EPCIS standard used for improved traceability in the redfish value chain

Gunnlaugsson[1], Valur N., Thakur[2], Maitri. Forås[2], Eskil. Ringsberg[3], Henrik. Gran-Larsen[4], Øystein and Margeirsson[1], Sveinn.

Value Chain, Processing and Acquaculture, Matís ohf.

Vínlandsleið 12, 113 Reykjavík, Iceland.

valur@matis.is

Abstract: *The application of the EPCIS standard for food traceability purposes was tested in this project. The approach used is based on identification of states and events in food production and mapping these events to the EPCIS standard. During this pilot, one day catch of redfish was followed throughout the HB Grandi premises, from catch to packaged items ready to depart. The catch was tracked by use of RFID and EPCIS software developed in this project. The EPCIS-based traceability system performed well in this pilot and opens up new possibilities for improved internal traceability presentation to other stakeholders in the value chain.*

Keywords: Food traceability, EPCIS events, UML statecharts, redfish value chain.

INTRODUCTION

Global fish production is significant for global food trade and food security, providing more than 15% of total animal protein supplies (Ababouch, 2006). Iceland is one of the largest single fisheries countries in the world, the total catch of Icelandic fishing vessels in 2009 was 1,130 thousand tonnes (Statistical Yearbook of Iceland, 2010). Fisheries play a great role in the Icelandic economy although other industries have gained importance during the last few years. About 42 % of the country's exported goods were marine products in 2009 (Statistical Yearbook of Iceland). Icelanders export almost all their marine products as the domestic market is quite small, where countries of the European Union are the most important market for Iceland, particularly UK.

Since the application of the European Union Common Food Law 178/2002, each food business operator must be able to identify all those who delivered food, feed or ingredients that were used in their products and identify where products are going and being able to rapidly provide this information to competent authorities, in case of food scare. Similar requirements for traceability systems are present in the United States and Japan (Bechini et al, 2008). In the US, the Bioterrorism Act requires that when demanded by regulatory bodies, traceability information must be available within 24 hours (US Food and Drug Administration, 2002). Furthermore the EU introduced a new regulation to prevent, deter and eliminate the import of IUU fishery products into the Community which came into force in 2010. Regulations 1005/2008 and 1010/2009 creates new requirements on fish and fisheries products entering the EU market from third countries (non-EU). All importers need now to take steps to ensure the goods they import have been legally caught. As a minimum, the importer needs to ascertain that his export partner is able to provide the validated catch certificate for every consignment. In addition, regulation 1224/2009 includes requirements about labelling of fish products, pointing out each batch identification number, each vessels external marketing or name of production site, FAO-code for each specie and date of

[1] Matís ohf, Value Chain, Processing and Acquaculture, Rekjavík, Iceland.
[2] SINTEF, Department of Fisheries and Aquaculture, Trondheim, Norway,
[3] Lund University, Department of Design Sciences, Packaging Logistics, Lund, Sweden.
[4] TraceTracker AS, Oslo, Norway

catchment or production, as the minimum mandatory information to accomplish traceability of fish products.

Electronic traceability systems based on automatic data capture and software applications are the most effective solution for providing relevant food safety information to the food industry and consumers in a fast and effective way (Sørensen et al, 2010) Electronic data capture can be optical or radio-wave systems, for example, barcodes and RFID (Radio Frequency Identification) technology. The interest in these systems for traceability has been increasing recently. RFID tags essentially contain EPC (Electronic Product Code) generation 2 (EPCglobal, 2010). Most of the research in this field presents traceability solutions where only the product packaging is used as traceable resource units (TRU-units) and tracked through the supply chains but fail to address the internal traceability issues linked to the production events within a food facility. Regattieri et al. (2007) presented the application of an RFID system integrated with alphanumeric code to trace Parmigiano Reggiano cheese through the complete supply chain. Shanahan et al. (2009) proposed the use of RFID for the identification of individual cattle and biometric identifiers for verification of cattle identity. They also proposed a data structure for RFID tags and a middleware to convert animal identification data to the EPC data structure.

