METRO Group
Future Store Initiative

RFID: Ready for Action

Technical analysis of the use of RFID at case level in retail logistics

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SAP intel IBM T-Systems

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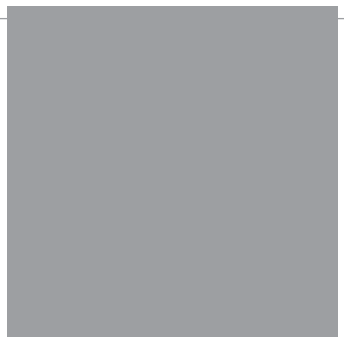


01

Management summary

Radio frequency identification (RFID), a technology which allows objects to be automatically registered without physical contact, is creating new opportunities for business and society. Indeed, RFID is already in use in many situations of everyday life. A particularly effective application of RFID is in logistics, where it can significantly improve process efficiency. The METRO Group is one of the world's first retailing companies to commit to the step-by-step implementation of RFID in its supply chain. Since 2004, selected suppliers have been fitting consignments with transponders. The pioneering work of all partners involved has contributed significantly to the further development of RFID.

Despite this, some critics remain skeptical about the viability of the wide-scale use of RFID throughout the supply chain. One of the key objections is that the technology does not work and is unlikely to prove practicable in the long term due to its physical limitations. The decisive question in ascertaining whether RFID can be cost-effective in the consumer sector: is it even possible for transponders on retail units to achieve read rates in excess of 90 percent?

Since July 2006, the METRO Group has been assessing this very issue within the framework of a technical analysis conducted in cooperation with Intel® Solution Services. The analysis focuses on the supply chain for a supermarket of the sales brand Extra. Cases destined for the Extra store are fitted with transponders and loaded onto mixed pallets at a central distribution warehouse. Consignments are then automatically registered by readers during order picking, as well as at the outgoing and incoming goods portals at the warehouse and store respectively.

Positive results

The project is due to run until the 3rd quarter of 2007, but initial assessments show that RFID is now ready for use in practice. Not least because of the new EPC Class 1/ Gen. 2 standard, RFID now achieves the required read rates even in normal working conditions. As a result of the technical analysis, the METRO Group has acquired valuable insights into the use of RFID at case level. The results will provide helpful input for the further optimization both of the technology and the related processes.

METRO Group sees these findings as an endorsement of its commitment to RFID. The next stage of the project, therefore, will be the introduction of RFID in all Metro Cash & Carry wholesale stores throughout Germany, as well as in 100 Real hypermarkets and in all central distribution warehouses belonging to MGL METRO Group Logistics. To begin with, the use of RFID will be restricted to the registration of incoming goods on pallets. However, the METRO Group will also continue to seek ways of ensuring scalability and process reliability in the use of transponders on retail units. The company plans to make best use of the advantages of RFID technology in this area, too.

Joint commitment

In addition, the METRO Group will be conducting further RFID trials, with a view to identifying and exploiting the technology's full potential. It will be counting on support from its partners in the consumer goods industries, because genuine, across-the-board supply chain optimization is only possible if retailers and industry cooperate. The important thing is not so much the integration of RFID in existing processes as the definition of new, more efficient processes that exploit RFID to the full. Only when this has been achieved can RFID become economically viable.

02

The technical analysis

Processes in the supply chain of a retailing company are geared to safeguarding supplies of goods. As a rule, supermarkets and department stores are supplied from distribution warehouses. The goods that have been ordered are loaded onto mixed pallets, before being brought by truck to the store's own warehouse. Using RFID, many related tasks, such as comparing order lists with the actual delivery, can be handled faster, more cost-effectively and also more reliably. For the technology to succeed, however, it must be able to achieve consistently high read rates.

Parameters

In a pilot project, the METRO Group, in cooperation with Intel® Solution Services, has been assessing the results achieved with transponders affixed to retail units. The study focuses on the supply chain of an Extra supermarket in Rheinberg. This store is supplied centrally from the distribution warehouse run by MGL METRO Group Logistics in Essen. At three different points – order picking, outgoing goods (warehouse) and incoming goods (store) – cases are automatically registered by readers. The aim of this project is to determine which technical, infrastructural and process requirements have to be met to ensure consistently high read rates, and to use this knowledge to formulate recommendations for action.

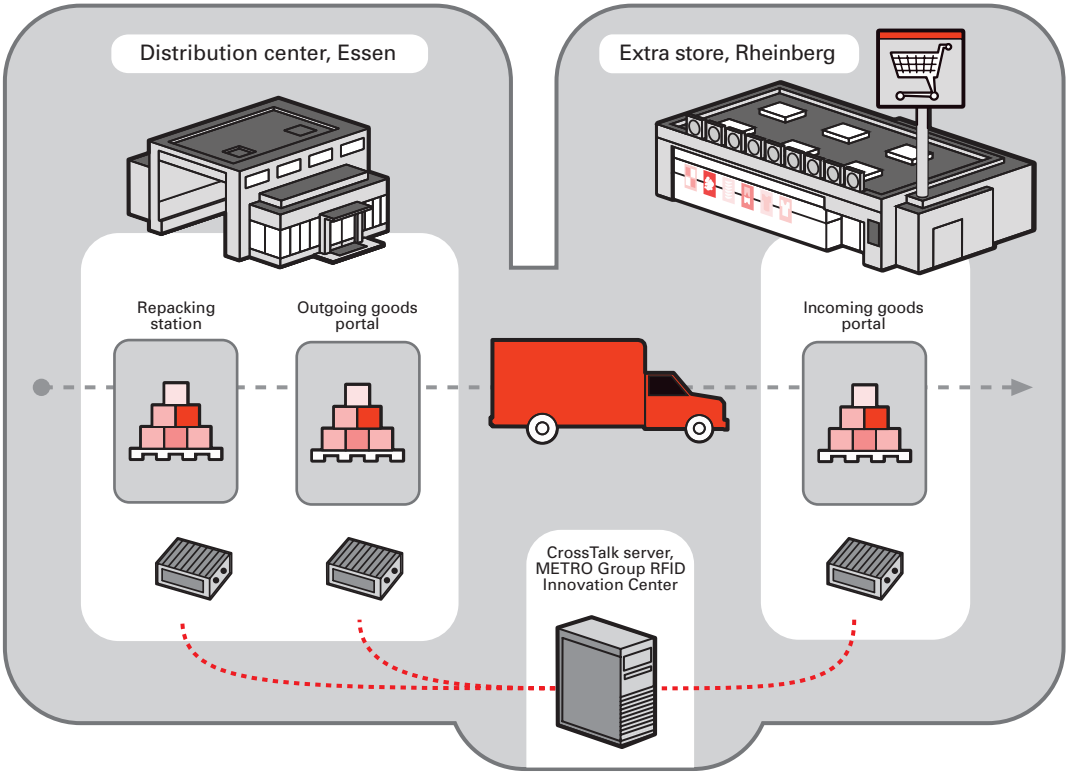
Launched in July 2006, the pilot project is still under way. The results presented in this publication relate to the time from July 2006 to March 2007. During this period, mixed pallets with more than 600 retail units were delivered twice weekly, on average, to the Rheinberg store. Exactly 414 pallets and 22,706 cases fitted with transponders were registered. The pallets contained between 2 and 120 cases each, with the average number of cases per pallet totaling 54. Altogether, the read rates for some 1,100 different products were analyzed.

Supported processes

The pilot project is built around an existing supply chain structure of the METRO Group (fig. 1). Thus, the Extra supermarket in Rheinberg orders its goods from the distribution warehouse run by METRO Group Logistics in Essen, where the ordered products are loaded onto mixed pallets. Staff at a special repacking station then fit transponders to each case and each pallet. The transponders contain an Electronic Product Code (EPC). The necessary labels are created using an RFID printer. Once labeled, each case is placed on a conveyor belt and automatically read and registered as it passes an RFID reader. Finally, the warehouse staff pack everything back onto the pallet, while the data collected by the reader are transmitted to a central server.

An RFID gate at the outgoing goods portal of the central distribution warehouse registers all pallets and cases destined for the Extra supermarket in Rheinberg once again and the data are automatically compared with those from the repacking station. As a result, missing cases or pallets with the wrong combination of products can be identified immediately.

