Identifying dangers for products: RFID labels control temperature monitoring in "intelligent containers", by Reiner Jedermann. Fleischwirtschaft International 2/2007, Volume 22, ISSN 0179-2415, Pages 79-81

Identifying dangers for products

RFID labels control temperature monitoring in "intelligent containers"

The traceability of the cooling chain required by the law-maker also brings many advantages for users – provided that the right technology is used. New RFID labels can record temperatures, or as in the case of the "intelligent container" help to identify dangers for the goods at an early stage.

By Reiner Jedermann

New temperature surveillance systems can be divided into two groups. On the one hand low-cost RFID data loggers with the size of a credit card have recently become available. At the end of the transport operation a log can be read out to check whether the goods were conveyed at the correct temperature. On the other hand remote surveillance systems allow constant access to the goods. The current location and temperature can be tracked "online".

The TurboTag Data Loggers of Sealed Air Corporation (www.turbo-tag.com) combine an RFID aerial with a sensor chip from KSW Microtec for recording up to 700 measuring points. In a field study by the University of Bremen, these data loggers are used to collect data on the spatial distribution of temperature within a truck or container. Prior to departure up to 40 data loggers are distributed along the walls of the vehicle and in the goods. The first results of this study document that the temperature of the goods can partly deviate distinctly from the set target value, despite using the latest in modern cooling technology. Together with the partners CCG Cool Chain Group Holding AG, CCG FRA GmbH and Rungis Express

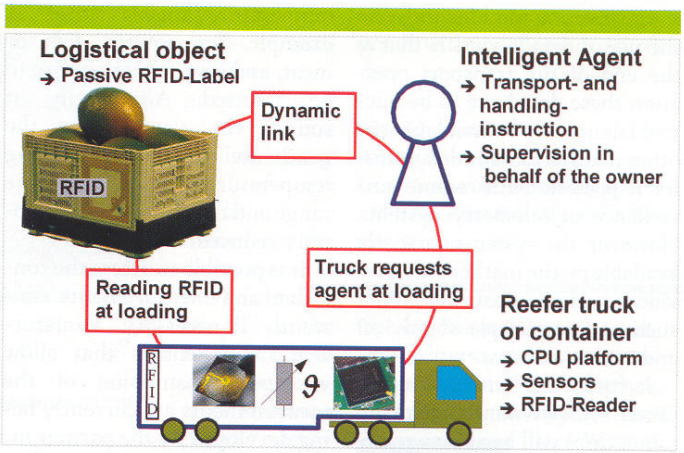

Fig. 1: Information chain for fresh products. The RFID label is read on loading the truck and calls for the electronic waybill. Via this the sensors are set as required by the product. The data are passed on via agents.

AG, weak points in the cooling chain are to be identified in this way and eliminated. Rungis Express has specialised in distributing high-grade foods to top caterers, delicatessens and hotels.

However, a disadvantage in the use of data loggers is that at the end of the transport operation these data have to be queried laboriously by hand. On the other hand automatic data transfer is possible with remote surveillance or telemetry systems. However, the systems currently available on the market only provide for a few measuring points, such as for example supply air and return air temperature.

In future the "intelligent container" (www.intelligentcontainer.com) will be able to remedy the situation. To this end a system is currently being developed at the Microsystems Center Bremen (MCB) that relieves the burden on the user by taking over the often time-consuming configuration of the surveillance system and supports him in evaluating temperature and environmental data. The "intelligent container" recognises the type of goods on loading thanks to an RFID radio label. It knows what temperature range is critical, for example, for poultry, fish or meat, and how deviations are to be assessed. Accordingly, it sounds the alarm when the goods are exposed to a wrong temperature over a certain time range and the shelf life is perceptibly reduced.

It is possible to access the condition and measurements constantly if necessary. Miniaturised radio sensors that allow wireless transmission of the measurements are currently being developed by the partner institute ITEM. The sensor nodes like the data loggers can be located anywhere in the cargo compartment. Some of the sensors are affixed to the walls of the means of conveyance as basic equipment. Other sensors may be located inside the goods. The sensors form a network in order to carry out the measuring task using as little energy as possible. Thanks to a new radio standard, the maintenance intervals of the sensors have been extended to periods of several months, even up to one year.

