Product tracing in meat industry

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Abstract

In the beginning of 21st century the matter of food-safety plays an accentuated role in the food industry. Important issues in this topic are the risk of bioterrorism, impurities in the food-chain and the ascendant customer needs. The solutions of these problems are the introduction of modern quality assurance systems, traceability and identification of products.
Nowadays there are several fine systems to solve the problem, but these systems are separated, and unable to cover the complete food supply chain. They have different data carrier; data capture; information management systems; and also question the interchange of data. I review in this paper the possibilities of harmonization of these systems with new information technology solutions (modern item attendant data carriers, data storage technologies, data and information communication systems) and I discuss the potential advantages and incidental costs.

Key words

Food safety, traceability, identification, quality assurance, ERP system

Introduction

By January 1, 2005, traceability systems are mandatory for all businesses operating within European Union food supply chains, based upon a one-up-one down principle. This means that a business must be able to identify all suppliers and the food, feed or food ingredients they supply to the business. A similar requirement is being introduced within the United States, over the period June 2004 to June 2005, as a result of a proposal contained within the Bioterrorism Act.
In the food chain, traceability means the ability to trace and follow a food, feed, food producing animal or substance through all stages of production and distribution. Stages of production and distribution means any stage including import, from and including the primary production of food, up to and including its sale or supply to the final consumer and, where relevant to food safety, the production, manufacture and distribution of feed.[1]
In primary production, traceability has been defined as the ability to trace the history of the product through the supply chain to or from the place and time of production, including the identification of the inputs used and production operations undertaken (British Standards Institute PAS 85:2000). Legislation has been recently introduced to ensure livestock identification and the tracking of livestock movements. Many of the farm assurance schemes require some level of traceability to be in place within primary production.

[1] Definitions at Article 3, EU General Food Law Regulation.

Market incentives give food suppliers three primary motives for establishing traceability:

1. Improve supply-side management;
2. Differentiate and market foods with subtle or undetectable quality attributes;
3. Facilitate traceback for food safety and quality.

Traceability in the chain

The traceability of products and components has received critical attention over the past few years. The requirements from the individual segments of the food industry may vary. They do have one thing in common, however: they share the need for seamless documentation of the path a product takes from producer, to supplier, up to the consumer. Benefits of traceability to the company:

- Seamless traceability in compliance with Commission Regulation (EC) No 178/2002
- Support for future requirements with regard to GMOs
  (GMO: Genetically modified organism)
- Safeguarded quality with paperless quality management
- Limited risk as it is well documented which lots went to which customer (enabling silent recalls)
- Controllable quality at receiving
  (suppliers are integrated into the value-added chain)
- Transparent batch management for more process and product safety
- Integrated visualization without the need for additional staffing throughout materials resource planning from goods receiving, through inventory, production, packaging, picking, up to shipping
- Fulfillment of company duty
- Transparency of the business-level goods flow as well as internal logistics and inventory control
- Atomization of the process steps in sub-processes with lot number logic and batch tracking and tracing
- Compliance with industry standards, quality and safety norms
- Flexible towards increasing demands of process safety, especially in the realm of food production, throughout all levels of manufacturing and distribution
- Economic and strategic necessity to limit risk in case of incidents (silent recalls)
- Increased consumer trust
- Transparent supplier and buyer tracking and tracing for each shipment at mouse-click speed

Main benefits to the costumers:

- Protect food safety by effective product recall, in the case of an emergency
- Enable avoidance of specific foods and food ingredients easily, whether because of allergenicity, food intolerance or lifestyle choice
- Enable real choice to be exercised between food produced in different ways

Traceability systems are of interest to government as part of systems which:

- Protect public health through the withdrawal of food product from sale
- Help to prevent fraud where analysis cannot be used for authenticity
- Control zoonotic disease e.g. tuberculosis, salmonellosis

- Enable control with regard to human and animal health in
- Control epizootic and enzootic livestock diseases through the rapid identification of disease sources and dangerous contacts.
- Monitor /control livestock numbers for subsidy claims

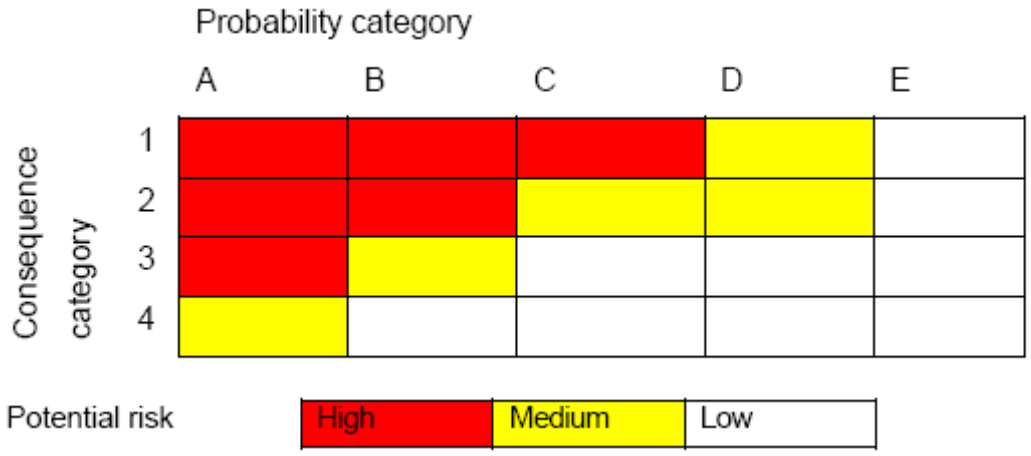

Figure.1: Example of a risk matrix to guide decisions relating to the implementation of Traceability (by Food Standards Association)