Fig. 1: From central distribution warehouse to store – the supply chain



The journey from Essen to the Extra store in Rheinberg is by truck. At the incoming goods portal all transponders are again automatically read and the data transmitted to the central server for comparison with the original data. This not only serves to check that the consignment is complete, but also to register other relevant data, e.g. the journey time.

System architecture

The system architecture used for the technical analysis is based on the EPCglobal Architecture Framework (fig. 2), in which standards for software, interfaces and data are defined. This enables the system to link up with and use related services of the EPCglobal Network. In addition, it provides users with a comprehensive data management

and assessment capability for the data collected by RFID – from registration and filtering through to aggregation and the exchange of data with business partners.

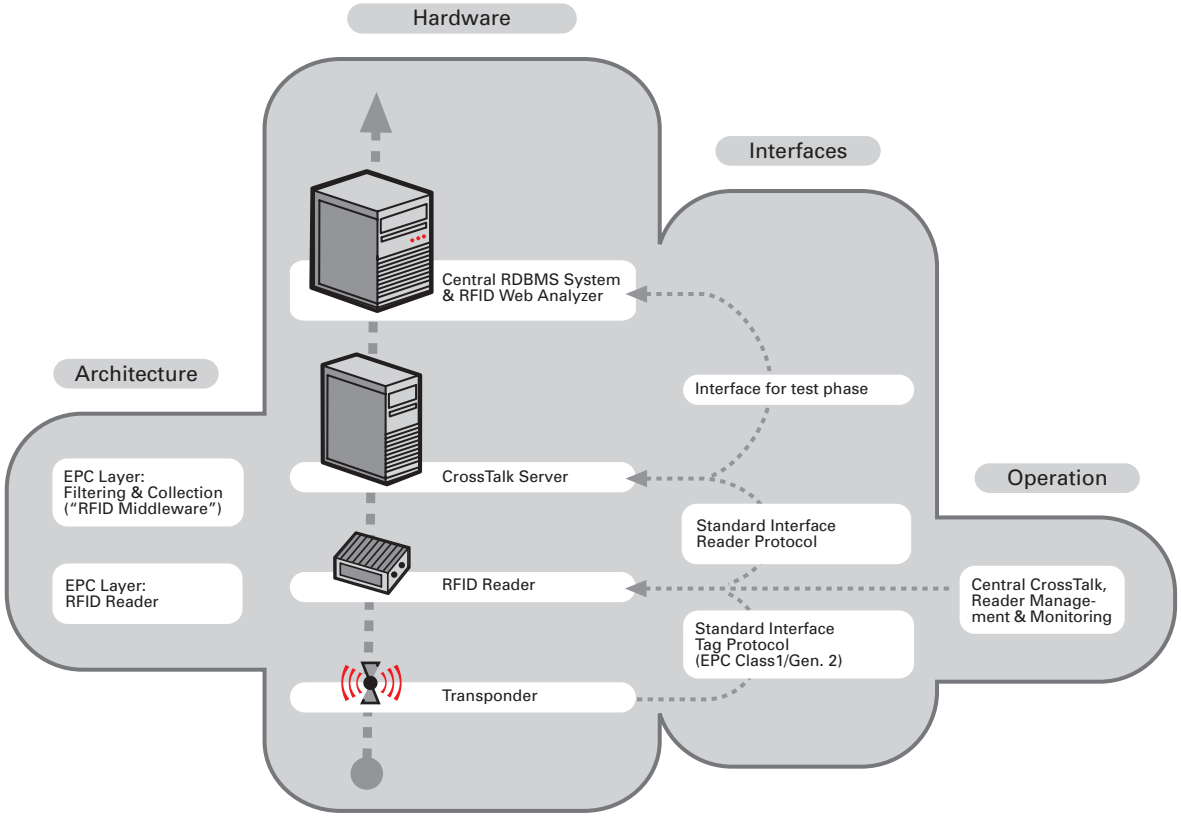
Flow of information

The Electronic Product Code on the transponder is registered by readers at three points along the supply chain. These points are connected to RFID middleware, the CrossTalk server (see page 11), which for the duration of data analysis serves as a central control and distribution platform. This server filters information and sends it to a central data base (Central RDBMS System). Here, transponder data are supplemented with information on time, place and business data, enabling specific evaluation processes. Later, the Central data base System will be replaced by the EPC Information Service (EPCIS).

Connections

The EPCs on the transponders are automatically registered at the incoming and outgoing goods portals in

Fig. 2: EPCglobal architecture (schematic) during the test phase



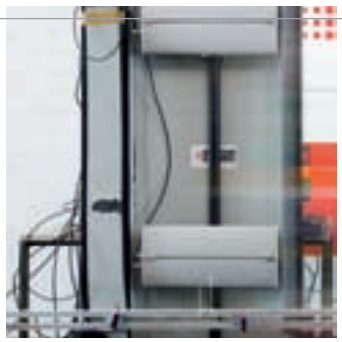
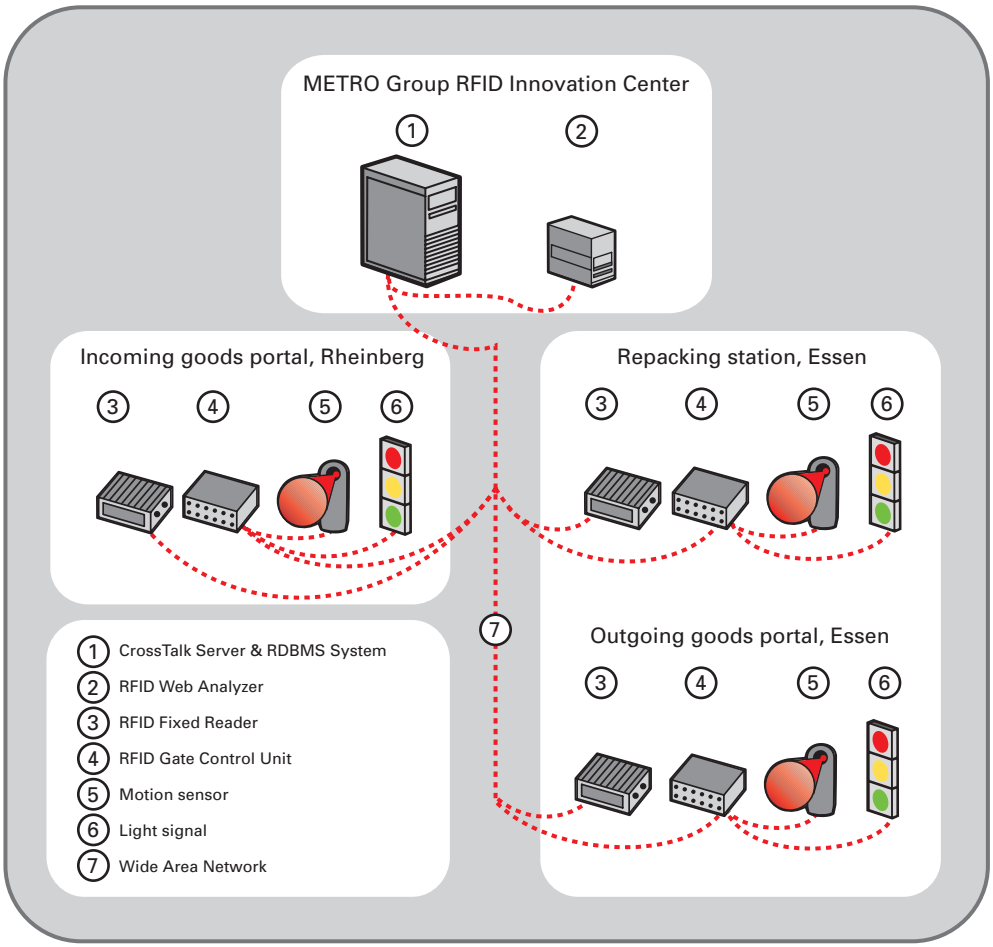


Fig. 3: Network structure as used in pilot project

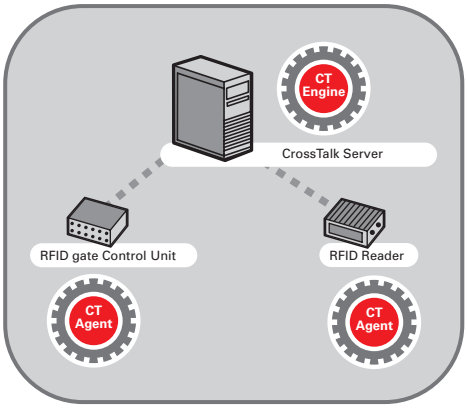


Rheinberg and Essen respectively and then transmitted to the CrossTalk server at the METRO Group RFID Innovation Center (fig. 3). The information collected is stored here in a relational data base. The Essen and Rheinberg locations are connected via a Wide Area Network (WAN) with the METRO Group RFID Innovation Center in Neuss. Locally, the various RFID components are connected via standard Ethernet. Actuators and sensor technology are controlled by an RFID gate control unit.

