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PROZESSEund**STANDARDS**

Identification Standards

EPC/RFID for Fresh Meat Container Logistics

PROZEUS – eBusiness in Practice for SMEs

Content

Glossary of terms and acronyms

Case Tagging | Use of RFID transponders at carton or case level.

DESADV | Despatch Advice. Electronic advance shipping notification in EANCOM® format.

E2-Crate | Transport crate in EU-standardized dimensions (LxWxH) 60cm x 40cm x 20cm.

EANCOM® | Standard for electronic data interchange.

EDI | Electronic data interchange.

EPC | Electronic Product Code, borne by data carrier RFID and based on the GS1 Standards.

EPCglobal | Non-profit organization responsible for developing standards for the use of the EPC/RFID technology.

EPCIS | EPC Information Services – an open standard for the capture and query of transponder-borne data. EPCIS is the basis for uninterrupted tracking and tracing of products along the entire supply chain.

EPC Manager Number | EPC counterpart to the company prefix in the GS1 Numbering System.

GLN | Global Location Number. Globally unique identification for locations and trading partners.

GRAI | Global Returnable Asset Identifier. Globally unique identification for returnable transport items.

GS1 Germany | Service and competence center for optimization of business processes with trading partners. Founding member of EAN International and GS1, as well as the exclusive German representative of EPCglobal. (formerly known as CCG, Centrale für Coorganisation GmbH)

Handheld | Mobile RFID reader.

Reader | Mobile or stationary device used to capture the data stored on RFID transponders.

RFID | Radio Frequency Identification.

RFID gate | Doorway-like array of antennas which read data on RFID transponders passing through.

RTI | Returnable transport items.

SGLN | Serialized Global Location Number. (see GLN)

SSCC | Serial Shipping Container Code. Globally unique identification for logistic units.

Transponder | Concatenation of the words "transmitter" and "responder". In this context, an RFID label or tag.

UHF | Ultra High Frequency. Range of electromagnetic waves whose frequency is between 300 MHz and 3 GHz. In the EPC context, UHF applications of RFID employ frequencies between 860 and 960 MHz for communication between readers and transponders.

e-Business Standards for Small and Medium-Sized Enterprises – Competitive Advantage in the Global Economy
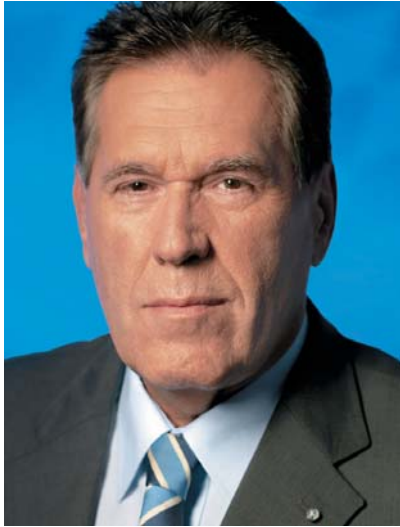
Electronic transaction of business processes is a decisive factor for success in assuring the competitiveness of German companies. e-Business offers small and medium-sized enterprises (SMEs) the chance to tackle the challenge of globalization and realize new business opportunities at home and abroad.

e-Business Standards, in turn, ensure that business processes run automatically, quickly and efficiently, saving costs for their users. Nonetheless, the multitude of different e-Business standards available can be overwhelming and unsettling for SMEs.

This is why the Federal Ministry of Economics and Technology has tasked itself with accelerating the adoption of e-Business Standards in Germany, assisting SMEs in this endeavor through the initiative "PROZEUS – Processes and Standards". In the meantime, a wealth of information on e-Business standards, including use cases and technical brochures, has been compiled and made available for free download from www.prozeus.de, a know-how transfer platform which will be continually expanded over the next few years.

Take advantage of PROZEUS in preparing your strategic entrepreneurial decisions – I wish you and your e-Business activities success and prosperity!