The rapidly increasing application of RFID and other types of EPCs give opportunities to increase the efficiency and accuracy to monitor and control the flow of goods and materials within and between actors in the value chain, where availability of real-time information is regarded as the main benefit (Bottani & Rizzi, 2008). EPC provides a method for unique identification of all items in a supply chain and makes it possible to register internal and external events electronically that are related to the movement of tagged items.

The standard for using RFID is based on EPCglobal standard. A technical concept that has been established and evaluated, but little tested for chain traceability in the food industry, is the Electronic Product Code Information Services (EPCIS) standard which originates from EPCGlobal. EPCIS is an EPCglobal standard designed to enable EPC-related data sharing within and across enterprises (EPCIS Standard, 2007). Automated traceability systems have existed in Nordic countries for several years (Storøy & Olsen, 2007) but EPCIS enables electronic data capture and information exchange, thus making EPCIS an applicable standard.

There are two kinds of EPCIS data, event data and master data. Event data is created in the process of carrying out business processes, and is captured through the EPCIS Capture Interface and made available for query through the EPCIS Query Interfaces. Master data is additional data that provides the necessary context for interpreting the event data. It is available for query through the EPCIS Query Control Interface. The EPCIS events cover normal logistic and stock control processes by the use of the Event classes: ObjectEvent, AggregationEvent, QuantityEvent and TransactionEvent. The basic chain traceability requirements with respect to managing and recording transactions between different business actors are directly covered by EPCIS Events. EPCIS has promising properties related to food supply chain traceability (Sørensen et al. 2010). Myhre et al. (2009) provided a conceptual solution on how EPCIS can be used to achieve both upstream and downstream traceability. The use of EPCIS and RFID is limited to tracking the product packages between stakeholders but the additional food product transformations (or transitions) that include process and quality parameters are not covered under the basic EPCIS specification (EPCIS standard, 2007).

The aim of the eTrace project was to specify, develop and evaluate an electronic traceability system where different information sources related to food safety and suitable enterprise management systems were integrated. The purpose of this system is to provide efficient traceability operations so that precise and reliable recalls can be performed in case of food scares.

METHODOLOGY

The application of the EPCIS standard for food traceability purposes was tested in this project. The approach used is based on identification of states and events in food production and mapping these events to the EPCIS standard. The generic events that take place in food production and processing are shown in Figure 1.

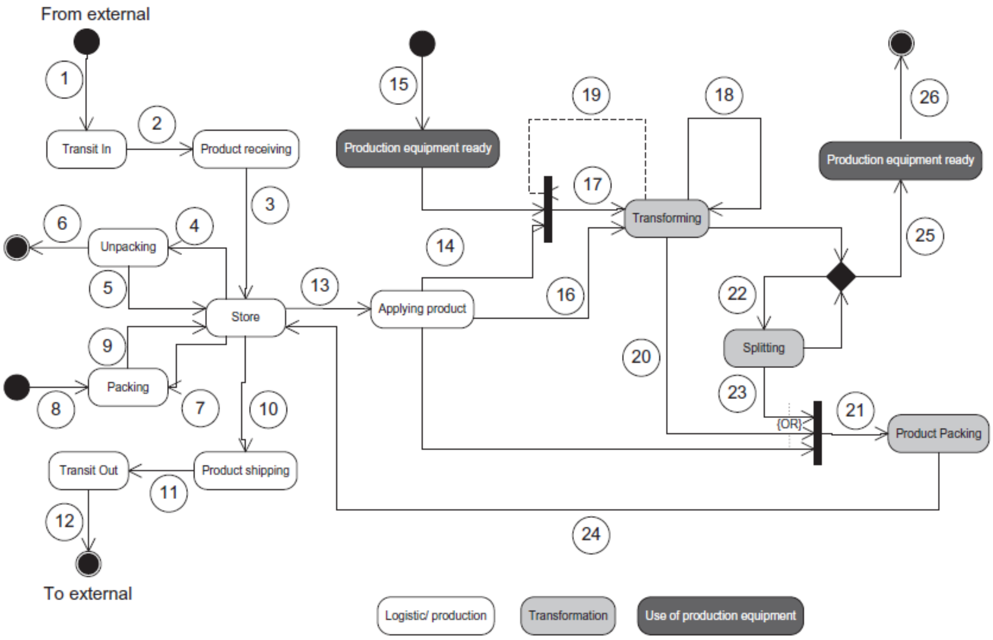

Figure 1: Generic events in food production and processing.