CrossTalk*

CrossTalk, an enterprise software package from noFilis, enables RFID devices to be centrally controlled and managed. It also allows dynamic processing of the data collected. CrossTalk transmits information quickly and safely from reading points to downstream systems. Offering transparent support of devices from various manufacturers, this software enables users to run a flexible architecture that can be centrally configured, monitored and easily expanded.

Fig. 4: Example of system architecture using CrossTalk



IT infrastructure

Both the CrossTalk server and the analysis tool are installed in virtual instances on the central Quad-Core Intel® Xeon® processor-based server. As a result, systems can be swiftly and easily copied for use in test environments or for back-up purposes. Alternatively, it is also possible – depending on application architecture and specific requirements – to use dedicated servers for the individual software components.

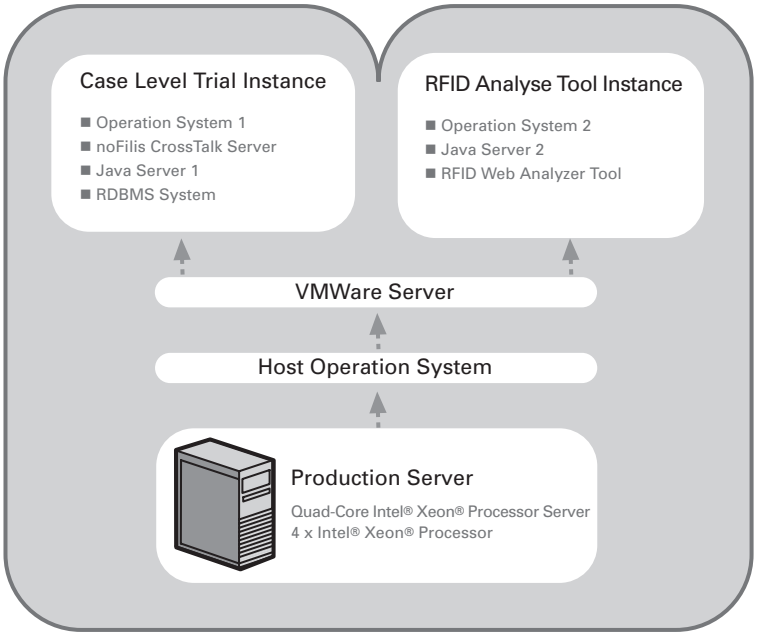
Reading points

Two different RFID architectures are used at the reading points:

- **Repacking station.** The transponders are labeled using a RFID-enabled printer. Warehouse staff then fit the transponders to the retail units, which are transported by conveyor belt to a motion sensor. On passing this, the cases trigger the reading process, during which a reader registers the data stored on the transponder. An acoustic signal notifies staff that the reading process was successful, and staff now put the cases fitted with transponders back onto the pallets.
- **Incoming and outgoing goods portals in Essen and Rheinberg.** These portals are equipped with RFID readers, and can therefore register all cases on a given pallet. The reading process is triggered by a motion sensor, which "notices" whenever a pallet passes the portal. The Electronic Product Codes are then read and transmitted to the central computer.

*Other names and brands may be claimed as the property of others.

Fig. 5: IT Infrastructure based on virtual instances



RFID components

Both the portals for incoming and outgoing goods in Essen and Rheinberg and the read point on the repacking station in the central warehouse are made up of several components. To achieve the desired read result, the individual components have to interact properly.

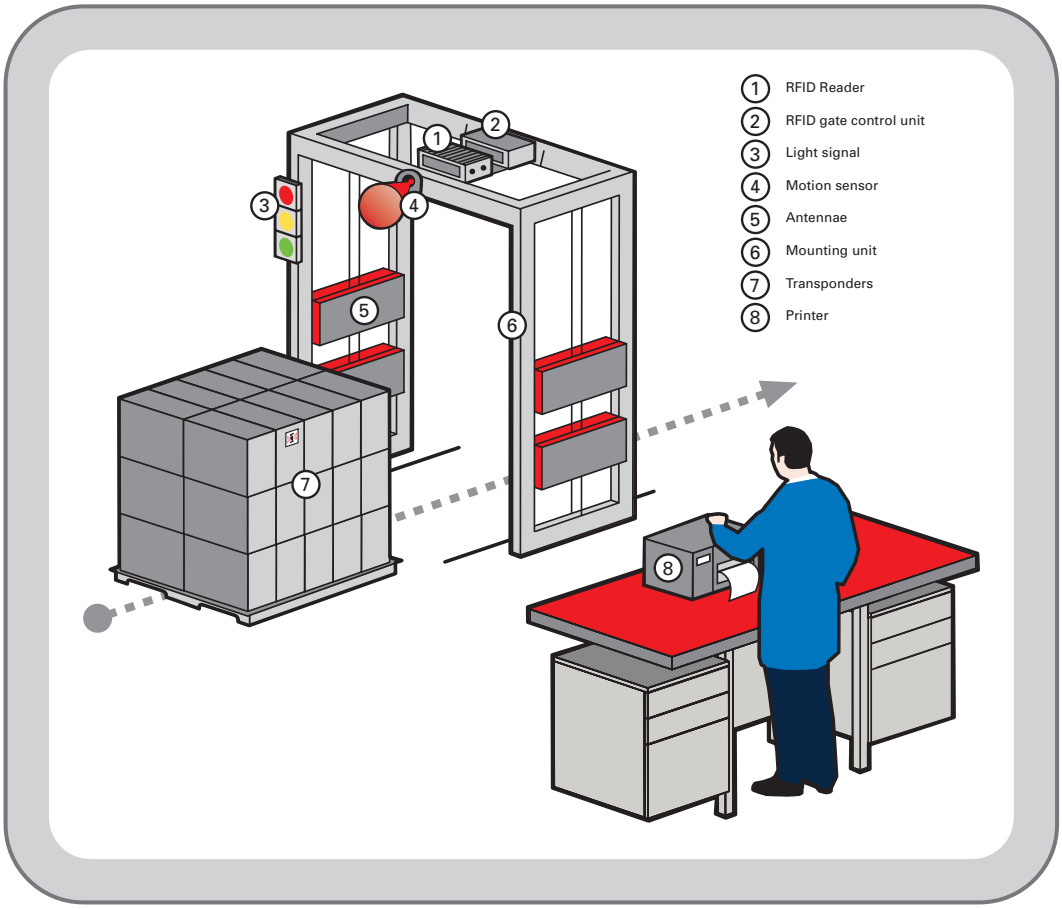
Readers

Only RFID readers that meet the specifications of the European Telecommunications Standards Institute (ETSI) were used in the pilot project. They were installed and operated in accordance with German and European regulations. For instance, the readers support the "Listen before talk" (LBT) function, which can be used to check whether a transmission channel is already occupied or not. Up to five antennae can be connected to a reader at any one time.

Antennae

Four antennae are attached at each portal for incoming or outgoing goods, two on each side. This allows extremely fast read times of the transponders affixed to cases loaded on each pallet. During the read process, the reader activates the antennae in series. There is just one antenna at the repacking station as only individual transponders have to be read here.

Fig. 6: Gate architecture (example)



Sensors

At the repacking station, a light sensor on the conveyor belt triggers the read process as soon as a case with a transponder is moved past the antenna. Motion detectors situated at the portals for incoming and outgoing goods register the area in front of the gate. If a pallet or another object moves past the portal, the read process is automatically triggered. Every time the motion detector is activated again, the process is extended.

