relevant data that is typically encrypted to prevent unauthorized reading of, for example, a shipping manifest. Active tags may contain sensors, global positioning (GPS), satellite links, or other enhancements.

Semi-active RFID tags contain a battery but this is not used to

enhance reading range. The battery is used to power sensors or volatile memory. Read range depends on the frequency and type of tag.

Also of interest are RFID identification cards, which may be contactless smart cards. These are passive since they contain no battery and have a more limited range. Passive RFID tags may also be found on pallets and other load devices within shipping containers.

## Access Control

### Employee ID

In addition to helping comply with the U.S. Smart and Secure Tradelanes (SST) and Container Security Initiatives (CSI), ensuring that only authorised personnel are admitted to the terminal area is necessary to prevent loss and possible mischief.

The use of RFID identification cards, either contactless smart cards or proximity RFID tags with a very limited range (in the range of millimetres) can not only store access information such as shift, job function, allowable vehicle access, etc. but can also contain biometric information such as a photograph.

For entry to secure areas, having an employee's photograph encoded in an RFID badge significantly reduces the possibility of forgery. For unmanned entry points, closed circuit TV (CCTV) can be used to compare an employee's picture stored on the RFID card to the individual. The picture can either be transmitted from data on the card to the guard station or a unique serial number could access the photo from a company database.

RFID employee ID badges can provide automated time and attendance and can also be used to associate an employee with a particular piece of equipment. Employee identity can be used to ensure that an employee is qualified to operate a certain piece of equipment or enter a certain area. In many cases, security or operations personnel can be relieved of these duties because the RFID badge will contain the necessary clearances or permissions.

In an increasing number of applications, RFID badges also function as stored value cards, allowing workers to make purchases within the workplace without the need to carry cash. This feature means that the RFID badge provides benefits to the worker as well as the employer, improving worker acceptance.

### Vehicle Control

Equipping tractors and other equipment with RFID tags is becoming increasingly common in fleet and yard management operations.

Readers placed at fueling stations, gates and other access points can be used to enable access or egress as well as to record the exact time at which a particular truck and container entered or left the terminal.

RFID employee badges can be used to validate that the right driver has the right vehicle and load. Tags on vehicles or RFID badges can be used to unlock fuel pumps and record fuel usage.

## Container Security

A great deal of attention is being focused on a new generation of 'smart seals' to ensure the integrity of a container and its contents.

Whereas conventional security seals will provide evidence of tampering, they require visual inspection to do so. Evidence of tampering is usually discovered long after the fact and offers little benefit other than proof of loss.

RFID seals, on the other hand, can alert terminal personnel at the time of tampering. Smart seals are active RFID tags and will broadcast the fact that they have been opened or removed without authorization.

Typically, these tags would be purchased and affixed by the shipper. However, terminals must be equipped to receive signals from these tags if they are to be effective.

Smart tags can also be equipped with sensors to monitor environmental conditions within the container. It's not possible to counterfeit tags so there's no possibility that one tag will be removed and another used to replace it.

Some tags, such as those used by the U.S. military on high security containers, also contain GPS, sensors, and satellite phone capabilities to constantly report the location of the container and the conditions within it. For perishable, sensitive, or high value cargos, this type of tag offers the highest level of security. These tags, and the satellite phone portals, are available to commercial shippers. Because they can report breaches to the shipment owner directly, terminals do not need to make special accommodations for them.

## Container Identification and Location

### Container Tagging

While there has been an ISO standard for tagging of maritime containers for a number of years, few container owners have implemented tagging; primarily because tag costs were initially very high. A new generation of active tags, however, has brought the cost down considerably, making it more feasible to tag the tens of thousands of containers in use.

A continuing problem with intermodal containers is the presence of multiple identification numbers on many containers. There may be one number on the side and another number on the end – and terminal operators have little guidance as to which is correct.

The increased concerns over the possible use of maritime shipping containers as a means of entry for illegal immigration, weapons, and chemical or biological agents means that positive identification of each container, under SST and CSI, will only increase. RFID tags provide a secure answer to this requirement.

Readers placed on gantries and yard vehicles will be able to automatically record the identity of each container as it's offloaded and transported within the terminal.

### Location Tracking

Even with sophisticated management software, containers are not always placed where they should be.

RFID tags can be buried at regular intervals in the aisles to serve as location markers. These tags can be read by RFID readers in yard vehicles and provide information on the exact location of the vehicle. These readers could also capture the ID of the container being transported. Communicated to the office via a wireless LAN, the location of any vehicle or container can be automatically recorded and displayed.

### Activity Tracking

Productivity is an issue that is of concern not only to terminal operators but to the ship owners, shippers and consignees as well.

Ensuring the most efficient loading and offloading of container ships is critical to profitability. Certainly time spent looking for containers that have not been placed where they should have been is time wasted and, in the case of perishable goods, may result in the loss of the entire shipment.

The use of RFID tags to record the location of containers and monitor the location and activities of yard vehicles will improve the overall quality of data and, therefore, the efficiency of the

entire operation. In addition, it will enable collection of detailed data that may uncover inefficiencies in established procedures that could not previously be identified.

RFID provides the ability to automatically collect real-time data without burdening employees. This provides managers with an up-to-the-minute picture of activities and that, in turn, allows them to respond to developing situations in a timely manner.

## Regulatory compliance

Without question, the world is becoming more regulated. From the U.S. SST and CSI initiatives to the U.K. food tracking mandates, more and more burdens are being placed on every link in the supply chain to record the movement of goods from the point of origin to the point of consumption.

The use of automatic identification and data collection (AIDC) technologies, including bar codes and RFID, will permit companies within the supply chain to efficiently cope with these data collection regulations.

With the U.S. SST and CSI regulations, there are increasing burdens on suppliers and terminals to ensure the integrity of containers once they have been inspected. The use of RFID technology for employee ID badges, access control, security seals and terminal operation will provide assurances that container integrity has been maintained. Containers that can meet all these requirements will be 'fast tracked' on arrival in the U.S., allowing them to be moved out of the terminal faster.

While there is currently no mandate for RFID in any of the current regulations, there is every indication that it will be recognised within a few years as a means of compliance.

Containers with RFID container seals will enable shippers and carriers to:

- Consistently monitor container security and integrity.
- Speed shipments through the supply chain.
- Verify that a container was loaded at a secure loading point.
- Significantly reduce the likelihood a tamper event happened in transit with container accountability from point of origin to destination.
- Gather enough data to conduct a 'virtual inspection' in advance of arrival.
- Guarantee that shipping containers meet governmental security regulations.
- Receive fast track or 'green lane' handling through customs at the point of dispatch and / or the point of receipt.
- Avoid extensive delays in the shipment and receipt.
- Minimise the cost of handling.

## Conclusion

A number of leading port facilities around the world have already become, or have contracted to become, RFID-enabled. Even if you do not yet feel an urgency to implement RFID technology within your facility, it would be prudent to explore the options and benefits of RFID. Because RFID is coming and it's coming faster than you may think.

### ENQUIRIES

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