

INCREASING EFFICIENCY IN MEAT PRODUCTION AND SAFER LIVESTOCK HANDLING

Many cattle breeders and feed lot handlers lack convenient tools for control and management of their production. Reporting to the Swedish Board of Agriculture and assessment of the production cause cumbersome paperwork. Smaller feedlot operators mostly deliver animals to slaughter without optimizing their revenue.

Handling of livestock is potentially dangerous – especially handling of beef cattle cause several injuries and a couple of deaths each year. At the same time, single person work increases in agriculture.

EID – THE BASIS FOR RATIONAL HANDLING AND WEIGHING

Electronic identity (EID) of livestock is being used increasingly and will be mandatory for sheep, lamb and goats within the EU as from 2008. EID is not yet certified by the Swedish Board of Agriculture as official identification scheme why all animal transportation and reporting requires

ocular reading of non-electronic ear tags. This system has several drawbacks and is in practice not used for internal feedlot management and handling of livestock.

The non-electronic ear tags are difficult to read and approx 10 % are lost when grazing, often causing ear injuries. Re-tagging of animals is a cumbersome procedure which cannot be performed rationally due to current regulations. Approx 2 % of the animals loose both their non-electronic ear tags and untagged cattle can cause a reduction of EU subsidies which can account to significant amounts for the single farmer.

TracTechnology has in cooperation with Mr. Leif Andersson, a larger producer of high quality beef cattle in Sweden, developed a system for more efficient meat production. Mr. Andersson is also the constructor of the mobile cattle pen in which tagging and registration reading is made safely.

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Easy animal identification?





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Identification on the way to weighing

MEATTRAC BREEDER

The web application includes modules for registering of animals and ancillary information, an electronic feedlot journal (pending certification of the Swedish Board of Agriculture), administration and reporting.



Feeding bolus transponder

The animals are tagged with RFID transponders and registered in the weighing instrument. The information is later transferred to the farm PC and the database holds information of all livestock, the holding and suppliers.

For improved production control and management the livestock is periodically weighed. The system has been designed so that neighbors can share the mobile weighing equipment yet use complete functionality within the system. Automatic weighing makes the procedure quick and simple and the animals quickly adopt the process.

Time-of-slaughter is automatically projected from individual weight series with the target weight assigned by the feedlot operator for each breed. The calculated weight is easily confirmed or moderated in the slaughter calendar.

Additional information can be noted in the database and reports to the central animal database of the Board of Agriculture are made quick and easy.

After slaughter, carcass feedback information is imported to MeatTrac Breeder and slaughter yield is automatically calculated.

BENEFITS ON THE FARM

EID saves time, decreasing the handling of animal re-tagging and provides safer wor-

king conditions. With a hand held RFID reader, the animals' identities are safely read from the outside of the pen and a stationary reader provides automatic identification. Automated sorting of animals can be made without the hazards of working amongst beef cattle.

Using individual animal performance data improves management decisions. Signaling of abnormal divergence in animal growth lets the feedlot operator control causes and take proper actions.

Production control, supported by the time-to-slaughter prediction, permits improved planning and higher revenues of slaughtered cattle. Reports give information for the best and worst individual carcass feedbacks. Relations can be analyzed for e.g. choice of breeder.

BENEFITS FOR THE SLAUGHTER HOUSE

The system shares information of feedlots' slaughter planning with the slaughter house user supporting the internal production planning of slaughter house.

Pushing information of animals being loaded on transport for slaughter provides a pre notification of delivery in real time. EID readers at the entrance at the slaughter house automatically verifies delivery and identity data can be automatically transferred to the MPS system of the slaughter house. This eliminates cumbersome correction of erroneously keyed in data.

MeatTrac Slaughter is TracTechnology's system for RFID-based identity handling at the meat processor. It provides further productivity enhancements in e.g. grading plus verified traceability.

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TAGS FOR WASTE BINS

RESULTS IN LARGE SAVINGS

NORSIK

Secure identification has been our main vision since Norsik first started printing bankbooks, checkbooks till today's production of credit- and smart-cards. Deliveries of magneticstripe solutions, chipcard solutions and contactless RFID identification has enforced secure identification as our main vision. RFID-solutions for waste management has become one of the companies main business areas.

