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FOOD QUALITY AND SAFETY MANAGEMENT

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ABSTRACT. Ensuring quality and safety of food are nowadays the most important goals set by companies who produce and distribute it. As a result, regulations have been introduced in the European Union countries concerning the production and distribution of food as well as norms which oblige companies to implement and execute several quality management systems..

Key words: food quality, food safety, GHP, GMP, HACCP system, ISO 22000, BRC, IFS.

INTRODUCTION

The strive to ensure the safety of food has particularly intensified in the recent years. Its effect is not only technical development in the area of food production, but most importantly working out a new, systematic approach to the issue. Quality and health safety of food have become an aim whose achieving requires the commitment and high awareness of all the entities which belong to the food production chain. Simultaneously, it is necessary to determine clear rules and guidelines which set certain standards in that area. Its proper functioning should contribute to creating a consumer-friendly food product market and, in further perspective, to the improvement of the whole population's health level.

FOOD QUALITY AND SAFETY - TERMS/DEFINITIONS

In the contemporary world, the issue of food quality and safety is the object of the European Union countries', including Poland, special care.

Quality is generally considered one of the most important factors in a product's market success, particularly its long-term well-being. As Baryłko-Pikielna [1975, 1983, 1994] and Toruński [2012] show, this notion is difficult to define because of its complexity. As a result, it is not unambiguously understood, even among experts in the field [Baryłko-Pikielna et al. 1996, Toruński 2012]. The concept of quality has already found its reflection in the deliberations of philosophers. For Plato it was a certain degree of perfection. For another philosopher - Aristotle it was quality by virtue of which things are defined in a certain way. Cicero talked about it as a property of an object, while Lao Tsu was convinced that quality is something that can be constantly improved. In the early years of food science development quality used to be defined as "the lack of defects". In agriculture and quality control it is still understood in this manner [Szymonik 2004, Ożarek 2004]. For consumers, quality assessment is mainly based on visual experience, which is the basis of the purchase decision [Słowiński 2000]. It is dependent on the person, time, place, circumstances and consumer expectations [Moskowitz 1995, Oude Ophius, van Trijp

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1995]. The ISO 9000:2000 norm defines it as the ability of a product, process or system to fulfil the requirements of the customer and all the involved parties. Deming [1986], considered the creator of the modern approach to quality, defines it as the degree of homogeneity and reliability of a product at the lowest possible cost and the highest possible conformity with the market's requirements. According to Juran [1962], quality is the degree to which a certain product fulfils the needs of a given buyer (market quality), or the degree of a product's conformity with a model, template or requirements (conformity quality). Feigenbaum [1992] sees quality as an entire characteristic of a product or service (technical, execution and service level), through which it realises the consumer's expectations. Crosby, on the other hand, defines quality as conformity with the customer's requirements [Zalewski 2002, Horbaczewski 2006, Stoma 2012].

Product quality needs to be stable. A producer should aim at fulfilling basic consumer expectations concerning food, particularly ensuring its wholesomeness and safety, comfort of preparation and full sensory attractiveness immediately after production as well as during post-production storage. The ability to predict the period during which quality remains acceptable is a matter of great concern. Most current solutions are based on the assumption that changes in quality undergo a zero degree reaction and that the change to time ratio is constant in constant temperature. This approach is useful and in selected cases allows for an accurate evaluation of quality persistence. The parameters which undergo changes during storage should be examined in the course of storage tests [Baryłko - Pikielna 1995, Baryłko - Pikielna et al. 1996, Baryłko - Pikielna and Kostyra 2004]. An important element providing safe quality of food is the control of chemical remains and evaluation of the state of microbiological contamination. It is related to the potential occurrence of pathogenic bacteria, especially Salmonella, Listeria, Camphylobacter or Escherichia coli [Piskuła et al. 2011]. Thus, to provide the safety of food, microbiological criteria have been established for food in all European Union countries. They have been published in Commission Regulation (EC) no. 2073/2005 from November 15th 2005. This regulation has introduced two kinds of microbiological criteria: the food safety criterion and the hygiene criterion. Until today, the European Commission has established numerous changes in the Commission Regulation (EC) no. 2072/2005 and implemented the following regulations: 1441/2007, 365/2010, 1086/2011, 209/2013 [Ścieżyńska 2013].

