THE PROGRESS IN RFID TECHNOLOGY

Tomáš Potkan*

Introduction

The approach of coprocessors, microprocessors and network systems opened a wide area of application the RFID technology. Nowadays it is used not only in monitoring or identification but also to tracking, increasing speed in delivery and most remarkable in lowering production and distribution costs. Everyday life is changing to a better one thanks to the RFID technology. We can find RFID technology in every single line of business. Read about the beginning of the RFID and what RFID became.

Ancestor and the beginning of RFID

About the RFID technology it is said that it is a new technology, but the first mention about similar technology is dated to 1939. In this period, this technology was used by British army. Technology IFF (Identify: Friend or Foe system) served to identify the aircraft of Allies from the aircraft of Osi. The aircrafts of the Allies were equipped with transponder, able to receive and send radio signal. The transponder after receiving the signal from earth sent another signal back under authority of it the operator recognized which aircraft is coming. [1]

Nevertheless the beginning of the RFID technology is regarded year 1970 when Mario Cardullo registered patent application. The RFID patent was bestowed in 1973 and around 1977 was the RFID technology used for the first time in the public sector. [1]

With the development of RFID technology were handling two companies, the Amtech and the Identronix Research. The usage of this technology was applied by the monitoring of cattle, its amount, temperature, etc. Faster development of the RFID technology occurs in the nineties with the approach of coprocessors, microprocessors and communication networks. In this time the RFID comes to the public sector more widely. It begins in the department of the security. [1]

Basic segmentation of RFID

The word RFID comes from the collocation Radio Frequency Identification. The RFID technology works in the high-frequency of low-frequency oscillation. There are several classifications of RFID tags and systems:

- frequency oscillation,
- type of identification tag,
- application of RFID. [2]

*Ing. Tomáš Potkan, Žilinská univerzita v Žiline, Fakulta prevádzky a ekonomiky dopravy a spojov, Katedra spojov, Univerzitná 1, 010 26 Žilina, tel.: +421949365228, e-mail: tomas.potkan@gmail.com

According to the frequency oscillation the RFID systems are divided into low-frequency and high-frequency systems. [2]

The low-frequency RFID systems are distinguished with latency and low operating costs. The usage of this type of RFID systems is in the contactless attendance controls, identification systems and systems for monitoring of animals and movement at all. [2]

The high-frequency RFID systems in contrast to the low-frequency systems offer bigger range and greater flexibility. [2]

By the dividing of RFID tags by the type of the identification tag there are two kinds- active and passive RFID systems. [2]

The active systems are created with active tags. Active tags have integrated power source and enable to change information in memory. These types are used for collection of information, scoring and consecutive delivery of data. The disadvantage of active RFID tags is its limited life, which is established on used power source. [2]

The passive systems are created with passive tags. These haven't its own power source and therefore for work use the energy from the magnetic field of the read device. Information in the passive tags are unable to be modified. They are used for identification and into the future are under consideration how to change them with the bar code. [2]

The third division is by the application in EAS systems, PDC systems, network systems and systems for position designation. [2]

EAS systems (Electronic Article Surveillance) are on the present probably the most visible application of RFID technology. It is the system used to help merchants before thieves. The reading devices are installed near the exit of the shop. When a costumer buys a product the RFID tag is corrupted or deactivated. [2]

PDC systems (Portable Data Capture). These systems are assigned to monitor movement of product and persons. [2]

Network systems are RFID systems similar to the PDC systems, as far as using. In contrary to them, they are used just like EAS systems stationary readers. The readers read identification data from RFID tags on products when they pass through the reader and then send the data into the central system.[2]

Systems for position designation are used to discover the exact location of object. Accordingly they are used for identification of vehicles when they pass through control posts. [2]

Fig. 1. Sticker RFID tags used by post parcels

Position of RFID technology in face of barcode technology

Many people, who know the RFID technology only marginally, imagine it like a new successor or new version of the bar codes. But this technology has from the beginning another bearing as the bar code (cattle monitoring, area of security). But with the approach of coprocessor and microprocessor has the area of its using sharp increased. One of these areas is evidence and identification of goods, so area in which is the barcode used everyday.[2]

If the RFID should substitute the barcode we have to compare these two technologies and to determine which one is more suitable. The basic task for the barcode was to accelerate routine operations in retail and to lower many mistakes which accrue by manual information

entering into the information system. This task is fulfilled by barcode very well for more then 30 years. During these years the barcode passed many improvements because of increasing requirements of buyers. On the present the buyers are preparing for the implementation of the barcode GS1 DaraBar. Into this barcode can the producer encode for example the maximum expiry date. The main advantage of this technology in face of RFID is that barcode has low production costs. The biggest disadvantage is the direct sight of barcode and reading device and the impossibility to change or actualize information encoded in the barcode.[2]