THE SOLUTION

By attaching a RFID-tag on bins, government and private waste management companies can save millions and increase the quality of services for the households. The system gathers data from readers mounted on waste trucks when emptying waste bins. The data is sent to the trucks onboard computer and sent via GPRS to the central fleet control program. The weight of waste for each individual household can also be registered if the truck is equipped with a weight.

LARGE SAVINGS

The biggest saving is a result of accessing correct subscriber data and charge subscribers for delivered services. Approximately 20% of the bins is not registered in any system prior to the deployment of the system. The county is emptying them anyway but do not get any income on the service. Also the size of the registered bin is often wrong compared to the household's subscription. Many households have bigger bins than what they are charged for. By implementing RFID tags all errors will immediately be identified and dealt with.

Governmental and private waste management companies also make savings on tenders for transportation. Analyses and reports from the system can be used in tenders for more detailed information in the tender process. The transporter can extract exact data on the waste flow on the route and make an exact bid for the actual transportation need.

NEW OPPORTUNITIES

The solution opens new opportunities for waste management. One option is to change the household's traditional fixed price billing to a price based on the weight of garbage. We see environmental benefits as a result of economic incentives for reducing waste. The information can also be communicated to the households as charts and reports in the invoices. Norsik believes the solution will contribute to better awareness in households when it comes to the environment and waste management.



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RFID SOLVES MEATY PROBLEMS

Foodstuffs production is probably subject to the toughest regulations on the market. Hygiene, ethical processing, quality controls and safety are just some of the aspects that have to function 100 percent. This is everyday routine for Gilde, the largest processed meat producer in Norway. With 20 factories around the country, the company accounts for around 60m percent of total processed meat production in Norway. Logistics are, to put it mildly, complex, and nothing must be allowed to go wrong. But these stringent demands also provide a driving force for development and the company is always on the lookout for new possibilities. Including RFID, a system that now offers major opportunities since new standards have come into force.

One of the largest Gilde factories is situated in Tönsberg, just south of Oslo. From here large quantities of processed meats and provisions packed in white plastic crates are delivered each day to customers in southern Norway. Inside the plant the plastic crates are carried about on different conveyor belts and packed with sausages, beef, cold cuts and other meat products. All packed and controlled according to customer orders.

Careful controls are applied to outgoing deliveries, what is produced and from where raw materials originate. All products must be traceable back to the livestock farmer.

Of special interest is that the Tönsberg plant has now become the focus of a new development project for RFID

controlled production. The company will be developing RFID systems and solutions here over a period of three years.

"RFID can provide definite improvements to our operations," explains Egil Sörfalten, head of the Gilde project. "But this is a sensitive kind of production where any changes have to be carefully tested before they can be implemented. The technology is still new and we have plant all over Norway, so there are a good many questions that have to be answered. So far however, results seem to be promising."

The project will run until 2009, and is being organised in cooperation with Intermecc and SINTEF, Scandinavia's largest independent organisations for

industrial and engineering research. Cooperation entails frequent meetings and intimate dialogue between the three parties, and interest displayed by the surrounding world is significant.

"We are involved in a sort of pioneering job and are collecting a good deal of experience along the way. Experience we are using to develop technical applications," says Gunnar Senneset, a researcher with SINTEF. "RFID offers a very large potential within the production control field. Simpler administration, faster processes and more reliable delivery chains are just some of the advantages. But there remain many practical matters to be solved. One example is the detail of finding the right position for fastening RFID plates onto plastic distribution crates.

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BETTER CONTROL AND HYGIENE.

ID marking is a matter of specific importance to Gilde's interest in RFID. "We have thousands of crates in circulation that we need to control," continues Egil Sörflaten. "We are now losing many crates because they are used for other purposes than those designated after they have left Gilde, and this is costing us a lot of money. RFID marking gives us a system that provides better control."

The well-encapsulated RFID plates withstand the Gilde washing process, where each crate is cleaned using high temperatures and high pressure before being returned to the plant. The present marking system of barcode labels fails to withstand this treatment and the labels simply washed away. With the result that drains are clogged up with sticky labels while the crates have to be re-marked.