Yours

Michael Glos
German Federal Minister of Economics and Technology

The project at a glance

Piloting company Krause Meat International Food Production GmbH
Location Lüneberg, Germany
Branch Meat
Employees 40
Annual turnover € 30 million (2006)

Project partner & coordinator
REWE Group
REWE-Informations-Systeme GmbH, Cologne

Additionally involved companies
REWE-Markt Zwingmann, Wedemark
REWE-Markt Erben, Giesen/Hasede
REWE-Markt Oelgeschläger, Nordstemmen
REWE-Markt Dreyer, Hildesheim/Himmelsthür
Wilhelm Brandenburg GmbH & Co. oHG, Frankfurt

Branch Food Retail
Project title EPC/RFID for Fresh Meat Container Logistics

Goals
• Application of RFID technology in the pre-packed meat and sausage
  supply chain: from the supplier to the REWE distribution center to
  the supermarkets
• Identify the potential for optimization in the supply chain with an
  emphasis on logistics

Approach
Transport containers were tagged with EPC/RFID transponders
operating in the UHF frequency range. These tags were automatically
read upon completion of commissioning as well as on passing
through dock doors in the shipping/goods receiving process.
Automation of data capture in this manner equates to a reduction
of effort and costs in the various process steps.

Service providers
deister electronic GmbH
FEIG ELECTRONIC GmbH
Höft & Wessel Aktiengesellschaft
mw4solution GmbH
Nordic ID GmbH
Waldemar WINCKEL GmbH & Co. KG

Project duration
September 2006 to April 2007 (8 months)

Introduction to RFID and EPC

RFID (radio frequency identification) employs electromagnetic waves to transmit information between a transponder (or "tag"), serving as data carrier, and a reader. As an automatic data capture technology, the advantages of RFID are considerable. First and foremost, line-of-sight contact is not required for data capture, which means that objects within cartons or on the other side of a pallet can be identified. Additionally, identification rates of up to several hundred objects per second are possible, which expedites the picking, commissioning and receiving of both large and complex shipments. Furthermore, transmission ranges of up to several meters allow for dependable areal coverage at read points such as dock doors, commissioning and storage facilities. Also, data stored on an

RFID tag may be updated or amended with additional information relevant to the handling of a shipment or the shelf life of a product.

An increasing number of companies of all sizes, representing diverse sectors, already profit from applications of this technology in their businesses. The automotive industry, for example, has implemented RFID in the automation of its production processes – from the pressing plant to the paint shop to the installation of wiring harnesses – for over twenty years, and continues to broaden the scope of its RFID applications in areas such as container management and vehicle location tracking at distribution facilities. Within the healthcare sector, unambiguous identification of patients and blood products on the basis of RFID helps hospitals expedite life-saving treatment and avoid critical mix-ups. The consumer goods industry is in the process of rolling out this technology for identification of logistic units (pallets & shipping cartons) as well as consumer articles ("item-level"). Until recently, such applications were restricted to proprietary solutions within closed systems, making it difficult to leverage this technology's full potential.

Implementation of RFID on the basis of the intersectoral EPCglobal Standards increases the efficiency and transparency of business processes not only within enterprises, but between trading partners and across industries. As the official representative of EPCglobal in Germany, GS1 Germany supports companies in their rollout of the Electronic Product Code (EPC). Based on the GS1 System, EPC provides for the globally unique identification of products, logistic units, locations, assets and other individual objects, encoded on an RFID tag. EPC's serialisation assures the complete visibility of these items along the entire supply chain – from upstream suppliers to production facilities, transport by logistics providers, distribution centers, POS in retail outlets and beyond. This supply chain transparency enables the optimization of inventory and manufacturing control, including just-in-time and just-in-sequence production, as well as reduction of shrinkage. Additionally, the resulting uninterrupted traceability simplifies the processing of quality-related product recalls and consumer returns under warranty. In this way, EPC/RFID provides for an increase in profitability and operational agility, coinciding with heightened consumer satisfaction and customer loyalty.

Incentives and general set-up

The REWE Group has been involved with RFID for quite a while. Current emphasis is on the grocery supply chain, especially with regard to pre-packed meat and sausage.

Loading plastic crates with pre-packed meat

Integration of RFID into existing processes assumes the proper observation of legal requirements. In the case of meat and sausage products, legislation stipulates the precise documentation of delivery route and location. Further hygiene provisions apply to the handling of containers.

In addition to rolling, insulated and cardboard containers, predominantly E2 crates are employed for transportation of meat. As elements of a container pool, empty crates are returned to the supplier in ap-proximately the same quantity as those loaded crates which have just been delivered. Alternatively, they can be stored for a period of time before being sent back in the framework of return logistics. Discrepancies in the inventory of these containers are thus evened out.

Automatic identification of meat containers by means of RFID reduces the effort required for documentation of these goods, at the same time allowing for comprehensive process optimization. This, in turn, equates to improved quality of deliveries, and simplification of goods receiving, asset management and traceability.

Objectives and approach

For technical innovation to bring about lasting improvement, it must function flawlessly – this applies to RFID, too.