Actuators

At the portals for incoming and outgoing goods there are signaling columns with different colored lights showing the status of the portal.

- Green: the portal is ready for operation
- Green and amber: the motion detector has triggered a read process; the portal is active
- Red: the portal is not ready for operation

RFID gate control unit

An intelligent input/output module is used to control the RFID read points. This robust interface processes the input signals from the sensors and controls the RFID devices using the middleware CrossTalk. To keep the operating costs for the control components to a minimum, these can be monitored and configured directly from the CrossTalk server.

Printers

The RFID printers used meet the requirements of ETSI and correspond to the EPC Class 1/Gen. 2 standard. They are operated in line with international specifications.

Transponders

The transponders used for the technical analysis also comply with the EPC Class 1/Gen. 2 standard. As the pilot project required a large number of different types of goods to be read using RFID, the transponders were set to cover a wide range of frequencies. It was essential for the project that the transponders were suited to all kinds of materials and could be read even under adverse conditions, such as when shielded by metal or liquids. A detailed description can be found in Chapter 5.

Analysis software

Special software, the RFID Web Analyzer, was used to determine the exact read rates at each portal based on the data collected and enable further analyses to be performed, for example, on selected product groups. The web-based application makes it possible for evaluations to be carried out and then presented in real time. The RFID Web Analyzer can be used centrally or directly at the read points. A detailed description can be found in Chapter 4.

Outlook

There are plans to work closely together with Intel on improving the RFID infrastructure in terms of system stability and availability for better and safer operation. For example, if the network fails between the central data processing center and the locations in Rheinberg or Essen, the data could be buffered using fault-tolerant applications.

In addition to this, further read points are to be added to the test. This can be done easily at any time using the existing infrastructure and architecture.

03

Results

In the context of the technical analysis, the read rate is the single most important performance criterion for the individual components. For this reason, the read rate and the success rate were treated separately. Cases and pallets that are not read because of an IT or system failure are not included in the read rate but still have an impact on the success rate.

Pallet read rate at a read point in percent

$$\frac{\text{Number of cases read on the pallet}}{\text{Number of cases on the pallet}} \times 100$$

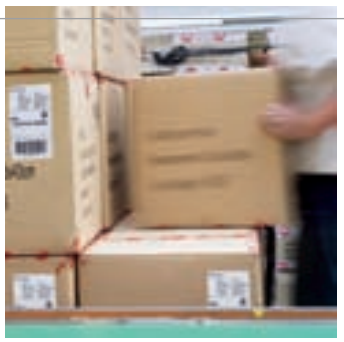
Case read rate at a read point in percent

$$\frac{\text{Number of cases read for a product}}{\text{Number of repacked cases for a product}} \times 100$$

Changes in the read rate at case level

At the start of the project in early July 2006, the read rates fluctuated between 72 and 82 percent. After introducing a new type of transponder in calendar week 35, they rose to between 79 and 89 percent. The transition to new readers in week 37 initially had a negative impact on the read rates, which was mainly due to migration difficulties. The results improved dramatically when a series of measures was implemented in week 41. More detailed information can be found in chapter 4.

The combination of new technology and process optimizations provided consistently high read rates of over 90 percent from week 43 onwards. The fluctuation margin of 5 percent is within the acceptable tolerance range and can be reduced in future by further optimizing the process.



Read rates for pallets according to number of cases

In the period under investigation – from July 2006 to March 2007 – 414 pallets with a total of 22,706 retail units were read. Each pallet contained an average of 54 cases. Only around 14 percent of the pallets had 80 cases or more (fig. 7). Based on the results from calendar week 43, the read rate for this group was still under 90 percent. On the other hand, a consistent read rate of over 93.5 percent was achieved for the majority of goods received. It was even higher for pallets with 40 cases or less: an average of around 98.5 percent (fig. 8).

Fig. 7: Histogram of cases per pallet in percent

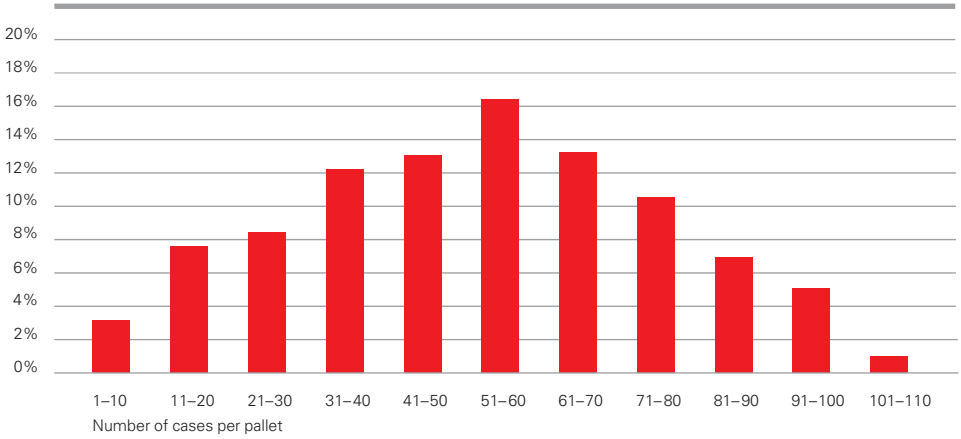
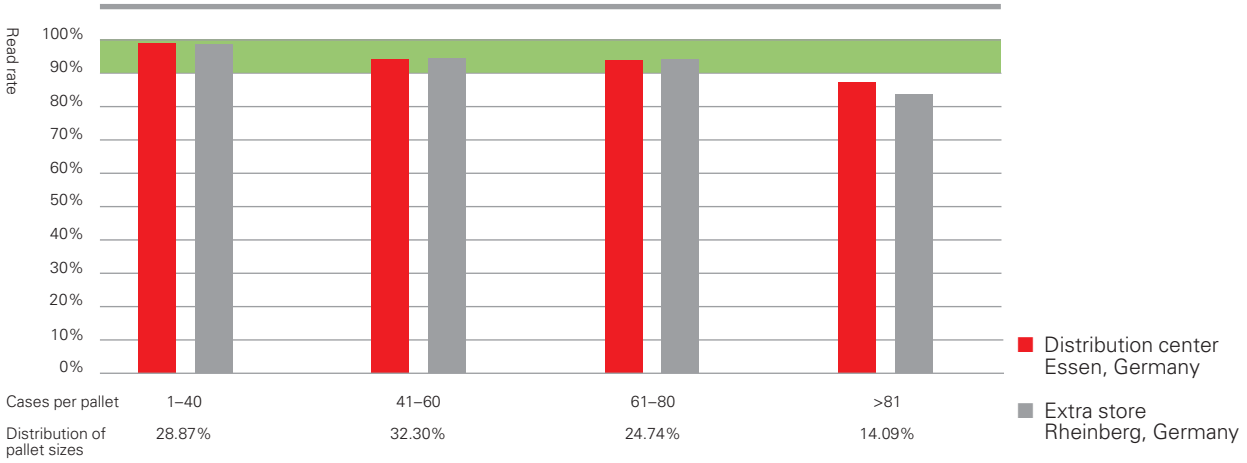


Fig. 8: Average read rate according to pallet size



Accumulation effect

A phenomenon that has been largely ignored so far is the so-called accumulation effect. This is based on the assumption that cases that have been read successfully must have passed earlier points in the supply chain. If a case is not read at outgoing goods in the central warehouse, for example, but at incoming goods in the store, it still counts as having been successfully read for both incoming and outgoing goods portals. This accumulation of results provides a read rate that is one to two percent higher than the actual value and is subject to fewer fluctuations.

04

Immediate measures for process optimization

The technical analysis provided the METRO Group with valuable experience in setting up and operating RFID systems in the supply chain. Building on this, measures to improve the read quality were developed and implemented during the course of the project. The "95+X percent" action plan, developed after the technology was optimized, comprises three main parts: analysis, documentation of faults, and tests.