In the eTrace project, 13 states and 26 generic transitions that may be used to provide traceability information based on data collection at specific points in the production process are identified. The states are divided into logistics and stock management processes, use of production equipment and the important transformation processes. The transformation processes may include irreversible treatments like heating, boiling, smoking, cooling and mixing. These transformation processes are changing the state of the products involved and are important to document from a food safety point of view, to ensure quality of the product. Transformations have been identified as the factor which will affect the potential precision of a traceability system (Bollen et al, 2007). For details of this model, see Thakur et al (2011). Different information sources related to food safety and suitable enterprise management systems were also integrated to improve product safety and information sharing. This methodology was applied in a pilot, preformed in HB Grandi ground fish processing plant in Reykjavik.

A newly introduced methodology for modeling traceability information using the EPCIS framework and UML (Unified Modeling Language) statecharts was applied. This method follows the approach of defining states and transitions in food production Thakur et al, 2011. The project also analysed whether EPC Gen 2 RFID hardware could be utilized in harsh production environments. The redfish process at HB Grandi was mapped using a method designed to analyse material and information flow in food chains (process mapping) and to identify the critical points with regard to traceability and food safety. A walk-through of the factory was followed by number of meetings with key actors in the chain to prepare for the pilot.

PILOT DESCRIPTION

During the pilot, one day catch of deep sea redfish (*Sebastes mentella*) from one of the HB Grandi trawlers was followed throughout the company, from catch to packaged items ready to depart from the premises. The catch was tracked by use of RFID and EPCIS software as described in next sections.

Deep sea redfish is found west, south and east of Iceland. In the wetfish trawlers, the catch is sorted, iced in 460 litre tubs and chilled to preserve the quality of the fish. Currently, the tubs are labelled with the fishing date. The fish is then processed in HB Grandi facilities in Reykjavik where it is size sorted, headed and filleted. The fillets are then trimmed and size-graded according to the requirements of the customer. The fillets are stored in slurry ice until they are either IQF (Individually Quick Frozen) or packed fresh in EPS boxes and airlifted the same day to the European market by cargo planes. Currently, traceability systems at HB Grandi have coarser granularity than wanted, resulting among other things, in complex catch certificates. The objective of this study was to help the company towards finer granularity and suggest improved integration between systems using the EPCIS standard.

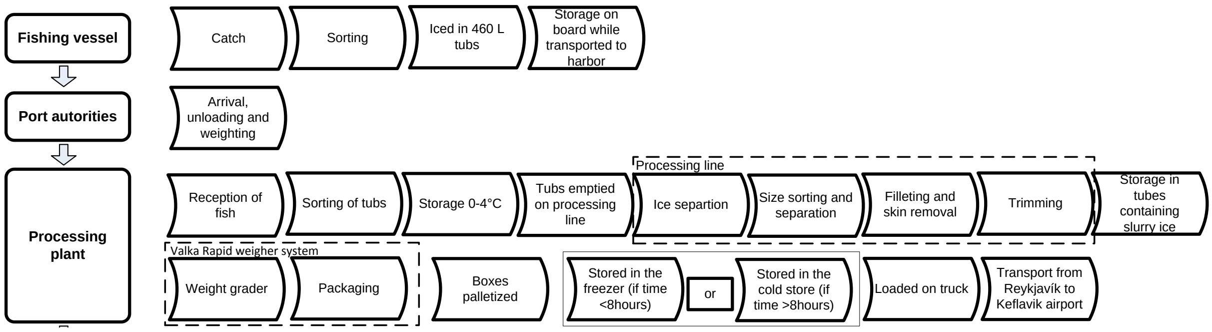

Figure 2: Diagram of the redfish value chain at HB Grandi, where the pilot was performed.