The procedure introduced here meant overcoming a particular challenge: groceries such as meat, fruit and vegetables are made up of a large proportion of water. Liquids can interfere with the performance of RFID trans-ponders, impairing read rate and reliability.

For this reason, the pilot pursued two main goals:

1. Main focus was placed on technical feasibility under realistic conditions.

2. Subsequently, process optimization potential along the value-added chain was identified.

In the realization of the pilot, the team installed RFID compo-nents at various steps of the supply chain. Over 15,000 meat crates were tagged with RFID transponders – either built in to the floor of the container or attached as "smart label" – and put into circulation.

Goods receiving and goods issuing were automated at the REWE distribution center and the parti-cipating grocery stores. The distribution center employed stationary RFID gates, while the stores tested both stationary gates as well as mobile RFID readers known as "handhelds". At the suppliers' facilities, RFID was applied to goods issuing, by means of stationary gates.

The actual environment and respective processes ultimately determine whether an RFID gate or handheld is employed. Larger volumes, such as the goods issuing department of Wilhelm Brandenburg, speak for the use of an RFID gate. Every day, this butcher supplies the REWE distribution center in Norderstedt with up to 500 crates of meat, as well as other products.

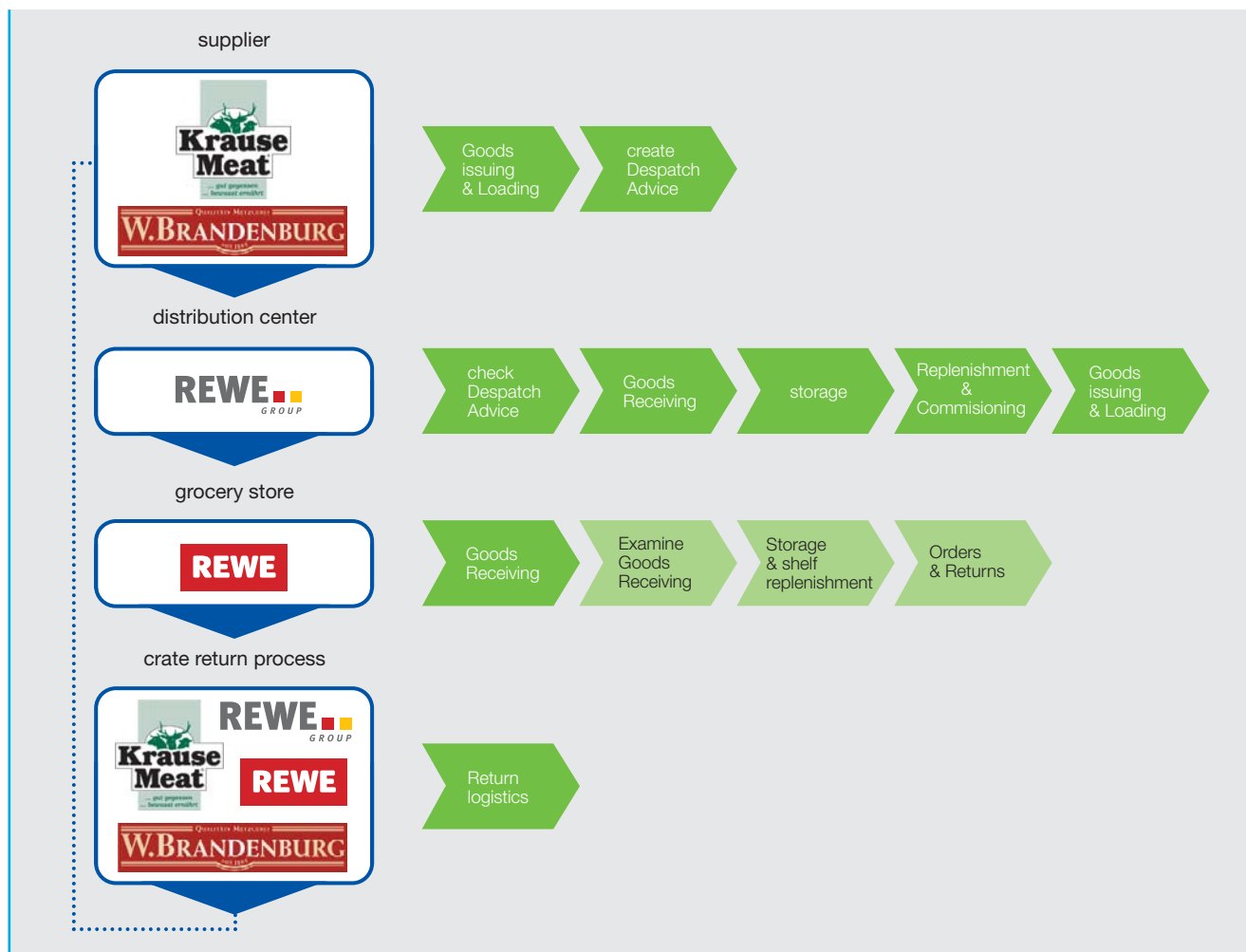The grocery stores involved in the pilot, in contrast, experience considerable fluctuations in the volume of goods received: anywhere between a handful and 400 crates a month. In cases of marginal volume, the use of handhelds makes sense, especially when one considers that space is often a luxury commodity in super-markets – newly arrived deliveries can make close quarters even tighter. For this reason, grocery stories rarely employ RFID gates, since handhelds can be efficiently and flexibly deployed in such situations.