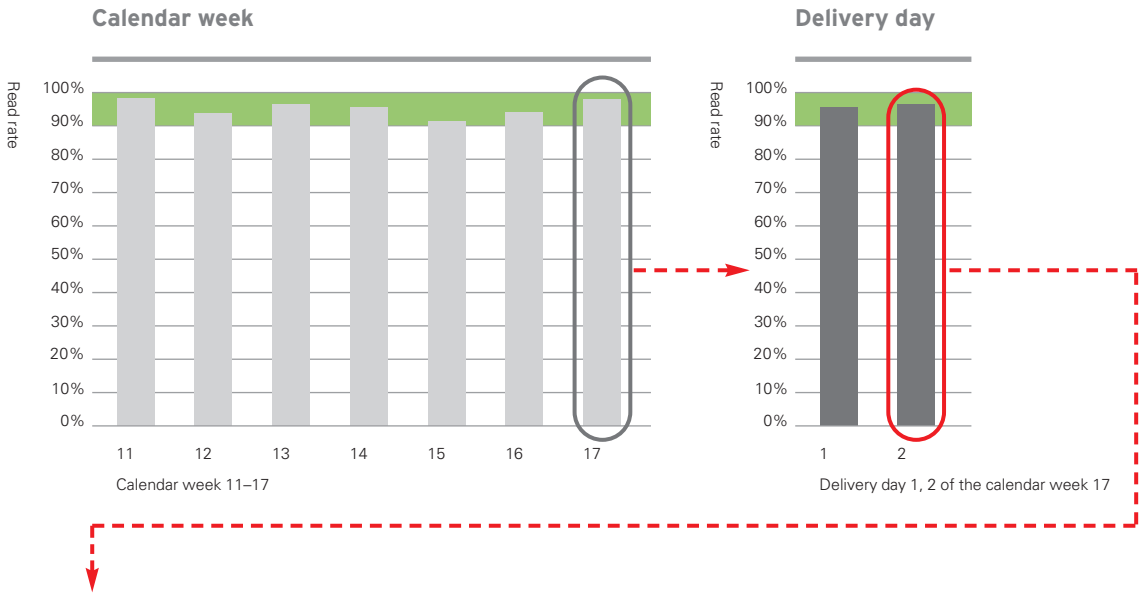
Analysis

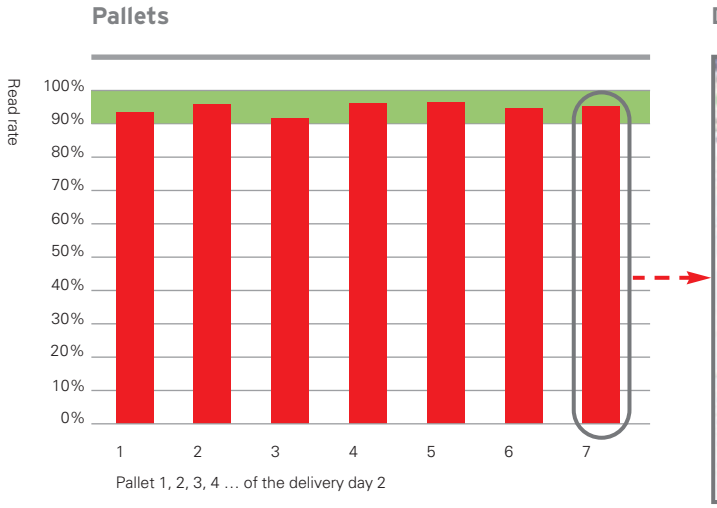
The RFID Web Analyzer is used to analyze and evaluate data collected by the reader. As the application is web-based, it is also possible to access a database and call up detailed evaluations using any standard computer equipped with an Internet browser. The first step of the pilot project involves defining the questions needed for the analysis.

Fig. 9: Questions needed for the analysis

Key question	What it tells us
How many cases are on the pallet and how many of these are read at the portal for incoming and outgoing goods?	Read rates
How often is a transponder read at the portal for incoming and outgoing goods in each reading process?	Behavior of transponder in connection with different materials
How are the reading processes distributed among the antennae at the portal for incoming and outgoing goods?	An antenna's share of the readings makes it possible to improve the switching sequence

Fig. 10: Analysis of read rates via web browser





Detailed view of pallet

Detailed view of pallet 7

Documenting and eliminating errors

Errors were documented on several delivery days over a longer period of time. Cases were examined whenever the error rate dropped below a predetermined level or when reading was unsuccessful at just one of the read points. The following causes of errors were found.

- The antenna of the transponder was in direct contact with the item.
- The portal antennae were covered by objects that should not have been there.
- A metal plate in the pallet lifting truck obstructed the transponder during reading.
- The transponders were incorrectly affixed.
- The transponders were covered by surrounding cases.
- The antenna of the transponder was bent or the chip was destroyed during transport.
- The product has properties that cause strong frequency distortions.

Some of the problems can be explained by the fact that the use of RFID in logistics is a pioneering venture and there is a lack of experience so far in certain stages of the process, such as where to attach transponders. In most cases, however, the number of faults was reduced by improving operating sequences. For example, at the start of the project employees unloaded goods in the portal area or scanned bar codes there. That had an adverse impact on the read rate as the antennae were blocked by products or people. The solution was to separate the bar code and RFID processes. The transponders on the cases are only read once the employees have scanned the bar codes on the pallets. If a pallet is to be loaded onto a truck, this only takes place once the bar codes have been scanned. Only then does it pass through the portal for incoming and outgoing goods.

To help the staff in the distribution warehouse affix transponders correctly to cases, simple instructions

Fig. 11: Problems and solutions

Problem	Solution
Transponder is affixed to the retail unit	Improved training for personnel
Antennae in the portal are covered	Clear floor markings for restricted areas
Transponder covered by lifting truck	Attach distance piece to truck
Transponder is incorrectly affixed	Improve affixing of transponders
Inlying transponder	Improve packaging
Critical product causes detuning effects	Modify transponder

were drawn up. Cases of the same shape and size were grouped together (fig. 12). General rules were then drawn up for each group. The staff were given comprehensive training. As a result, the read rates improved noticeably.

Another problem was the construction of the lifting truck used to transport pallets in the warehouse. A metal plate on the vehicle obstructed the transponder, preventing it from being read. To solve this problem, a rubber stopper was attached that created a three-centimeter gap between the transponder and the plate. In most cases, this gave good reading results.

Fig. 12: Poster distribution center

Initial results

Implementation of the aforementioned measures reduced the proportion of inaccurate readings to seven percent. Process-related problems in particular occurred less often. The solution created by installing a distance piece on the lifting truck, however, only proved to be temporary. Around a quarter of all faults can still be ascribed to the fact that a metal plate on the vehicle obstructs the transponder.

By far the greatest number of problems was caused by transponders being attached facing inwards on the pallet where they are covered by other cases. Their readability depends to a large extent on the material of the surrounding products. Changing the packing arrangement only caused a light improvement in the read rate. It may be possible to correct this problem by using more sensitive readers and RFID chips as well as through improvements in the transponders themselves.

So-called detuning effects, or frequency shifts, can also have an adverse impact on the read results. The material of the products or packaging can influence the frequency at which the transponder transmits its answer back to the reader. If this frequency falls outside the permissible ETSI range of 865 to 868 MHz, the transponder cannot

