

Chapter 95

New Perspectives on Adoption of RFID Technology for Agrifood Traceability

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ABSTRACT

Radio Frequency Identification (RFID) is an ubiquitous technology which may provide important improvements for the agri-food in different fields, e.g., supply chain management and alimentary security. As a consequence of local laws in many countries, which lay down that the traceability of food products is mandatory, industrial and academic research entities have been conducting studies on traceability management based on non-traditional technologies. A relevant outcome from these studies states that RFID systems seem to help reducing processing time and human-related errors in traceability operations due to their automation characteristics; nevertheless, engineering and economical constraints slow down their full adoption. The main purpose of this chapter is to analyze, describe and compare the most significant and novel RFID-based traceability systems in the agri-food sector while providing an exhaustive survey of benefits, drawbacks and new perspectives for their adoption.

INTRODUCTION

Food traceability is a ticklish factor in the agricultural industry nowadays due, mainly, to the advantages that an effective system yields, such as a higher customer security, increased consumer confidence and commodity withdrawal control.

Regulations in many countries impose traceability to be mandatory for the agri-food sector. That is the case in the European Union where the food traceability is strictly regulated and businesses in food sector shall be able to identify the origin and the destination of each food product, and the food shall be adequately labeled (The European Parliament And The Council, 2002).

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Traceability management (TM) in the agri-food sector is often carried out by traditional systems that employ labels or barcodes for the commodity identification. Nevertheless, the new requirements of accuracy and efficiency have promoted the exploration of optimized solutions for TM. One of the most promising alternatives to traditional solutions is portrayed by the Radio Frequency Identification (RFID) technology.

RFID transponders used for TM are, commonly, passive ones, i.e., they do not have battery and acquire their power from the external RF communication. Passive RFID tags have such a modest cost which, compared to active transponders, makes it almost disposable. Another important architectural characteristic in RFIDs is related to its memory which should be large enough to hold the tag identification number. The well-known EPC96 standard utilizes identification numbers of 96 bits, however a tag may have several kilobits of capacity. Indeed, several applications require a large user memory in order to record information about the good or to add redundancy to the system by backing up database information inside the tag. RFID applications for Supply Chain Management (SCM) have been more numerous than for TM, but the trend is changing due to the development of many research projects to evaluate whether RFID technology can be properly exploited for TM in the agri-food sector.

While TM aims at detecting and recording the path and the history of items (ISO 9001:2000), SCM aims at improving the production chain. Managing the traceability of items may be among the activities of SCM; however, within the context of SCM, traceability is only an optional intermediate step towards the ultimate goal of improving supply chain processes. There are issues that characterize agri-food sector and that affect both TM and SCM: (a) the management of perishable products requires special solutions like controlled storages in refrigerating rooms; (b) The Out-of-Shelves problem (Corsten & Gruen, 2004) is a threat for all kind of goods and, in particular, for

perishable products (Kranendonk & Rackebrandt, 2002), producing direct losses to retailers and manufacturers, such as lost sale, brand switch, and store switch. As a result, many research projects provide data about SCM and Automatic Identification and Data Capture (AIDC) that concern activities comprised by TM.

New traceability systems based on RFID technology are starting to be effectively employed; nevertheless, a large part of agri-food enterprises, namely, small and medium companies are wayward to invest in novel technologies. Hence, it is evident the importance of studies that investigate the properties of the RFID technology application. The aim of this chapter is to provide readers with a clear overview of agri-food traceability characteristics and how RFID technology can be applied to traceability activities. The results obtained by state-of-the-art research projects will be compared in order to identify benefits and drawbacks of the exploitation of RFID technology for agri-food traceability.

The remaining of the chapter is organized as follows. Section 2 will introduce the traceability management concept. The features of traceability and its relations with SCM will be detailed and the characteristics of traceability systems employed in agri-food sector will be shown. Section 3 will present a state-of-the-art overview of RFID traceability applications. Results from studies about different topics, which are related to RFID applications and can provide important information about RFID perspectives for traceability applications, will be shown. Section 4 will present a set of benefits and drawbacks for the employment of RFID technology for traceability management in agri-food sector. Finally, Section 5 will present achieved targets and open issues for the near future.

AGRI-FOOD TRACEABILITY

RFID technology is used for different kind of applications. This section aims at providing the

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