A generic model is presented in Figure 4 for the process of redfish, where all states and transitions for this process and corresponding food safety information were identified. This includes the product, process and quality information. In this pilot, the EPCIS standard was tested in an internal traceability system. Internal traceability is defined by Moe (1998) as the ability to trace the product and process information within a company, while chain traceability is defined as the ability to trace the product and process information through all of the links in a supply chain. The product ID, process and quality data is recorded corresponding to each state and can be linked to the consequent transition and thus carried to the next state (Thakur et al, 2011).

The pilot follows in the footsteps of similar test pilot preformed in Sweden in May 2010, where cod was tracked from the fishing boat to the processing plant, wholesaler and retailer, using EPCIS software. The main goal of the pilot to was to determine whether EPC Gen 2 RFID hardware and EPCIS-compliant software could be utilized to track fish.

PILOT IMPLEMENTATION

After mapping the flow of material and information in the redfish process at HB Grandi, and a walk-through of the factory and discussions with key actors, it was concluded that: the company wants to improve the production efficiency by automatic counting and to have better overview of inventory status in real time. Also to improve automatic documentation, in relation to improved information sharing with customers, i.e. have single point access for customers to access traceability and other information such as food safety and quality. Table 1 lists the existing problems at HB Grandi and the projects suggestions for improvement.

Existing problem	**How to improve:**
Coarser granularity than wanted, resulted in complex catch certificates	1. Tubs need their own identifiers 2a. Each new boat starts with empty production tubs 2b. Keep track of mixed production tubs 3. Documentation of mixed fillet EPS boxes
A lot of manual counting (5 times)	1. Serialized numbers on labels on production boxes 2. Read labels when boxes are added or removed from pallets 3. Pallet number should be connected to serial numbers
No easy access for traceability information	1. All different internal systems have to share information to traceability system by using the EPCIS standard

Table 1: Existing problems and suggested improvements.

The granularity is in many ways quite complicated in a processing plant like HB Grandi. Especially, the traceability of by-products that accumulate from processing of fish from number of boats over a period of time, resulting in complex catch certificates, for certain products. Furthermore, when the company's boats are not fulfilling the plant need for raw material, fish is bought from the fish market, which arrives usually unlabelled in same kind of tubs used by HB Grandi boats. While tubs are not embedded with RFID tags, the tracking of external tubs in the plant can be a complex task.

Currently, during packaging, there is a lot of manual counting for empty EPS boxes, full boxes, full boxes on a pallet, boxes on pallet before shipping and again when Cargo Company accepts the pallets. There are some movements of boxes after they are stacked on pallets, because of quality inspections. To prevent all this labour intensive work, the pilot group suggested to label EPS boxes with serialised numbers, but decided on labelling them with RFID (SGTIN). The pallets were also labelled with RFID tags.

One of the concerns of management team at HB Grandi was that there is no single access for traceability information for managers and other actors in the value chain. The solution would be that all different internal systems would add and access information (product, process and quality linked to Traceable Units) from the EPCIS based traceability system. This solution to automate the data gathering was outside the scope of this project, so all information capture into a single EPCIS system from relevant HB Grandi internal systems was performed manually.

Electronic identification (RFID) tags were attached to fish tubs at HB Grandi, both tubs coming from ships and internal tubs used inside the premises during processing of the fish. The RFID tags were attached to the tubs "ear" with "luggage labels", so there was little risk of losing labels, in the wet processing conditions. RFID based Temperature loggers where placed in 10 locations, around and inside the selected tubes and at several locations inside the production premises. The temperature was recorded at 10 minute intervals. The temperature loggers were read using the same handheld RFID scanners, and the information was linked to the corresponding traceable units (fish tubs or EPS boxes).

Figure 3: Redfish tubs tagged with "luggage labels" with attached RFID tags.

HB Grandi wetfish trawlers label each tub with coloured slip which reveals what day of the fishing trip this tub is from. The label number 3 in Figure 3 is equivalent to the catch from day three of the fishing trip. Previously programmed hand scanners from Nordic (ID PL3000) where used to read RFID tags, supplied by CONFIDEX and the data was uploaded wirelessly with Wi-Fi connection, were web based EPCIS system from TraceTracker received the data.