Fig. 13: Correctly affixed transponders

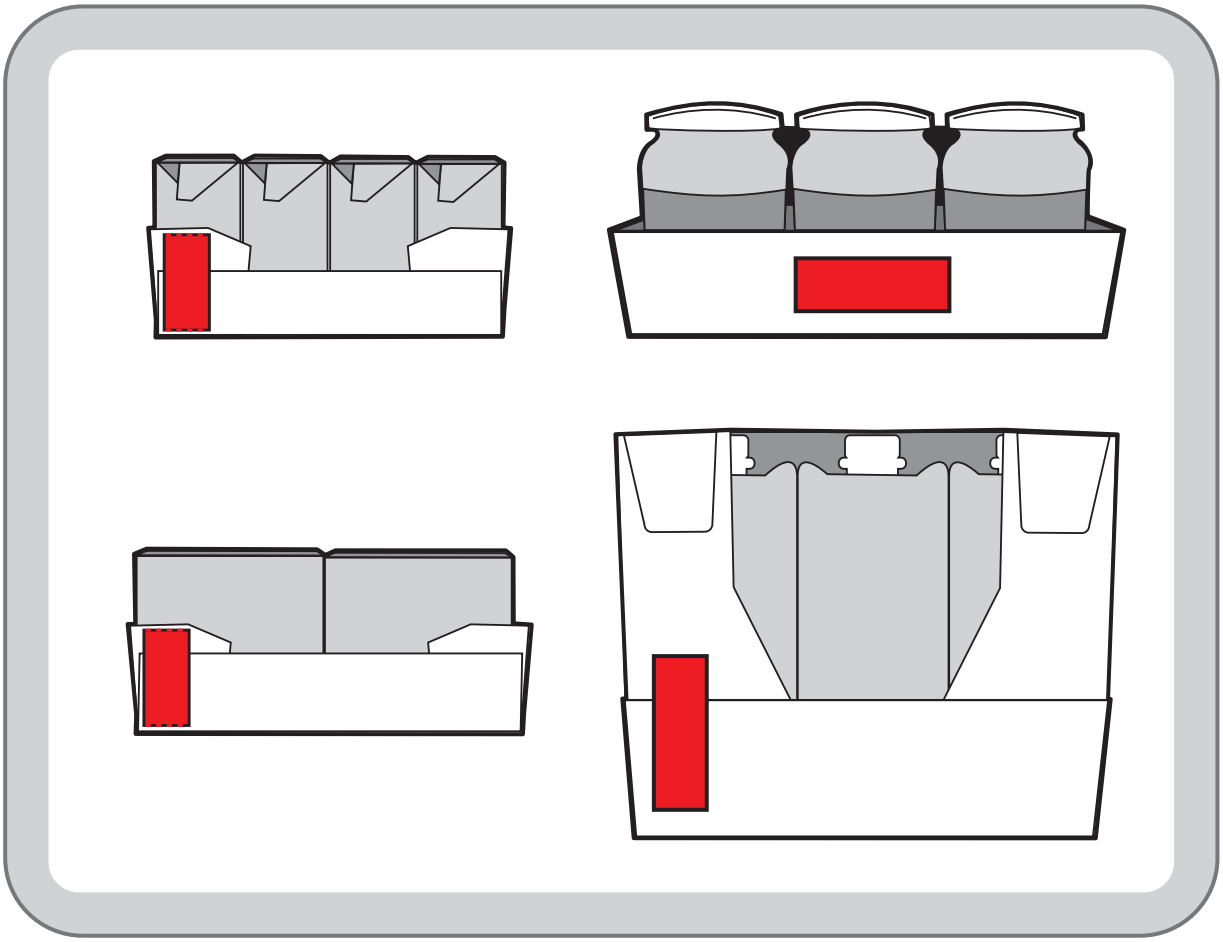
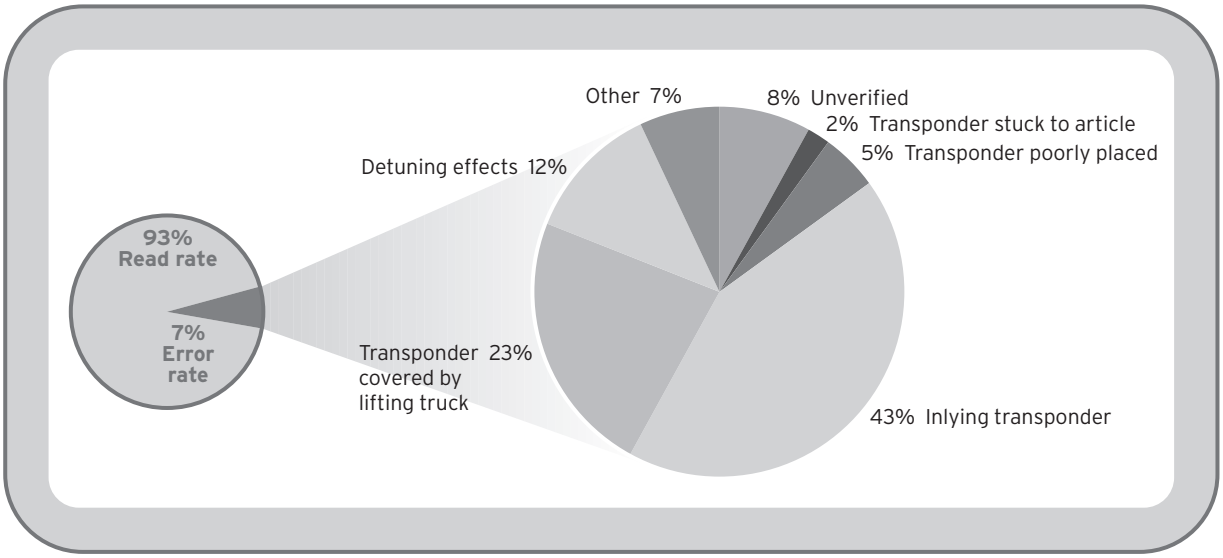


Fig. 14: Causes of faults after implementing measures



be read. Such materials include Tetra Paks, for instance, for which modified transponders have now been developed. The relatively high proportion of read errors in this product group shows that RFID technology is at its physical limits at this point. It is likely that the only way to overcome the problem is to change the shape and type of the packaging. However, the pilot project revealed that this only applied to a very small share of products. A mere one percent of the more than 1,100 products tested demonstrated frequency shifts.

Transponder tests

One of the most important prerequisites for good read results is that the transponders are affixed correctly on the products. Trials were carried out together with the European EPC Competence Center (EECC) – a company set up by the METRO Group and GS1 Germany to test RFID under laboratory conditions – to find out the best place to affix the transponders on retail units. The objective was to develop general rules for affixing transponders on cases with a similar shape and size.

Fig. 15: Paper-faced transponder

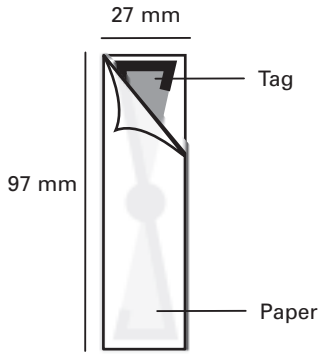
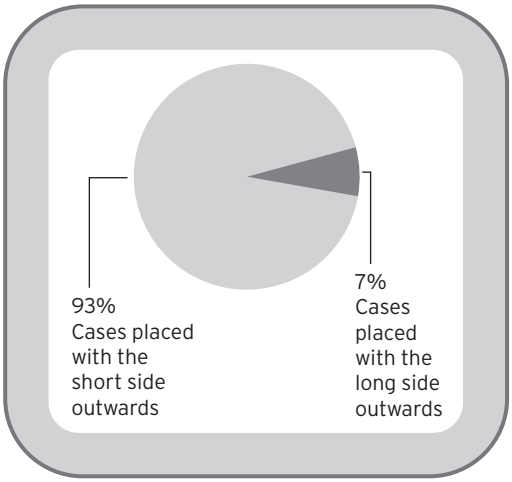


Fig. 16: Distribution of cases according to position on pallet

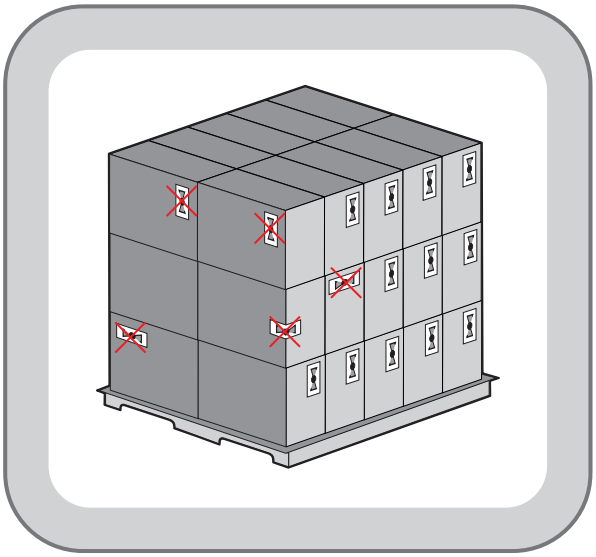


The following rules have proven to be feasible in the course of the project:

1. Place the transponder over hollow spaces.
2. Only attach transponders to the packaging.
3. Avoid any contact between the transponder and the retail unit.
4. Do not fold or bend the transponder.

