

5 RFID Technologies and Applications

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5.1 Introduction

Commercialism plays a critical role in contemporary society. To stay ahead of competitors, businesses must find a better, more cost-effective method of production quickly and efficiently through research and development, or make investment toward technological improvement. At the same time, companies must successfully adopt these improvements quickly in order to respond to the demands of the market.

Corporations must differentiate which technologies are beneficial to them, and which are unnecessary in order to flourish in competitive markets. Any technology that speeds up decision making and increases productivity, while reducing production costs is considered beneficial. Fundamentally important production stages include supply chain management, warehouse control, product tracking, and security to name a few.

Since the birth of modern wireless technological era, there is no other technology that has drawn more attention to itself than RFID in terms of product management.

RFID is now rapidly becoming prominent in the contemporary business world. It has attracted extensive attention from the business community and has many applications such as access control, security management, purchasing, manufacturer, supply chain management, and distribution logistics.

Given the benefit of communicating without relying on line-of-sight access, RFID offers a genuine solution to handling product management, whether from the supply chain perspective or from the inventory perspective. RFID provides an effective way to communicate and transfer data without the need of physical contact. RFID tags on products are not easily damaged, as they can sustain high amounts of pressure, as well as survive in varying temperatures. This, along with many additional benefits (discussed in later sections) that RFID brings to corporations, makes it a very real and viable business solution.

5.1.1 What is RFID?

Radio Frequency IDentification (RFID) is a standard term to describe technologies that utilize radiowaves to capture and identify data. RFID uses wireless technology to convey data between microchip-embedded transponders and readers. The

transponders or tags, consisting of a microchip and an antenna, are attached to objects that need identifying. The reader, using one or more antennae, reads the data held on the microchip. By emitting radiowaves to the tag and receiving signals back, the reader is able to communicate with the transponder.

5.1.2 History

RFID systems have been around for decades and have been used in many different applications. But it was not until recently that RFID has started to receive enormous amount of attention from business corporations and commercial retailers.

One of the earliest uses of RFID was during WWII, when the long-ranged transponder system was explored. Identification, Friend or Foe (IFF) was one of the first practical uses of RFID, where military forces attempted to identify whether aircrafts were friendly or hostile.

The earliest commercial impact RFID had was during the late 1960s, when the electronic article surveillance (EAS) equipment was designed to counter theft and shoplifting. Although the EAS equipment consisted of only one-bit tags, it was an effective method to counter theft. Because only one-bit tags were used, the system could only detect whether an item was present, or absent. However, the system proved cost efficient, as the tags were relatively cheap and provided an effective way to prevent theft.

One of the first passive, read–write RFID tags was invented in the early 1970s. The transponder now included a way to store data, using a memory chip. It also responded to signals transmitted to write data into the memory, as well as data read from the memory. Furthermore, it transmitted a return signal out of the memory to the reader. The transponder also had a way to internally generate power to operate. This new invention was groundbreaking, as it opened the door for many new possibilities. With the ability to alter data in the tag, RFID tags became much more useful in the practical world.

Following this invention in the 1970s, many tracking applications began to appear. RFID played a significant role in animal tracking, which is still used in modern society. Special tags are applied beneath the skin of animals, be it domestic, stock, or wild. The earliest form of animal tracking was used to analyze the migration route of different species of birds. The tag is usually in the form of a little glass pill, where information about the animal pertaining to its age, physical attributes, and health conditions can be stored and updated. The pill is placed under the skin of the animal and can in no way harm the carrier.

With the increasing uses of RFID in the 1980s, RFID systems were beginning to break out in a significant way, emerging from the hidden shell of the past with a bang into the 1990s and the twenty-first century, where commercialism plays such an influential role.