Stationary RFID gate at supplier
Krause Meat

Reading the transponders with mobile RFID
reader ("handheld") at grocery store

supplier

Krause Meat
W. BRANDENBURG

Goods issuing & Loading → create Despatch Advice

distribution center

REWE GROUP

check Despatch Advice → Goods Receiving → storage → Replenishment & Commisioning → Goods issuing & Loading

grocery store

REWE

Goods Receiving → Examine Goods Receiving → Storage & shelf replenishment → Orders & Returns

crate return process

REWE GROUP
Krause Meat
REWE
W. BRANDENBURG

Return logistics

Overview of individual processes along the supply chain

Technical and organizational requirements

The success of an entire project always depends on individual components. This is why the analysis of processes, prerequisites and particularities represents and important foundation.

Process-oriented application of technology

A substantial success factor in RFID projects is the selection and installation of the appropriate technology. This is why the project team analyzed both on-site environmental conditions and process flows. This allowed for the development of a requirement profile for the RFID systems and, in turn, the implementation of the optimal hardware: RFID gates, handhelds und EPCglobal compliant UHF transponders.

Circulation of fixed and collapsible E2 meat crates

Conventional fixed-side meat crates in E2 format comprised the brunt of the container pool in this project. Additionally, in close coordination with government officials, collapsible crates were outfitted with RFID transponders and put into circulation. These containers served to transport pre-packed meat in a closed loop between trading partners.

Standardized information in compliance with GS1 and EPCglobal

Even though the pilot project involved a closed system, there could only be one, standardized solution: the internationally established standards of GS1 and EPCglobal.

For unambiguous identification, each crate was assigned a globally unique Electronic Product Code (EPC), in which a Global Returnable Asset Identifier (GRAI) was encoded according to the GS1 Standards. The GRAI was developed specially for returnable containers, and is already widely used in barcoded form.

This enabled the identification of meat crates across different points in the supply chain, including container return logistics. The underlying data model for saving event-driven data was set up in according to EPCglobal's EPCIS standard.

While in circulation, each crate can be read several times, at different read points. For this reason, the unambiguous identification of crate, time-stamp and read location was imperative. The EPCglobal identification numbers GRAI, SSCC and SGLN were ideally suited to this purpose, together with the EPCIS data model for recording and archiving event-driven data. (See Glossary at the front of this brochure.) This data can then be centrally evaluated chronologically and in a process-oriented way, regardless of read location. This provides a solid foundation for precise identification, tracking and tracing.

Membership of involved trading partners in EPCglobal is a prerequisite for using the globally unique Electronic Product Code (EPC) and its corresponding identification numbers. EPCglobal issues member companies a unique EPC Manager Number, which serves as the basis for generating individual EPC numbers. German companies can apply for an EPC Manager Number via GS1 Germany, the German representative of EPCglobal.