Rule of thumb: Attach the transponder vertically.

Fig. 17: Correct placement of transponders



Problems with Tetra Paks

Tetra Paks are just one type of product packaging that has a negative impact on read results. The packaging material affects the performance of the transponders in the permissible frequency range so that they can no longer be read. A detailed fault analysis and tests revealed that cutting the transponders on Tetra Paks at defined points shifts their transmission frequency back into the permissible frequency range. Transponders that were modified accordingly achieved satisfactory results. This example shows that it is possible to solve a number of problems by examining RFID more closely. It is the interaction between theory and practice that creates technological products which are tailored to companies' needs.

Fig. 18: Modification of transponders

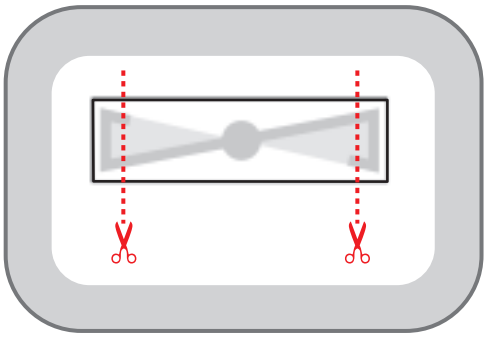
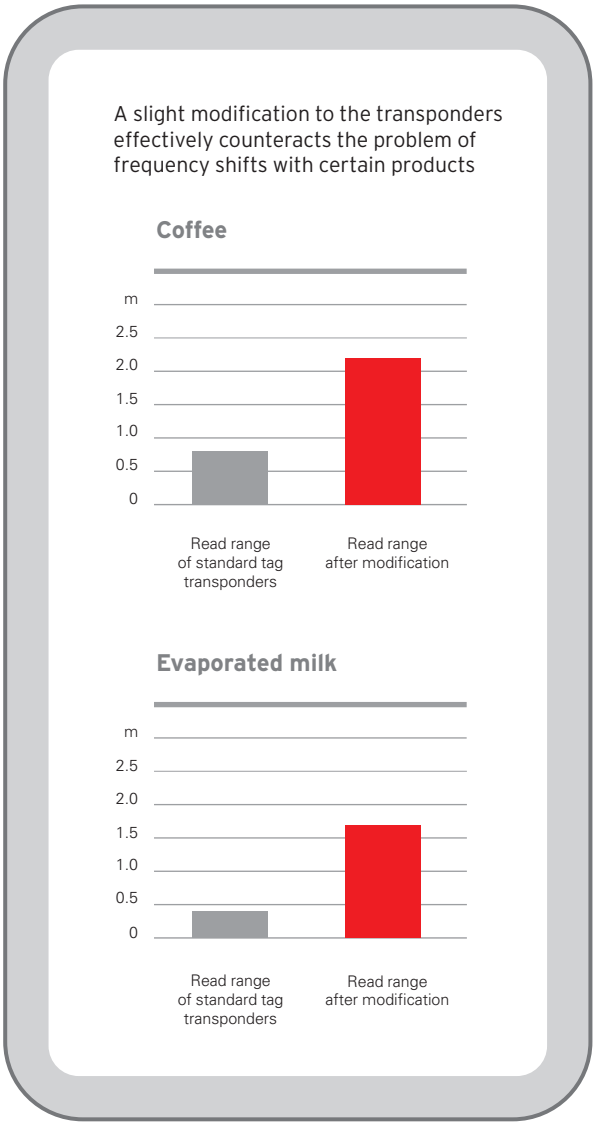
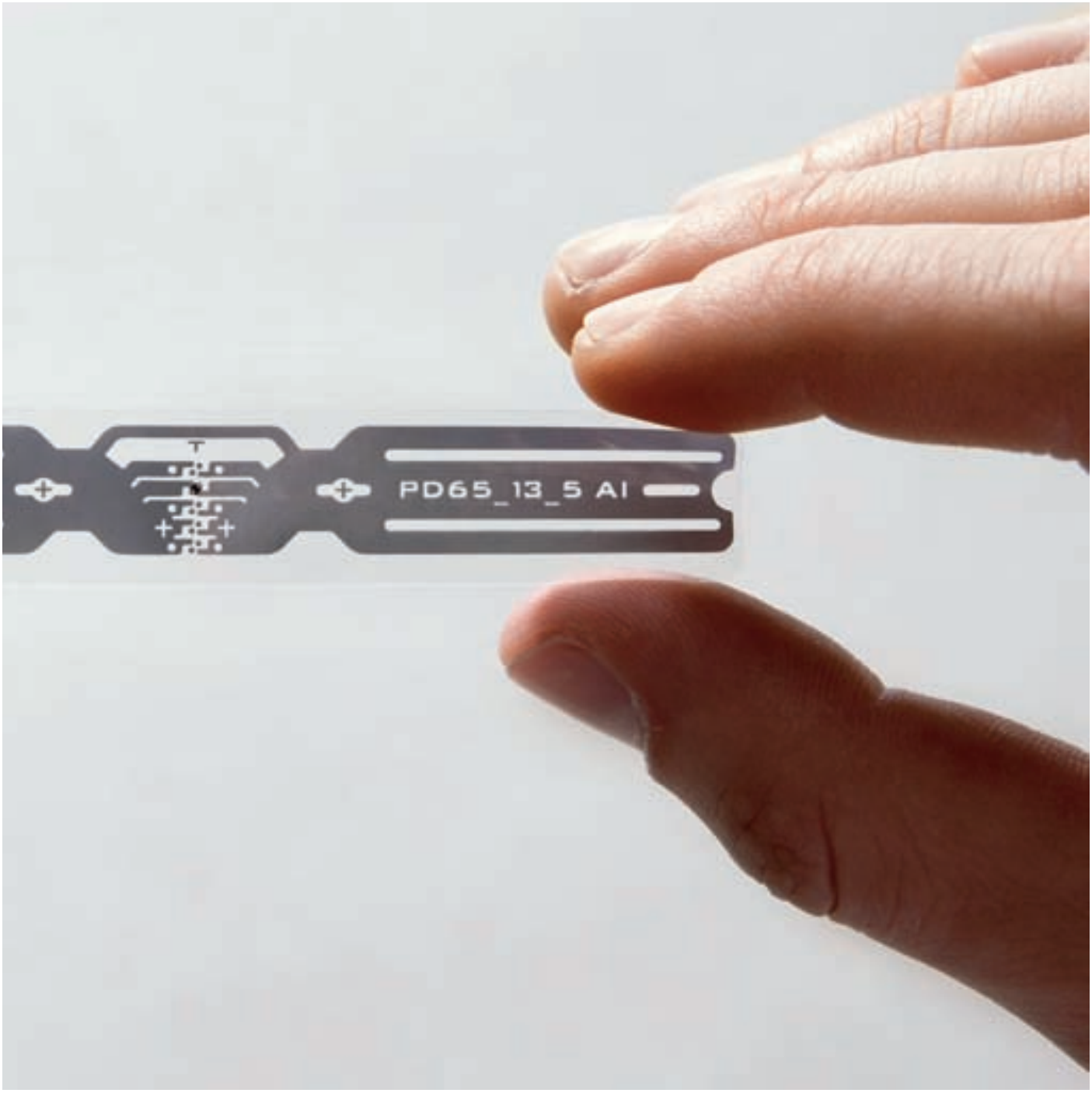


Fig. 19: Read rates before and after modification





05

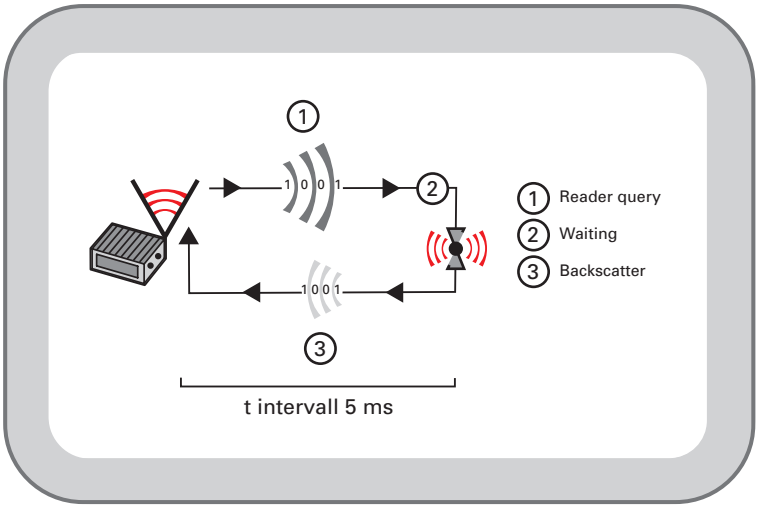
Optimum technology design

Efficient technology is just as important for the successful application of RFID in logistics and warehouse management as smooth-running and tested processes. The hardware and software should also function reliably under normal working conditions. The valuable insights gained during the pilot project help with the selection and configuration of the individual components. Three criteria are particularly important: the choice of transponder, the configuration of the readers and the construction of the portals for incoming and outgoing goods.