The EPC is a universal identifier for any physical object. It is used in information systems that need to track or otherwise refer to physical objects (EPC Tag Data Standard, 2007). There are nine GS1 Identification Keys that support the identification of items, services, locations, logistic units, returnable containers, etc. and the relevant keys in this pilot are listed in table 2. In this standard, GLN stands as the name implies for “Global Location Number”, the GLN is the GS1 identification key for locations. The 13 digits GLN number can be used to identify physical locations and legal entities where is a need to retrieve pre-defined information to improve the efficiency of communication with the supply-chain. In this pilot, the vessel was assigned the GLN 5699000023093, while HB Grandi processing facilities were assigned GLN 5699000023024.

The GRAI (Global Returnable Asset Identifier) is used to assign a unique identity to a specific returnable asset, such as a reusable shipping container or a pallet skid, in this pilot the GRAI tags were used for fish tubs. The SGTIN (Serialized Global Trade Item Number) is used to assign a unique identity to an instance of a trade item, such as a specific instance of a product or stock-keeping unit. In this pilot SGTIN tags were used for EPS boxes and pallets, but also for internal processing tubs.

EPC Scheme	General syntax:	In pilot	Units tagged in pilot.
GLN	urn:epc:id:sgln:*CompanyPrefix.LocationReference*	urn:epc:id:sgln:5699000023.093	Boat, plant.
GRAI	urn:epc:id:grai:CompanyPrefix.AssetType.SerialNumber	urn:epc:id:grai:5699000023.77.1 (and up to 100)	Fish tubs
SGTIN	urn:epc:id:sgtin:CompanyPrefix.ItemReference.SerialNumber	urn:epc:id:sgtin:5699000023.333.1 and up to 500)	EPS boxes, pallets, internal tubs.

Table 2. The EPC URI (Uniform Resource Identifier) used in the pilot test.

The EPC URI is the preferred way within an information system to denote a specific physical object. The EPC Tag URI is a URI string that denotes a specific EPC together with specific settings for the control information found in the EPC memory bank (EPC Tag Data Standard 2010).

An EPCIS repository enables diverse organization to share information about EPC-tagged products. The EPCIS repository (ER) used in the eTrace project was supplied by TraceTracker. The ER stores and manages standardized “event” data related to individual items; “what, why, when and where” of that item. When the tubs of fish were scanned and information uploaded from the RFID reader, the ER records the unique identification of the tub, its location and then other information such as relevant processing step and time. When the same tub was scanned multiple times at different steps in the process, or divided into smaller cases, production and transport history for the fish from the specific tub was created.

Modelling of bizLocation and readPoint

The activity in this pilot did not cover multiple companies, because HB Grandi runs both the fishing vessels and processing plant, therefore, to limit the complexity of the pilot everything was modelled in a single EPCIS system. When a corresponding solution would be implemented, each company should have their own EPCIS, to control the visibility of their own data and to perform product trace and track activities.

Key to the EPCIS concept is the modelling of business activity via so called bizLocation and readPoint, which refer to physical locations in the companies. As was introduced in Figure 1, the eTrace project has established its own concept for modelling the flow through a company (Sørensen et al, submitted for publication). Figure 4 shows the relationship between the traceability model and the underlying eTrace event model. As the figure indicates, the tubs were read when accepted into HB Grandi facilities [17], when they entered production (filleting) [9], when internal tubs where full and removed to storage [11], when tubs left storage for packaging [12], and EPS boxes [16] on a pallet [17].