The RFID technology has many advantages which appreciate everyone who come closer to this technology whether in production area, logistics or the area of selling. One of the biggest advantages is that is not necessary direct visibility between RFID tag and reading device. This opportunity mainly appreciates the area of production and logistics, because package doesn't has to be directed to the reading device to identify the product. If the RFID tag is inside the package the tag is also protected against humidity, dirt and temperature. Another advantage against barcode is that barcode has to be read one after another but by RFID tags are read many tags in a second and from a further distance. By barcode is impossible to actualize or change data. It looks like the RFID technology resolves every barcodes disadvantage. On the other hand the RFID can't compete with barcode in the price. Because of this disadvantage which is critical for many producers barcode won't disappear from the market. RFID systems are in the present used mainly in the area of production, storage and distribution.[3]

Field of utilization RFID technology

The RFID technology is very flexible and can be used in every part of production cycle, from material through work-in-progress, distribution until selling of product. [4]

RFID systems are used by more and more businessmen in production field because with increasing requirements of customers and pressure to lower production costs are they forced to change expensive human resources with full- or semi- automatic. Work which in the past performed several people is today executed by one human supervisor. The RFID technology began to be used in production in bigger rate by car factories. Material worked to single car parts can be automatically transported to another elaboration thanks to the RFID tag on which is recorded information in what state is the product and where the product is heading for. When the product is completed it is easy to find out if the product is complete thanks to load of all RFID tags. It is not necessary to control the whole product.[4]

The advantage is not only in increasing production cycle but also the RFID tags can preserve information how long each activity of the cycle took. This helps to find out the factory price.[4]

The usage of RFID technology begins to play invaluable work in the logistics. To the main contribution belongs:

fast information loading,
elimination of service mistakes and particularization of the whole product evidence,
repeated data record of product on tag during whole logistic movement,
great resistibility of RFID tags,
exact evidence of consumer units,
minimization of costs linked with product marking,
acceleration of income, expense, move and inventory process of the product. [5]

In the process of distribution are passing products through many processes. The basic activities are for example receiving to storehouse, movement inside storehouse, expenditure from storehouse to another company in distributive channel. In the field of logistics and

distribution are successful only those companies which are able to transport faster then anyone else. If a company uses barcodes to identify its products, it has to read them only one after another, but by RFID technology it can read thousand tags per second and the tags doesn't have to be in visible contact with read device. [5]

By the reading speed of the products is important the repeatable record to RFID tag. This attribute of the RFID technology will be probably main by substitution of barcodes in some fields. Into the tag could the producer write the manufacture date, thereafter there would be written up single logistic records which accrue during whole logistic path of the product. [5]

By the logistic of products with barcode accrue a carping matter. A product has its own barcode. A couple of identical products is wrapped into a package, which has its own barcode. Then a group of packages is packed into a pallet with another unique barcode. The main problem is that the operating personnel of the pallet can't determine if there is enough packages in the pallet and if there are enough products in each package. By the RFID is the tag only on the products and by the scan the operating personnel knows how many products are on the pallet. With these way are effectively controlled all transported products.[5]

Conclusion

From the beginning until today proceed RFID many changes, development and improvement and now stands in every line of business in this world. The pressure form the side of costumer is high but RFID systems can silence it. Coprocessor, microprocessor and network systems allowed to get RFID tags smaller and smaller and more useful than barcodes. All of barcodes disadvantages turned RFID into advantage which makes this technology more and more attractive. The only handicap of RFID is its price but it is lowering every day. If a producer thinks to invest into RFID he will receive competitive advantage and gradually better position on the market.

References

[1] RFID technológia. [online]. [s.a.]. [Quoted: 2009-13-03]. Available on: <http://www.fi.muni.cz/usr/jkucera/pv109/2005/xkukucka.htm>
[2] Od čiarového kódu k RFID a ďalej. [online]. [s.a.]. [Quoted: 2009-13-03]. Available on: <http://dal.hnonline.sk/c1-24930260-od-ciaroveho-kodu-k-rfid-a-dalej>
[3] Jaké jsou přínosy a výhody RFID. [online]. [s.a.]. [Quoted: 2009-13-03]. Available on: <http://www.rfidportal.sk/index.php?page=pouziti-prinosy_rfid>
[4] Výroba. [online]. [s.a.]. [Quoted: 2009-13-03]. Available on: <http://www.rfidportal.sk/index.php?page=pouziti-vyroba>
[5] Logistika. [online]. [s.a.]. [Quoted: 2009-13-03]. Available on: <http://www.rfidportal.sk/index.php?page=pouziti-logistika>