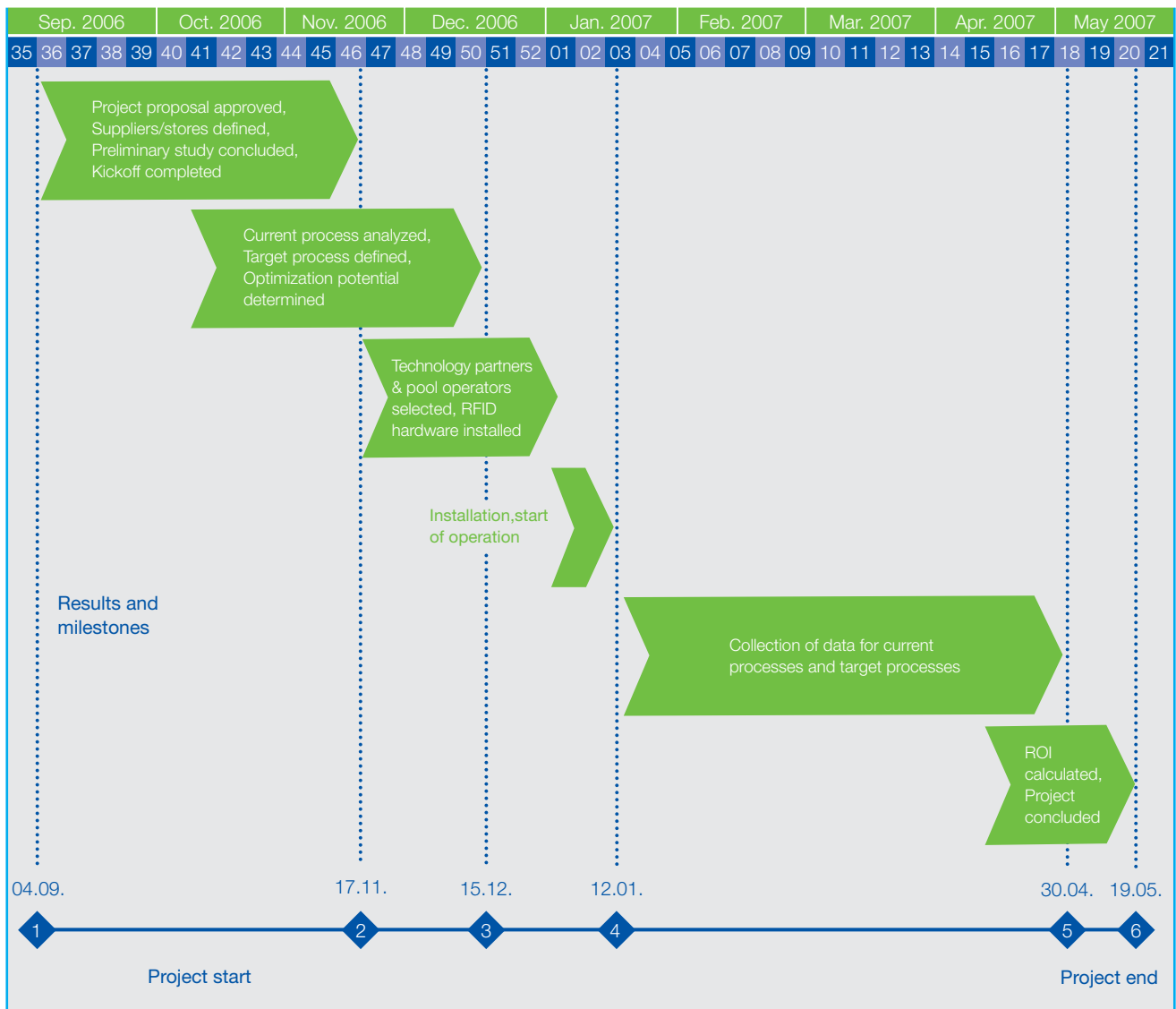|		
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epcList	urn:epc:id:grai:epc_steco_cc_nagel.00001.(051000-060000)	GRAI
action	ADD	
bizstep	urn:epcglobal:epcis:bizstep:fmcg:shipped	Process ID
disposition	urn:epcglobal:epcis:bizstep:fmcg:processing	
readpoint	urn:epc:id:sgln:4028132.00002.0	Location
eventType	AGGREGATION	

EPCIS data, as recorded at a given read point

Project chronology

At the beginning of September 2006, the pilot was started with a preliminary study and the finalization of participating partners. Upon kick-off, current processes were painstakingly analyzed, the potential for

optimization determined, and a target concept developed. The next steps comprised the selection of technology partners and the installation of RFID hardware for the test phase across the supply chain.

From the middle of January to the end of April 2007, this technical infrastructure was used to collect data on goods receiving and goods issuing operations, which in turn served as the basis for calculating cost effectiveness.

Sep. 2006				Oct. 2006				Nov. 2006				Dec. 2006				Jan. 2007				Feb. 2007				Mar. 2007				Apr. 2007				May 2007			
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21

Project proposal approved, Suppliers/stores defined, Preliminary study concluded, Kickoff completed

Current process analyzed, Target process defined, Optimization potential determined

Technology partners & pool operators selected, RFID hardware installed

Installation, start of operation

Results and milestones

Collection of data for current processes and target processes

ROI calculated, Project concluded

04.09. 17.11. 15.12. 12.01. 30.04. 19.05.