"This is expensive and results in a good deal of operational breakdown," Egil Sörflaten tells us. "Eliminating the problem while simultaneously improving control over our crates will be a tremendous gain. It will mean faster and better identification of different consignments and ensure that all deliveries maintain the correct quality."

CUSTOMISED TRANSMISSION

The first stage of the project involved test-driving a packing line at the Tönsberg plant. Results were good. Achievements include working out the correct position for antennae, the best antennae to use and looking into how these can be customised. The project group has examined the possibilities of shorter distances and controlled read-offs.

"The antennae need only be active during reading-off, when the crate is very close to the antenna," explains Gunnar Senneset. "We have already achieved almost 100 percent efficiency in reading-off the test line, a clear improvement over earlier performances. And this level can be maintained using tighter transmission times. The optimum situation is when the antenna is activated exactly at the moment when the crate comes within range



RFID antenn

and then switches to standby. Read-off should preferably occur within a very tight and narrow timeframe, precisely the interval required to provide an accurate read-off. Intermec is looking into the possibilities of customising this process; it is an aspect that contributes to better working conditions for our personnel."

NEW IDEAS

The project will expand successively to include more parts. These include altered working routines with more automation, better working conditions and better traceability. Improvements to working conditions are important because work entails spending time in a cooled environment, a situation that makes demands on personnel.

Additionally, RFID speeds up information flow with the advantage that information on breakdowns or production deviations can be provided faster.

"Exactly what gains will be made and how significant they are going to be is too soon to say," says Egil Sörflaten. "But RFID technology is very interesting and the project is already generating positive results. The

fact that we are developing new working methods based on new technology is a stimulating factor in its own right. We are working to involve as many personnel in this as possible. The more people who participate in the practical development work, the greater the interest in the work process. In this way we can obtain the best ideas for improvements. Many personnel have begun to think more divergently since the RFID project started.

THE FUTURE DRAWS CLOSER

Gilde visions are not limited to the boundaries of the company. In the long term the intention is for suppliers, in other words the livestock farmers, to start using RFID to mark their animals. A kind of marking that is both comfortable and harmless.

"This will complete the RFID chain throughout the operations flow," concludes Egil Sörflaten. "And perhaps this kind of future is nearer than we might think; if all things run as planned we should be ready to implement RFID throughout the entire operations system within a few years."

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The Gilde project is very valuable to Intermecc. As the first suppliers on the market with a complete range of RFID products the company has a chance to join in and develop a system using the latest techniques.

“RFID is still a relatively new area in production control and we are proud

to be the first suppliers offering a complete range of products,” declares Linda Skanser, Intermecc. “This project allows us to build up an almost unique experience of RFID applications that we can use in our future development work. This in turn will enable us to be more useful to our customers in future RFID projects.

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INTELLIGENT LOGISTICS FOR SMART TAGS

The demand for smart RFID solutions within the logistics industry is increasing quickly, much due to the fact that the end customer's demands are getting more and more sophisticated. The trend today is that it is not enough to only track and identify the goods, but also to prove what the goods has been exposed to during the transportation or storage. Smart active tags able to measure and log physical values form the base of Adage Solutions RFID based system for logistics – a complete system including tags and readers as well as software and integration platforms.

Adage Solutions has developed a complete logistics system where the components are designed for harsh environments. The base of the system is the smart active tags that do not only identify the goods, but also measures and logs physical values. Basically any type of sensors is possible to integrate to the tags where the most common today are vibration, humidity, temperature and chock, or a combination of different types of sensors in one single tag. Adage has patented solutions for e.g. tags measuring and logging both temperature and vibration in one tag.

The complete system is built on modules that make it easy to adapt the functions to the customer's specific needs. The basic system includes mobile and fixed readers that communicate with an integration platform, preferably through W-LAN or Blur Tooth. The system is integrated to the customer's existing business- or logistics system and thereby a real time update is achieved directly in the customer's existing system. Besides the standard functions there are a number of special modules as add-on, e.g. GPS and GPRS for real time tracking or radio modules for extension of the coverage area of the tags.

The main advantages for the user is to achieve an automated process for the logistics handling, including a documented history over what the goods



has been exposed to during freight or storage. With the documented history the customer can easily control/prove that arriving goods has been handled according to stipulated rules and regulations or at an early stage in the logistics chain separate goods that has been exposed to non-accepted conditions.