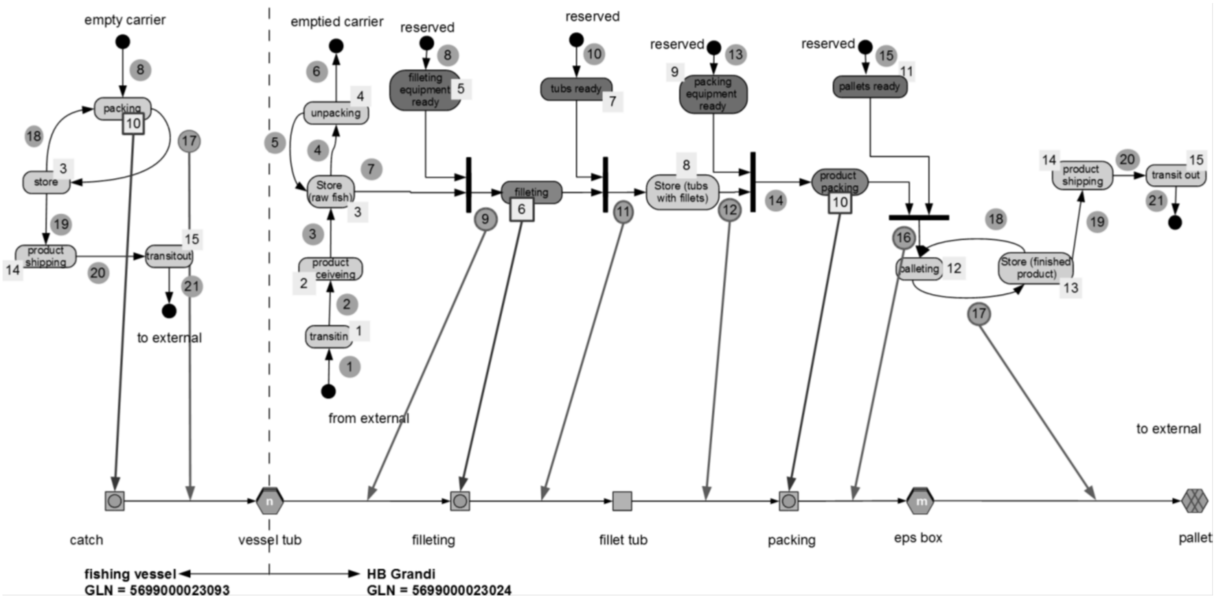

Figure 4: The graphic shows the relationship between the traceability model for HB Grandi redfish catching and processing, and the underlying eTrace event model. Pointing circles refer to readPoint and pointing squares refer to bizLocation (Courtesy of TraceTracker).

In order to ensure traceability, it was crucial that transformations like splitting of catch, mixing vessel tubs into filleting, etc. refer to traceable entities that are created (eventTime) before the transformation takes place. Otherwise the expected relationships might not be created, as chronologic development is broken. Note that catch and vessel tubs can be populated with attributes at later stages when they are available from other system like vessel logbooks and other internal systems such as quality control, etc.

RESULTS AND DISCUSSION

The methodology using UML statechart, helped with modeling the HB Grandi production from the usual product traceability view towards the EPCIS event traceability view. Figure 5 shows one fishing day which resulted in 38 vessel tubs of iced redfish, modeled as one catch to simplify internal traceability. These tubs went into filleting where fillets were placed in 12 internal tubs containing slurry ice. In this pilot we followed 7 of those tubs into packaging were the fillets ended up in 329 EPS boxes of packed fish. These boxes were stacked on 5 pallets. Every item shown in this picture contains extensive information connected to an RFID tag.

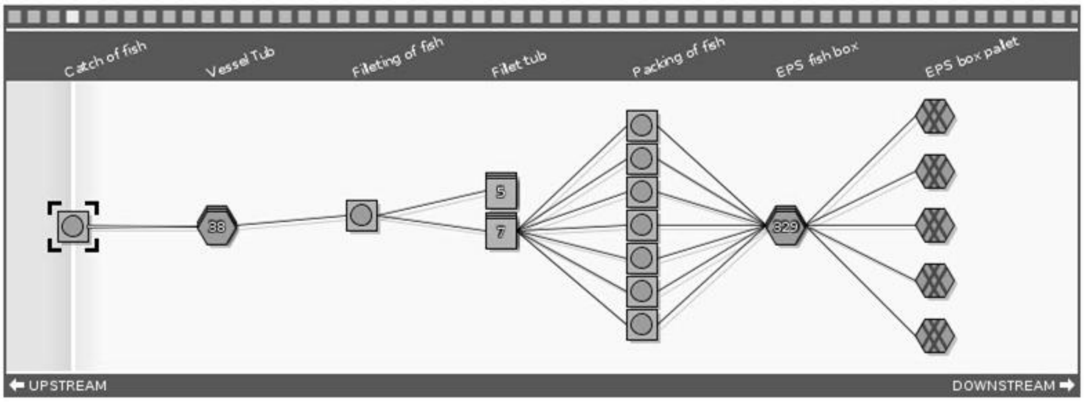

Figure 5: Diagram of redfish processing at HB Grandi from EPCIS repository (ER).