1   2   3   4   5   6

Project start   Project end

Project chronology and milestones at a glance

"Once we had the system up and running, we achieved read rates of nearly 100 %, thanks to the reliability of this technology."
Thorsten Vogedes, Project Leader Consulting/Standards REWE-INFORMATIONS-SYSTEME GMBH

Feasibility and ROI

The pilot project was intended to answer two main questions: Is RFID suited for the pre-packed meat & sausage supply chain? Which meat & sausage supply chain processes can be made more efficient with RFID?

The answer to the first question was loud and clear: RFID is suited for this supply chain.

1. At all read points in the supply chain, the crates were identified using RFID with almost 100 % reliability.

2. Bulk identification exhibited read rates of 100 % for up to 200 crates passing through an RFID gate. (see photo).

3. Frequent washing had no negative impact on crate readability.

4. EPCglobal's EPCIS data model enables crate traceability.

stacked and folded crates for RFID bulk reading

Furthermore, a range of process optimization potential was identified:

1. Use of RFID and EDI in conjunction with automatic cross checking of order and delivery (case tagging) increases efficiency and cuts costs at goods receiving in warehouses and stores.

2. RFID-supported container management enables automatic inventorying and transparency for the efficient utilization of available assets.

3. RFID-driven automatic identification and logging of container flow supports shipment tracking.

4. The use of collapsible crates saves space in warehouses, stores and trucks, and allows for more efficient utilization of rolling stock capacity.

A range of benefits were identified in various processes for the involved small and medium-sized suppliers and grocery stores.

Supplier: commissioning/warehouse

Current process	RFID-supported process
Commissioning in fixed E2 crates	Commissioning in E2 crates with RFID transponders. Each transponder is encoded with a unique Global Returnable Asset Identifier (GRAI).
Unmixed crates are stacked on pallets with SSCC shipping labels	Unmixed, RFID-tagged crates (identified with GRAI) are stacked on pallets with SSCC shipping labels.
Each pallet is marked with a GS1 128 SSCC shipping label	
Empty crates are replenished, where applicable	Empty crates are replenished, where applicable.
Loading onto truck	Loading onto truck. Automatic comparison with SSCC/GRAI. Erroneous loads can be indicated by means of "traffic light" at the goods issuing dock door, and logged accordingly.

Benefits
- Prevention of erroneous loads through automatic checking and verification
- Reduction of printing costs for shipping labels
- Logical interconnection between pallet, crate(s) and article(s)

Supplier: Despatch Advice generation

Current process	RFID-supported process
Printing of shipping documents and handover to truck driver	Automatic generation of Despatch Advice (EANCOM® message type DESADV, including SSCC & GRAI) and transmission via EDI upon commissioning/loading

Benefits
- Automatic generation of Despatch Advice
- Automatic generation of advance shipping information

REWE grocery store: Goods Receiving

Current process	RFID-supported process
Delivery to cold storage room via goods receiving loading dock	Delivery to cold storage room via goods receiving loading dock
Manual handover of shipping documents and transport equipment paperwork	Automatic comparison of Despatch Advice (DESADV) and Order (ORDERS) upon identification of rolling container (GRAI); determination and logging of crates (GRAI) via RFID gate or handheld
	Immediate feedback to driver in case of erroneous delivery at an RFID gate
Completion of transport equipment paperwork and confirmation by store	Automatic inventory control of crates and rolling containers (GRAI)

Benefits • Automatic inventory control of crates and rolling containers
• Reduction of shipping documents and transport equipment paperwork

REWE: Return Logistics

Current process	RFID-supported process
Empty rolling containers and crates loaded onto truck	Upon loading, empty rolling containers and crates are automatically identified via RFID gate or handheld
Loaded rolling containers and crates are noted on transport equipment paperwork (store is credited)	
Return to warehouse/washer system	Upon arrival in warehouse, empty rolling containers and crates are automatically identified via RFID gate or handheld
	Automatic inventory posting (debiting and crediting of the store) for stock of crates and rolling containers

Benefits • Elimination of transport equipment paperwork
• Automatic compilation of transport equipment information
• Transparent crate and rolling container inventory

Cost benefit comparison for the entire supply chain

Costs

Hardware:
- RFID gates at individual read points within the supply chain (goods receiving, goods issuing, disposal) *