Consequence category	***Probability category***
1. *Customer fatality* Lose a major customer Product recall via press Malicious contamination/ extortion	**A** *Possibility of repeated incidents*
2 *Lose a minor customer* Unsatisfactory customer audit External audit non-compliance Major contamination Customer ill-health Infestation of product/premises	**B** *Possibility of repeated incidents*
3 *Multiple retail complaints* Many industrial complaints Local authority investigation Minor product contamination Low hygiene audit score	**C** *Possibility of isolated incidents*
4 *Individual retail complaint* Product out of specification Non-compliance	**D** *Not likely to occur*
	E *Practically impossible*

Traceability in ERP systems

Only an integrated ERP system can meet efficiently with these objectives. The integration into business processes guarantees:

- Online capture of data right at the source without the need for additional resources
- Online processing of data, eliminating the need for isolated, stand-alone solutions
- Seamless proof of origin throughout and beyond the industry-specific ERP software

An ERP system in the food industry (like CSB-System) is specialized in transparent proof of origin and safeguarded traceability for all segments of the food industry and in accordance with all prevailing international standards (including Reg. (EC) No 178/2002, 1830/2003, EUREP-GAP, IFS, HACCP, ISO9000, BRC, GLP, GMP, GHP). On the basis of the cross-industry standard EANCOM we have developed a solution that allows for flexible interchange of origin data between companies and organizations. With the help of this data interchange mechanism, user companies can guarantee seamless farm-to-fork proof of origin for each and every batch that has entered the production process.

Users profit from the following essential benefits:

- Maximized growth potential through completely integrated information processing
- Variable weight items and equalized units
- Flexible planning of materials and capacity resources
- Reduction of inventory costs through paperless order processing, picking, and delivery
- Transparent quality management (paperless HACCP) and seamless traceability
- Solid integration of numerous locations via Internet and Intranet

Solutions is Hungary

The product quality of the Hungarian meet industry meets the high level international standards. For the very reason, if only because the Hungarian meet industry is an export oriented sector. However, the application of computers and information systems still haven't got enough emphasis in the food sector, although the majority of companies use ERP systems.

Figure. 2: A product tracking system that gives the opportunity of collecting information of meat products. This way consumers are provided with exact information on the origin and quality of the product bought (4D Kontroll was installed on 2nd november 2005 at a Hungarian poultry processor named Tapiocsir Kft.)

The IT budget of the Hungarian companies is smaller than in the well developed countries. They spend 0.49% of their return from sales on IT operation and development. We find different rates among Hungarian owners and foreign owners. The Hungarians spend less (0.36%), but foreigners spend twice this amount (0.61) on informatics.

Modern traceability and communication between ERP systems

One of the answers of the modern traceability and communication between ERP systems is the realization of EDI or XML. Electronic Data Interchange, the transfer of data between different companies using networks, such as VANs or the Internet. As more and more companies get connected to the Internet, EDI and XML are becoming increasingly important as an easy mechanism for companies to buy, sell, and trade information.
With EDI, paper transactions can be replaced with electronic transmissions, thus time is saved, and the potential for error is minimized. Data can be exchanged at any time. Related business expenses, such as postage, printing, phone calls, and handling, can also be significantly reduced. EDI can aid in the support of manufacturing efforts, such as Just-in-Time and Third Party Warehousing, and financial efforts, such as Electronic Payments.
EDI translation and communication software is available for most computers, whether PCs, minicomputers or mainframes. Basically all EDI software packages do the same thing. Translation software translates business documents into a standardized format that complies with ANSI X12 or EDIFACT, and communication software sends and receives documents.

Technologies of identification

The identification of food items is based essentially upon two categories of identifier:

- Primary identification (based on the use of biological markers and feature extraction based upon anatomical, physiological, biochemical or molecular, including DNA, methods of identification).
- Secondary or data carrier-based identification techniques in which a number or alphanumeric string is used for identification purposes and may be accompanied by other data or information for traceability or process support purposes.

A secondary identifier may also be linked to a primary identifier, particularly where the primary identifier is held as a data template in a data carrier or database. Meta-data may be used to distinguish data types and assist in automatic identification and handling of source data concerning the item or items being processed or handled.

Data Carrier and Capture Capabilities

In recognising the need for flexibility in defining traceability systems to satisfy different supply chain needs it is necessary to identify a range of technologies and associated products to meet these needs. The technologies may be conveniently grouped as follows:

- Item-attendant data carrier technologies – including linear bar codes, two dimensional (multi-row bar code and matrix codes) and composite codes, contact and non-contact magnetic data carriers, contact memory and radio frequency identification (RFID) data carriers.
- Item-attendant feature identification technologies – including static and dynamic feature-based systems, identification based upon physical and chemical properties, including DNA profiling.

- Item-attendant location and locating technologies –including RFID and GPS locating technologies.
- Item-attendant communication technologies – including wireless local area network (WLAN) technologies.
- Item-attendant sensory – exploiting at the item level developments in sensory and telemetry technologies.
- Item-attendant security technologies – embracing a range of technologies for fraud prevention and security at packaging level.
- Data storage and communications technologies – including large volume relational data base technologies and both local and wide area communication technologies.
- Software support technologies – embracing the wide range of information management systems software and the needs for interfacing item-attendant technologies to appropriate management systems.

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