This system and the EPCIS standard made it possible to associate other relevant information, like temperature with the tagged item or event in the process itself. EPCIS standard specifies only a standard data sharing interface between applications that capture EPC-related data and those that need access to it. However, it does not specify how the service operations or databases themselves should be implemented (EPCIS Standard, 2007), moreover, how to present the captured data into common view: show history of the EPC tagged items through the value chain or how to utilise the information to show inventory status. TraceTracker respiratory was able to make standardized but in a way cryptic data accessible and user-friendly for managers, and other stakeholders in this chain by providing a simple diagrams where the software was able to connect events and thus identifiers together. It is necessity to have this linkage between events and identifiers to present the RFID history through the value chain in a figurative format.

It is valuable to have for example catch information in line with other event information and transformations, thus compiling much more information into a single view. This makes the repository user friendly and while the actual events will of course be preferred by other applications that need to make their own sense of captured data.

This RFID EPCIS traceability system enables finer granularity than is currently available in HB Grandi traceability system as presented in table 1. In current traceability systems in use in fishing sector, companies are usually able to trace products down to the ship and possible the fishing day, but the proposed system could trace products down to specific fishing haul, and therefore link haul information to specific products.

In the first stage of the pilot where 38 tubs were labelled with GRAI RFID, 4 tags did not work and were replaced. No such problems were detected with the SGTIN tags, which were used for internal tubs and all the EPS boxes. No tags lost its readability during the pilot, despite the cold and wet conditions.

Few problems came up with hardware. There were problems reading temperature sensors with Nordic hand scanners and sometimes the hand scanners had problems sending data wirelessly, due to software coding. This was not a big problem and could easily be solved by connecting scanners to computer to access the data manually. In this pilot, the hand scanners were used and therefore lot of manual work had to be done, like choosing right event before reading tags and to give the file right name to ensure chronological order in the process, and therefore secure traceability through the process.

Temperature was one of the safety and quality parameters chosen to be integrated into the EPCIS system and linked to the EPC tagged items or events. The temperature profiles were linked to the corresponding traceable units (fish tubs or EPS boxes) in the repository and information was stored and available to be exchanged. Being able to connect temperature log to traceable units or events on the production floor can be used to show compliance with a critical limit, for other stakeholders to access.

CONCLUSIONS AND FURTHER DEVELOPMENTS

One of the main aims of this project is to develop and evaluate an electronic traceability system based on a general EPCIS infrastructure in production, processing and transportation of food, to exploit the standard as the basic traceability infrastructure for foods and to enable automatic data capture of information related to the tagged items, from different sources.

In general, EPCIS-based traceability systems performed well in this pilot and opens up new possibilities for improved internal traceability presentation to other stakeholders in the value chain. The installation of automatic reading stations in processing plants instead of hand scanners like the ones used in this pilot may provide a faster and more efficient way of information capture and exchange, and reduce manpower needed. HB Grandi saw potential in this system. With increased information flow through the value chain and a gateway for customers to access products information, like traceability information, opportunities for better processing control of products and even greater efficiency opens; this system also makes way for increased automation in the processing of fish.

Integration of an EPCIS infrastructure with relevant systems in use provides a way to integrate otherwise disconnected information into a common view. But as things stand today, there are usually many systems used in the value chain of fish, with limited integration. The concept is that actors control the visibility of their standardised data in their EPCIS system.

It is clear that the requirements for traceability of food products are always increasing. The use of RFID and automatic information gathering seems to be a good method to ensure traceability. Presumably the Icelandic fishing companies and processors will take a drastic step towards finer granular traceability systems, when fishing tubs will include electronic permanent RFID. Today, most of the fishing tubs used by Icelandic fishing companies are rented and the owners are looking for a solution regarding RFID inclusion, in order to enhance traceability of tubs. Subsequent developments will be installation of automatic reading stations for RFID tags.