- Handhelds in stores, where applicable

- RFID printers for production of EPC labels (SSCC, GRAI), where applicable

- UHF transponders for containers (pallets, rolling containers, crates)

Software:
- Middleware for RFID gates

- Adaptation of warehouse management systems, where applicable

- Implementation of inventory management software for management of container stock

- Implementation of EDI to replace shipping documents and transport equipment paperwork

other:
- Training of employees

* includes infrastructure (electricity & LAN) and installation costs

Benefits

- Reduction of paperwork through the use of electronic data exchange (EDI) in combination with RFID

- Label usage minimized through RFID (goods receiving, commissioning involving the identification of crates on rolling containers instead of crates on rolling containers as well as pallets)

- Increased efficiency in goods receiving via automatic comparison of Despatch Advice with the original order

- Reduced effort for checking and verification enabled by advance receipt of Despatch Advice (including important details such as sell-by date, amounts, weights, etc.)

- Avoidance of erroneous shipments via automatic recognition and logging of erroneous loading

- Increased efficiency in goods issuing via automatic identification at RFID gates (instead of barcode scanning)

- Collapsible crates require significantly less space in warehouses, back-store and in trucks (improved utilization of rolling stock capacity)

- RFID-supported container management enables transparent and efficient use of available assets (e. g., optimized distribution at peak business times such as the Christmas season)

- Automatic identification and logging of container flow (debiting and crediting of stores, shipment tracking)

Example of hardware cost (based on prevalent 2007 market prices):

Component	Price per unit	Quantity per gate	Cost
Reader incl. transformer and power cable	€ 2,800	1	€ 2,800
Interface for reading and writing data (multi I/O board)	€ 55	1	€ 55
Antennas	€ 240	4	€ 960
Antenna mounting brackets	€ 28	4	€ 112
Antenna cable, 10m	€ 27	4	€ 108
Motion detector	€ 420	1	€ 420
Metal framework "gate"	€ 2,900	1	€ 2,900
Total costs (excl. setup costs)			€7,355
Assembly and setup priced individually, according to effort			
Handhelds (mobile RFID readers)	€ 3,500		as necessary

Conclusion

UHF RFID transponders in conformance with EPCglobal standards were able to prove themselves in the field, even though the high degree of moisture in the fresh food logistic sector presented a challenge.

Despite the high proportion of water in meat and sausages, the transponders had a read rate of almost 100 %. Even the frequently required washing of the transport crates had no negative impact on the ability to automatically and reliably identify transponders in the field.

"I was surprised at how technically mature and implementable the RFID technology already is. After installing the RFID gate, data was automatically captured without our employees having to take additional measures. This allowed us to increase transparency in the supply chain with no additional effort."

Bernd Kasprack, Plant Manager, Krause Meat

EPCglobal's EPCIS standard is ideal for storing the events logged at individual read points across the supply chain and back again, in return logistics.