The need for documented history is best noticed within the handling of sensitive goods, such as ammunition, food, medicine, military equipment, electronics, textiles or wooden products. The trend is, however, that the need quickly is spreading to other logistics related fields as the end customer's demands are growing more advanced by the day.

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RFID HORSE FODDER

A Fodder Automat, allowing the horses to portion their own food, stands nowadays among a group of foals on Menhammar Stud Farm, on Ekerö outside of Stockholm. A heavy and time consuming work moment is gone from the keeper's workday, at the same time the feeding of the young gems can now be followed up and analyzed afterwards.

In charge of development is RFIG Sweden AB, a project that started during the summer of 2006 after an idea from a company in the stud farm business. The outspoken goal was that the horses would be able to feed themselves from an independent fodder autoamt. One could also be able to follow up statistics on every horse and be able to adjust the automat to every horse individually, such as the amount of fodder or the time intervals between the servings.

RFID technology for identification of the horses was the starting point of the project, and thereafter we could deci-

de how to solve the other tasks in the project. In the automat there would be altogether four cribs for feeding, and to every crib a motor for portioning the fodder. To provide electricity for an independent, mobile automat the natural solution was solar cells on the angled roof. The electricity had to be sufficient for the four motors, that when needed all should be able to operate at the same time, the pocket PC controlling the system, and maybe above all, for the four antennas that in a rotating order are looking for RFID tags in "their" area. The antennas, mounted behind the automat walls, had a distance of 30-40 cm, which

was enough to reach the tags that are applied on the horses' halter, under the snout.

The automat was built in plywood and one issue was to put sustainable bands on all sawed areas, to prevent the horses from destroying the plywood when gnawing on it. When metal bands were used a distance between the bands was carefully held to avoid disturbance from metal circuits. The antennas, mounted below the cribs, also had to be internally shielded against the opposite antenna. The RFID reader and the battery together with other electronic equipment was

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at the automat in different parts of their time intervals a rhythmical thumping from their knees can soon be heard. Maybe it is lucky the antenna is mounted just behind where the knees hit the wall.

With four fodder cribs on an automat, for around ten horses in a pasture, sometimes also fights over the food emerge. After a while however a turn-taking was developed, modeled after the horses' status in the group. The portioning system was here of good use, when the first horses had received their last portion and tired waiting for a new one, the horses of lower status could step forward. With these observations the time intervals could be decided so that when the last horses had finished, the first horses could return to the automat for a new round. This was in line with the keepers' wishes that the horses should have a steady rhythm of eating. Daytime it can go hours between the feedings since the horses much liked to graze, but from the statistics we could learn that they above all preferred the automat in the evenings and nights. One can wonder when they really sleep.

The transition from late summer to autumn and now the decreasing daylight has brought some problems with the solar cell, that on a long term can not supply the whole automat with power. Also the wear and tear on the RFID tags in the halters is very hard, apart from the exposure of water, soil and horse snot everything positioned under a horse a nose has to suffer, as said earlier they also like to gnaw on everything they see, including each others halters and their hanging RFID tags. The idea and the technology behind this project is however working according to our expectations.

Author: Olle Wessel

mounted in the bottom inside the automat, except the pocket PC hanged up inside the roof, to be easily accessible. The fact is that the roof is a hatch that can be opened to fill the automat with fodder.

The major part of the development work was however to make a program for the pocket PC that controls the system. Simplified it can be said that the program should be able to communicate with the RFID equipment, to find out if there are horses close to the automat, then control if that horse is allowed to eat at the moment, and then start the motor corresponding to the antenna where the RFID tag was detected. A pure technical challenge was that the pocket PC only had one serial port but still needed to communicate with both motors and the RFID reader. A small line listener was manufactured and placed between the pocket PC and the rest of the equipment, using a protocol the line listener could separate RFID communication from motor communication and branch off the signals. The data about

every horse is stored in a database and once every day the data is also sent to an external database, through a modem in the pocket PC. When this connection is made the pocket PC also checks if there are any new commands for the automat, like changes in the feeding intervals or registration of new horses. In this way the fodder automat can be remote controlled from an office computer.