The work is being promoted by the German Research Community (DFG). Within the framework of the collaborative research area "autonomous cooperating logistic processes", the system is to be expanded in cooperation with other institutes of the University of Bremen to form an automated transport and route planning system and the information is to be integrated into complex logistic networks. In future the goods negotiate with several vehicles on the most favourable transport and automatically calculate an alternative route in the event of disturbances. It was shown using a model container how the various technologies can be combined practically to form an intelligent surveillance system too. As of 2007 the system is to be tried and tested in practice with three partner firms.

The RFID labels do not merely store a product code or a serial number, as in other applications. In addition, they control the entire process of temperature surveillance. When the waybill is drawn up the consignor enters additional information that states how the goods are to be monitored. At the same time it is specified who is to be notified in the event of an alarm. The subsequent processes all proceed completely automatically. Even if goods are trans-loaded several times, it is not necessary to carry out any settings on the vehicle or the sensors.

The RFID label only needs to store the Internet address under which the waybill can be called up electronically. When the goods are trans-loaded, the on-board computer of the truck or container reads the label attached to the product and calls for the waybill. The actual waybill becomes active itself by calling up the required sensors and setting them for the measuring range specified for the product. Depending on the situation, the waybill is supplemented by current data on the quality condition and passed on to the next means of conveyance or store. Software agents are used for this – programs that can send themselves to another computer.

Only the current quality condition is stored as supplementary information on the RFID label. Thus it is possible to ascertain quickly with a manual reading device whether the goods have been transported soundly. The costs of this will be only slightly higher than the cost of standard com

Fig. 2: Wireless sensor nodes can be located like data loggers on the walls of the vehicle and at any location in the goods in the compartment space.

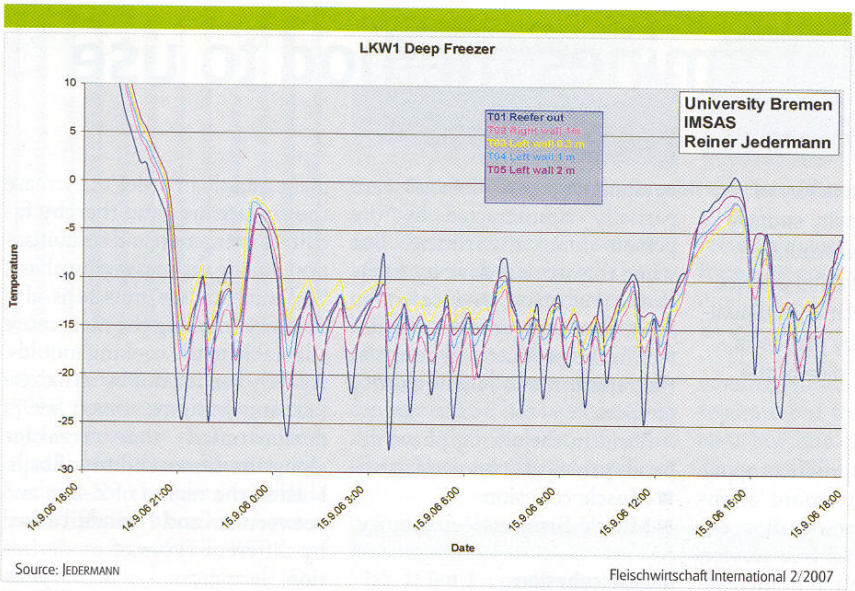

Fig. 3: Temperature curves of various measuring points are summarised graphically.

mercial tracking and tracing or telemetry systems. All that is needed on the goods themselves is a standard RFID tag costing 10 or 20 cents. The radio sensors can be purchased depending on the desired extent and precision of surveillance. As they remain in the vehicle, the pro-rated costs per trip are relatively low.

In return the owner of the goods or the forwarder receives early reports whenever a quality loss is on the horizon without having to keep their eye on hundreds of temperature graphs. If goods are spoiled in one out of ten trucks, the owner can redirect the vehicles while they are still on the road so that all customers receive at least a partial delivery. At the end of the transport it can in future be stated precisely just how many days of shelf life the temperature conditions prevailing have cost. By combining various technologies such as RFID, wireless sensor nets and software agents, it is thus possible to predict the residual shelf life per freight item at low cost. Losses in the store can be reduced by selling the goods with the shortest calculated shelf life first, and not necessarily the goods with the oldest production date.

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Dipl.-Ing. Reiner Jedermann is currently writing his doctoral thesis on the combination of various technologies for autonomous transport surveillance. Within the collaborative research area "Self-steering in logistics" he bears responsibility for developing the sensor system.