The positive results of the case study, "EPC/RFID for Fresh Meat Container Logistics" speak for themselves, and should encourage companies to undertake further EPC/RFID pilot projects, in order to structure their own processes more efficiently.
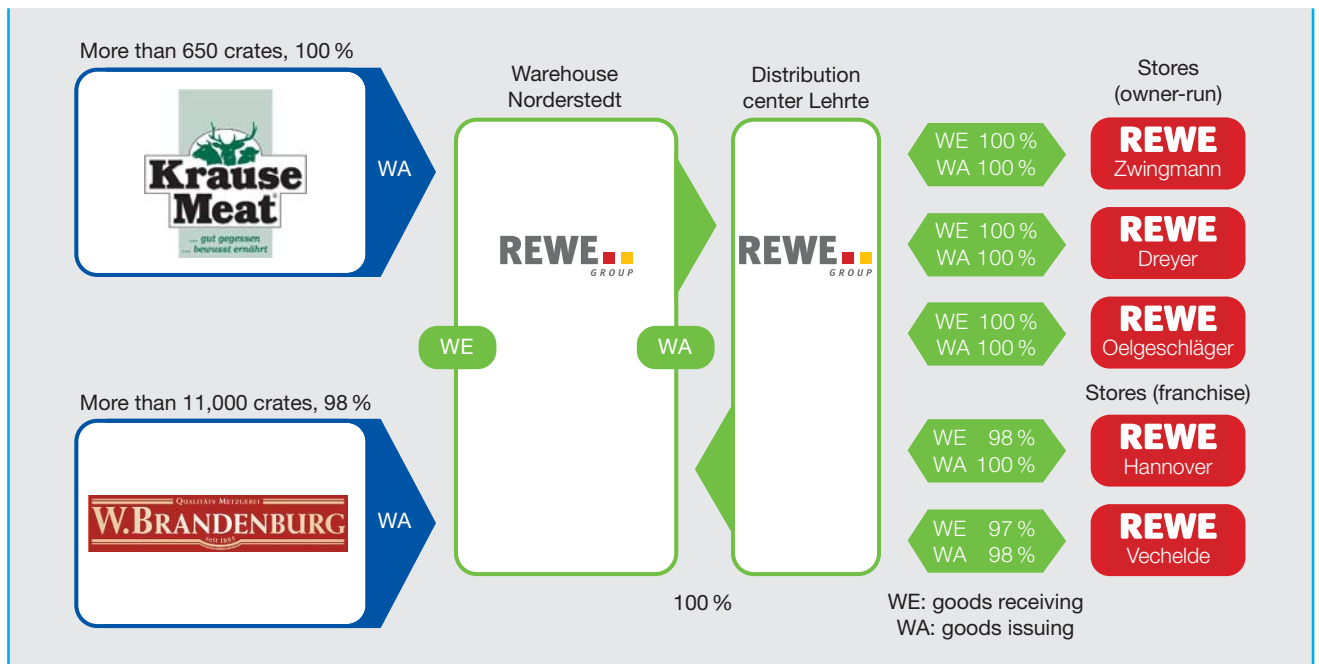
Illustration of the supply chain in the RFID pilot project, including read rates (%)

Further Information

GS1 Germany (www.gs1-germany.de) | EPCglobal in Germany (www.epcglobal.de) | EPCglobal Inc. (www.epcglobalinc.org) | RFID im Blick (www.rfid-im-blick.de) | RFID Journal (www.rfidjournal.com) | Informationsforum RFID e. V. (www.info-rfid.de) | Internet der Dinge (Bullinger & ten Hompel) (www.internet-der-dinge.de)

About PROZEUS

PROZEUS supports the e-Business competence of small and medium-sized companies through integrated processes and established standards. PROZEUS is a non-profit initiative run by GS1 Germany, the service and competence center for inter-company trading processes, and IW Consult, a subsidiary of the economic research institute, Institut der deutschen Wirtschaft Köln. PROZEUS is funded by the German Federal Ministry of Economics and Technology. Providing comprehensive information material, PROZEUS aims to make decision-makers aware of e-Business topics and encourage them to take an active role in e-Business implementation. Free brochures (German language) addressing the topics listed below can be downloaded at our homepage, www.prozeus.de.

eBusiness

Electronic business describes business processes which are transacted by means of digital technologies. Solutions range from simple online shops or catalog systems to electronic procurement, sales and logistics processes. PROZEUS furnishes companies with guidelines, checklists and data sheets covering the selection of the proper e-Business standards, technical prerequisites and range of IT service providers.

Identification Standards

With the help of standardized identification numbers, each product can be unambiguously, globally identified. Under the umbrella of the GS1 System, EAN barcodes and EPC/RFID comprise the most well known numbering system in the consumer goods sector. PROZEUS addresses implementation, benefits and ROI in practical reports and application recommendations.

Classification Standards

By means of classification standards, products are not merely identified, they are described as well. This is accomplished by classification into product groups and subgroups. Examples of such standards include eCl@ss, Global Product Classification (GPC) and the Standardwarenklassifikation. PROZEUS provides implementation recommendations on classification standards, including practical reports and guidelines.

Master Data Alignment & Catalog Exchange

Electronic product data can be communicated accurately to suppliers or customers by means of standardized formats such as BMEcat or the EANCOM® message PRICAT. This is another area where PROZEUS offers diverse practical reports and selection criteria.

Transaction Standards

Business transactions such as orders, deliveries and invoices can be processed electronically with the help of transaction standards, such as EANCOM®, EDIFACT and GS1 XML. Application areas, benefits and ROI are addressed in PROZEUS application recommendations and practical reports.

Process Standards

Process standards such as Category Management provide the framework for the automation of complex business processes. They define the conditions under which processes such as replenishment or asset management are carried out, as well as which data is exchanged with which business partner at each step. PROZEUS offers concrete help for implementations by means of practical examples.
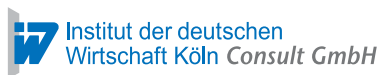
Publisher responsible for
the content of this brochure:

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