Integration of information from different sources can provide more reliable and relevant information to actors and consumers. A good traceability system also provides opportunities to inform consumers further about the product, i.e. by demonstrating its carbon footprint or food miles, as well as being able to show such factors as how the product was made and that it was caught from a sustainable fish stock. The Swedish pilot in this project resulted in increased fish sales of cod from the Baltic Sea, due to increased information available to the final consumer (Thakur et al, 2011). Other factors may also be important to consumers, such as whether the product is healthy, whether its contents are known to cause allergic reactions, is packaging renewable, and whether the product is safe and legal. By being able to answer these questions, the consumer confidence in the product can be increased. Increased regulatory requirements, suitable standards in connection with traceability systems, better informed consumers and rapid development of mobile phones is making fast improvements in product traceability and relevant information presentation.

REFERENCES

Ababouch, L. (2006). “Assuring fish safety and quality in international fish trade”, *Marine Pollution Bulletin*, 53: 561–568.

Bechini, A., Cimino, M.G.C.A., Marcelloni, F., Tomasi, A. (2008). “Patterns and technologies for enabling supply chain traceability through collaborative e-business”, *Information and Software Technology* 50: 342–359.

Bollen, A. F., Ridena, C. P., Cox, N. R. (2007). “Agricultural supply system traceability, Part 1: Role of packing procedures and effects of fruit mixing”. *Biosystems Engineering*, 98: 391–400.

Bottani, E., and Rizzi, A. (2008). “Economical assessment of the impact of RFID technology and EPC system on the fast-moving consumer goods supply chain”, *International Journal of Production Economics,* 112: 548-569,

EPCglobal, (2010). The EPCglobal Architecture Framework. EPCglobal Final Version 1.4. <http://www.gs1.org/>.

EPCIS Standard, (2007). EPC Information Services Version 1.0.1 Specification. <http://www.gs1.org/gsmp/kc/epcglobal/epcis/epcis_1_0_1-standard-20070921.pdf>

EPC Tag Data Standard (2010). Version 1.5. <http://www.gs1.org/sites/default/files/docs/tds/tds_1_5-standard-20100818.pdf>

Lovejoy, H. (2003). Interview cited in: Iles, Alaistair (2006). “Making the seafood industry more sustainable. *Journal of Cleaner Production*, 15: 577-589

MOE, T. (1998). “Perspectives on traceability in food manufacture”. *Trends in Food Science & Technology*, 9: 211-214.

Myhre, B., Netland, T.H., Vevle, G. (2009). “The footprint of food - a suggested traceability solution based on EPCIS”. In the 5th European Workshop on RFID Systems and Technologies (RFID SysTech 2009), Bremen, Germany.

Regattieri, A., Gamberi, M., Manzini, R. (2007). “Traceability of food products: general framework and experimental evidence”. *Journal of Food Engineering,* 81: 347– 356.

Shanahan, C., Kernan, B., Ayalew, G., McDonnell, K., Butler, F., Ward, S. (2009). “A framework for beef traceability from farm to slaughter using global standards: an Irish perspective”. *Computers and Electronics in Agriculture*, 66 (1): 62–69.

Sørensen, C., Vevle, G., Gunnlaugsson, V.N., Bjørnson, F.O., Forås, E., Margeirsson, S., Thakur, M., (2010). “EPCIS as an infrastructure for electronic traceability”. *Computers in Industry*, submitted for publication.

Storøy, J., Olsen, P., (2007). Norwegian, Nordic and European Traceability Research Projects. Presented at the Tokyo International Forum, October.

Statistical Yearbook of Iceland, 2010. Vol 103. <http://www.statice.is/pages/2532>

Thakur, M., Sørensen, C., Bjørnson, F.O., Forås, E., Hurburgh, C.R. (2011). “Managing food traceability information using EPCIS framework”, *Journal of Food Engineering*, 103(4):417-433.

US Food and Drug Administration, (2002). “The Bioterrorism Act of 2002”.

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