Choice of transponder

The transponder is at the heart of RFID technology. It is a tiny computer chip that is connected to one or two dipole antennae. These not only enable the transponder to receive the signal from the reader and respond to it, they also passively supply the transponder with electricity. The transponder "chops up" and returns the permanent two-watt signal transmitted by the reader, thus modulating its own answer. This means that the closer the transponder is to the reader, the more energy is available. The reading range is therefore the maximum permissible distance at which the transponder can be reliably identified. This value can be reduced dramatically by external factors, such as suboptimal ambient conditions. The potential dielectricity of the product material can also play an important role. This term describes how a radio wave transmitted by the reader changes when it travels through the products equipped with transponders.

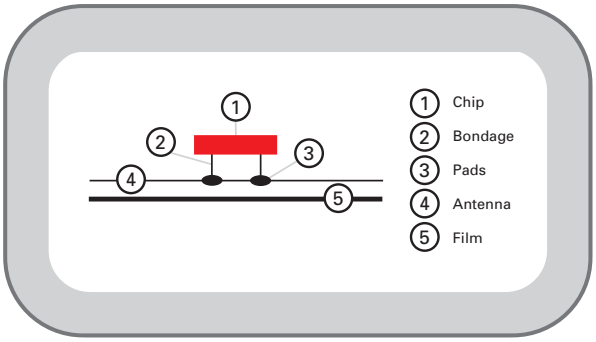
Fig. 20: Reading process of transponders



Types of antennae

So-called "single dipoles," which feature a single dipole antenna, were used as transponders in the pilot project. These were chosen due to their excellent energy efficiency and their compact design. Transponders of this kind measure 4 inches by 1 inch, an ideal size for affixing to retail units. The principle advantage of so-called "dual dipoles" featuring two dipole antennae, on the other hand, is that they can be positioned facing any direction. However, this aspect was less important in the technical analysis, which is why these transponders were not taken into consideration.

Fig. 21: Design of a transponder



Characteristics of single dipoles

- The compact design of these transponders means that they can be attached in a variety of ways; this is particularly important when gaps between the retail units have to be used.
- Their wide tuning range is advantageous for materials that cause frequency shifts.
- Their flat and uncomplicated design can be easily modified.

Configuration of readers

To cover the entire area of a portal for incoming and outgoing goods as effectively as possible, ideally four antennae should be connected to one reader. During the reading process, these are serially switched in a recurring cycle of 20 to 100 milliseconds. This process, known as multiplexing, enables the maximum permissible transmitting power of two watts per antenna to be fully utilized. The sequence in which the antennae are energized is therefore one of the most important influenceable parameters for readers. The key variable here is the so-called Q value. This makes it possible to estimate the expected number of transponders per reading process in advance. If the reader is set accordingly, the transponders can be read extremely fast.

Parameters for readers

The majority of the pallets read in the pilot project corresponded to the CCG-1 standard. This means that the retail units were loaded onto the pallet up to a height of 900 millimeters. This fact is important when switching the reader, as in most cases the goods are only read by the two lower antennae in the portal for incoming and outgoing goods. For multiplexing, a sequence therefore had to be chosen in which antennae 1 and 2 were activated more often: 1-2-3-1-2-4.

In addition to this, the average number of logistic units per pallet was 54, so that the Q value could be selected accordingly. Using these two parameters, it was possible to adjust the readers to the surrounding conditions.

Construction and configuration of the portals for incoming and outgoing goods

An RFID portal for incoming and outgoing goods usually comprises a mounting, impact protection in the form of bollards, a reader connected to four antennae via a cable and an RFID gate control unit. The antennae are usually located behind a shield made of high-frequency-neutral plastic. There are several ways to minimize negative influences such as reflections in the field during the reading process. One possibility, for example, is to attach a steel grille at a preset distance behind the antennae to make the field more homogeneous.

The sensors used to control the start and end of the reading process are installed on the beam of the portal. The portal can be anywhere between 2.2 meters and over 3 meters wide. In the pilot project, a width of between 2.4 and 2.5 meters was chosen, which was ideal for the process performance. The antennae were attached on both sides at a height of 70 and 170 centimeters. This meant that pallets with a loading height of both 900 millimeters (CCG-1) and 1,800 millimeters (CCG-2) could be fully read.

06

Conclusion

The technical analysis demonstrated convincingly that consistently good read rates can be achieved using RFID on retail units under normal working conditions. It is essential that the transponders are affixed correctly and that process rules exist for employees. As high-performance hardware and software that corresponds to the EPC Class 1/Gen. 2 standard is now available, RFID is ready for use in practice. Nothing now stands in the way of a nationwide roll-out of the technology, especially in the light of the forecast prices for transponders: an inlay – a chip together with its antenna – currently costs around six eurocents at a purchase quantity of a million items. In future, the unit price is expected to drop to below 3.8 eurocents. The time has therefore come for companies to put aside their reluctance and integrate this innovative technology in their supply chains.

Next steps

As an innovation leader in retailing, the METRO Group has decided to extend the use of RFID at its retail brands and cross-divisional service companies. By the end of 2007, all Metro Cash & Carry wholesales stores, around 100 Real hypermarkets and the central distribution warehouses owned by MGL METRO Group Logistics will be equipped with the technology.

Over the next few months, the METRO Group will be working together with Intel and its industry partners on the question of how to further improve RFID. One focal area will be on products containing critical materials such as metal. Another priority will be to reduce process errors by simplifying operating sequences and providing training for employees. A detailed analysis of the transmission performance revealed further possibilities for optimizing the technology. One of these is to determine the background noise level. Armed with this data, readers will be able to recognize interference themselves and automatically switch to another channel. There are around 100 of these parameters in total, although further tests first have to be carried out to find out how relevant they are.

The so-called observation framework is also important in this context. This is a method of monitoring and analyzing errors. It involves RFID readers collecting additional information which helps identify invalid transponders and damaged chips. These elements are then automatically pinpointed and deactivated.

Win-win situation

The availability of goods in supermarkets and department stores can be improved considerably in future with the help of RFID. Retailers have to be able to trace what goods are available on the sales floor and in the store's warehouse at all times. The next stage of the pilot project, therefore, will be to install additional read points to enable separate inventory management. A portal for incoming and outgoing goods will be set up at the transition from the warehouse to the front store. The disposal of cases can also be documented using RFID. Another step will be the integration of portable readers into the process to test the feasibility of monitoring inventory levels using mobile devices.

Using RFID to monitor the supply chain in supermarkets opens up new opportunities for the consumer goods industry. Companies receive reliable and transparent information on their current inventory. On the basis of this data, they can improve their planning and adapt their processes automatically. In other words, retailing companies and their industrial partners both profit equally from RFID.

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For more information on ...

... the RFID smart device management solution CrossTalk from noFilis see www.nofilis.com/products.html

... Intel's new server platform based on Quad-Core Intel® Xeon® processors 5300 series, see www.intel.com/quad-core

... Intel Solution Services, Intel's worldwide professional services organization, see www.intel.com/go/intelsolutionservices

... Intel Solution Services RFID activities and offerings, contact Dieter Kilian; e-mail: dieter.kilian@intel.com

... the test methodology and the RFID Education Program of the European EPC Competence Center (EECC) please contact epc@eecc.info

METRO Group
Future Store Initiative

EECC
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Center