During the testing with the fodder automat in the enclosed pasture it has undeniably been interesting to observe the horses. According to the keepers' wishes the settings were made so a horse first receives some portions during a short time interval, then there will be a longer break until the horse can eat next time. As mentioned earlier, they also like to gnaw at anything on the automat, but many other behaviours could be observed at the fodder automat. The most striking was how they knee-butted the wall of the automat as soon as their portion was finished, to shake a little more fodder out of the motor. With four horses standing

TAG-ON-DEMAND CONCEPT FOR RFID ENABLED PALLETS

As RFID is increasing its presence everywhere, logistic managers are increasingly facing the question on how to handle shipments to end-users requiring the RFID-tag at the same time as the traditional end-user still rely on the barcode. As the latter still are in a majority, a high number of tags can be saved by not applying the RFID-tag in those cases.

Another issue is that the SSCC standard for pallet labels requires two labels on different sides of the pallet, whereas only one RFID-tag is allowed on a specific pallet. The slap-and-ship procedure used in pilot projects does not scale economically and is prone to errors.

These points are addressed by the Tag-on-Demand solution provided by Logopak. By allowing the use of a RFID-Tag – or not – to be determined by the printer software an automatic solution is possible. On each label the usual information is printed. That is, the name and address of the receiver

of the goods and the standard EAN-128 / Code-128 barcode with the SSCC number. This data extended with the information required for the RFID-Tag. Thus the same SSCC number is automatically used in the RFID-Tag and the corresponding barcode. The Logopak Tag-on-Demand concept allows for verifying each and every RFID-Tag

before it is applied so that faulty tags can be discarded. If there is a limited number of receivers no host-connection is required, and the layout selection can be done manually or via I/O-signals.

Since the complete system consist of two modules existing owners of Logopak 920-II / 2920 print-and-apply applicators can in most cases

upgrade the machine simply by adding the RFID module, thus saving both cost and time to integrate a completely new system and get it up and running.

Companies looking for pallet labeling solution can install the standard 920 today and then upgrade with the RFID-module when the requirements warrant it.

Flag-Tags are supported to handle situation where the content of the pallet may interfere with a reading of the RFID content. Tag-on-Demand can be combined with the Flag-Tag method to provide a reliable, automatic solution for applying RFID-Tags when required.



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THE GENTLE TAG: PUTTING RFID INTO A TECHNOLOGY AND SOCIETY CONTEXT

What technologies are most likely to cause explosive change across society? It is not the highly specialized ones, because they will always be limited to their own applications even when they are inherently powerful.

Rockets and nuclear power are impressive, but they do not change society significantly. Instead it is the general-purpose technologies that change everything. The knife, writing, the steam engine, electricity, the personal vehicle and the computer have utterly transformed our world just because they can be applied in an infinite number of ways. Such technologies may start out as solutions to specific problems like calculating mathematical tables, but soon branch out to new applications. The inventors of the electronic computer never intended video games, the Internet, word processing, digital movie special effects and global credit networks.

When I as a futurist mention the next few such technologies I of course mention IT, biotechnology, nanotechnology and cognotechnology. But recently I have started to add identity technology to the list. Identity technology consists of methods of making objects "know" who, what and whose they are, and allowing automated systems to make use of this information. Identity technology is as transformative as the others. Considering how much of human and machine time is spent on identifying it is going to be

profoundly important. It is a general technology that can be applied to nearly anything, combined with other



technologies and likely to spawn many new and currently unthinkable applications.

RFID tags are a key component of identity technology. While traditional EAN codes, QR codes, pattern recognition, laser fingerprints, biometrics and other systems are also important, RFID promises many benefits of automation and efficiency they would be hard pressed to match. The sheer commercial interest and technological innovation of RFID is also important. When Edison invented the electric light he did not just invent a light bulb, but also the socket, the distribution

system and the electricity meter – all pieces of a greater system that made the technology possible, profitable and extendable. The development of standards and infrastructures that go on today will be very important in defining what kind of identity technology we will get.

The debate and assumptions surrounding a new technology can shape it for good and ill. It took a single highly publicized accident to doom Zeppelins to a curiosity, while we still suffer railroad accidents from time to time without anybody considering abandoning rail. The framing of genetic engineering in the 1970's in terms of risk and ethical problems has shaped the field and made agricultural biotech a hard sell in many countries. The current integrity concerns of RFID are a similar risk.

Helping RFID and identity technology become a trusted – and trustworthy! – technology in everyday life and across society requires not just listening to consumer and customer concerns and designing away the worst problems. It requires a proactive stance in acknowledging the problems that exist, suggesting solutions and allowing experimentation.

FORTS NÄSTA SIDA



It is clear that enabling reliable and discreet tracking of things and people poses problems. Tracking people may be the greatest concern but even our possessions contain parts of our extended selves. There are also obvious security concerns as well as potential problems if tags get broken. But the real problems will not be apparent before they occur, just as spam was not predictable when the first email programs were written. This is something we need to acknowledge and get around.

We can construct trust both by designing trustworthy systems and by engaging stakeholders of all kinds in the development process. Some problems can be solved by engineering, like security, blockable tags or how to handle the data. But much is going to be social interactions: do we trust the different stakeholders, their methods and goals? And stakeholders often do not understand what they want or need; supplying exactly what people ask for seldom works. This is why an exploratory process is going to be necessary where solutions are invented, tested and often discarded.

Getting people to discuss the values and visions they have for their technology is very helpful. This may be the biggest lesson from the GMO issue: as long as proponents of a technology do not argue for why it is good and why they are for it, the opponents can always claim that the technology is immoral even if it is useful. Just explaining why tags are used makes people much more comfortable with them, and admitting the dreams driving

much development enables more broad and deep discussions about means and ends.

A focus on end user benefits is often helpful. Consumers have nothing against GMO in Europe if they see a lower price or higher nutrient count. Consumers would love RFID tags if they visibly lowered prices or gave their goods useful capabilities.

It is important to develop visible and transparent technology. Having a sense of control and overview is essential to human wellbeing, regardless of whether it is actually exerted or not. There is nothing more frustrating than devices acting (or suspected to act) outside one's control. Hence technology should not be secretive and its activity should be possible to monitor. Tags should have clear owners and defined loyalties. Maybe markup describing the tag system itself a standard feature, so that people can if they wish check out unfamiliar aspects of an objects identity.

Similarly there is a need to give the user a sense of control over the system. This includes the ability to turn off, remove or shield tags, but also the ability to read tags in the vicinity and to write to owned tags.

The best way of achieving trust and a sense of control is to enable experi-

mentation with technology. At present there is a big risk that industry and critics just think of the big applications like supply chains, producing regulations that are based on these assumptions. But general technologies are innovation friendly. Without people playing around with home computers the Internet revolution would not have taken off or been so accepted. To get the maximum benefit we should have a broad base of bottom up experimentation, ranging from RFID hackers to kids to entrepreneurs, and the understanding that we will see many utterly unexpected uses. Regulations ought to not gel too fast, since they might otherwise trap the technology based on the assumptions of an early stage. Young technologies are vulnerable to overregulation. Computers are not just calculating machines, and tags are not just a convenient stock management tool. But if they are treated like that much of their full potential is lost and it becomes hard to innovate.

These kind of broad considerations based on the history of technology, regulation and public risk perception may appear remote from the everyday business of making real systems that work for real customers. But they cannot be imposed top-down as a plan, but should ideally inform the everyday work. Enable tinkering, transparency and engagement locally, and global effects follow.

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FACTS ABOUT DUALINTERFACE CARDS

Paypass is built around the idea that with contact less technology payments up to a limited credit. PayPass is built on EMV which is built on PKI technology. This means that information cannot without encryption keys (PKI) be copied or sensitive information read.

If anyone should get access to a Mastercard terminal and in theory be able to make a transaction it has to be in close contact to the wallet (3-5 centimetre from the card) during a few seconds time period. The risk could therefore occur in close contact on the dance floor]

Because of the fact that the reader must be able to decrypt the information and have access to Mastercards

keys in a accepted terminal Mastercard handles the risk that one vendor misuses this function and the vendor would very fast be recognized and blocked from proceeding usage.

Observer that in difference from todays magstripe an EMV card with contact or contactless technology cannot be copied or tempered. As additional information there is a pilot in the USA with more then 15

million users and many thousand of terminals without the proposed problems has occurred.

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