Food safety is an integral part of food security [Kwasek 2013]. According to FAO food security is a situation in which all the people, all the time have constant physical, social and economical access to a sufficient amount of safe and nutritious food, which fulfils their nutritional needs and food preferences to live an active and healthy lifestyle (FAO 2009). For the consumer, however, the most important characteristic of food quality is its safety [Kwasek 2013]. Thus, the issue of safety and quality of food products has been brought up for a long time on a large scale and its significance does not raise the slightest doubt. The huge importance of these aspects in the production and distribution of food is backed by broad law regulations in the area as well as by a constant strive to improve food production and distribution processes. Several organs are responsible for food safety, particularly the European Food Safety Authority. Research activity is also an important element of food safety policy. Because community law is superior to European Union member countries' local law, national regulations have to be adjusted to current European Union acts. It is important to remind at this point that European Union regulations apply in every member country. They are taken into account in national legislation by pointing them out without citing their content, while directives are transposed into national acts of law. In Poland, the issues concerning food safety are regulated by the act from August 25th 2006 on food safety and food security [Dz.U from 2006, No. 171, pos. 1225, incl. further changes]. The act has a frame character, it comprehensively regulates conditions necessary to provide food safety on all stages of the food production chain "from the field to the table". According to this act: food safety is the entirety of conditions which need fulfilment, concerning especially: employed additives and flavourings, levels of

contaminants, pesticide remains, conditions of food exposure to radiation, sensory characteristics and actions which need to be taken on all the stages of production or distribution of food in order to ensure human health and living.

The Codex Alimentarius, on the other hand, as a document which constitutes a source of norms and standards related to food, defines food safety as ensuring that food will not have any undesirable effect on the consumer's health when it is prepared for consumption and/or when it is consumed accordingly to its purpose. It simultaneously defines food hygiene as: all the conditions and actions necessary to ensure the health safety of food and its production accordingly to its original purpose.

The Codex Alimentarius determines basic rules of food hygiene within the whole food chain, thus from original production until the final consumer, which shall guarantee food safety and suitability for consumption. At the same time it imposes certain tasks in this area on governments as well as the industry and consumers. As a result, governments should conduct a policy which promotes implementing the general rules indicated by the Codex in order to:

- appropriately protect consumers from diseases and harm caused by food; the way of acting should take into account the sensitivity of particular populations or various groups within a given population;
- guarantee that food is suitable for consumption;
- maintain trust in the food which is the object of international trade; and
- introduce health education programs, which will effectively spread food hygiene rules among industry organisations and consumers.

The industry's task, on the other hand, is to:

- provide food which is safe and suitable for consumption;
- guarantee that consumers receive clear and comprehensible information in the form of labelling and other appropriate means, making it easier for them to protect the food from contamination by causal pathogens through correct storage and processing; and maintain trust in the food which is the object of international trade.

What is also emphasised is the role of consumer awareness, which should result in conforming with specific instructions and employing appropriate means of food hygiene.

Poland and other European Union countries apply Regulations of the EU legislation bodies in the area of food safety. Since January 1st 2006 all European Union member countries have common food laws which constitute the so called "Hygiene package" based on the general food law defined by the Regulation (EC) NO. 178/2002 [Kielesińska 2012, Fernández - Segovia et al. 2014]. The "Hygiene package" encompasses the 4 regulation mentioned below, which determine food hygiene rules as well as rules of conduct for appropriate authorities who supervise the food sector operators:

Regulation (EC) no. 852/2004 of the European Parliament and the Council from April 29th 2004 concerning food hygiene (it determines general rules for food sector enterprises in the area of food hygiene).

Regulation (EC) no. 882/2004 of the European Parliament and the Council from April 29th 2004 concerning official inspections carried out in order to check conformity with feed and food law as well as with rules concerning animal health and well-being (it determines general rules of conducting official inspections aimed at checking conformity with rules targeted at: preventing, eliminating or limiting acceptable levels of threat to humans - food safety in the whole food chain; guaranteeing fair practices in food trade and protection of consumer interests (along with food labelling) - trade with third countries and trade within the Union).

Regulation (EC) no. 853/2004 of the European Parliament and the Council from April 29th 2004 establishing specific laws concerning hygiene in relation to food of animal origin (it establishes laws for food sector enterprises concerning hygiene in relation to food of animal origin, which

supplement the requirements included in reg. 852/2004).

Regulation (EC) no. 854/2004 of the European Parliament and the Council from April 29th 2004 establishing specific laws concerning the organisation of official inspections in relation to products of animal origin intended for consumption by humans (it is applied to feeds and products of animal origin in the area of official inspections).

These regulations clearly direct the responsibility for food safety and hygiene in the entire food chain at the food sector enterprises regardless of the position they occupy in the food production chain. Supervision over these obligations is exercised by a number of government agencies (usually by Food and Veterinary Offices) [Kielesińska 2012, Jendza 2012]. In Poland, the entities responsible for food safety at all stages of the food chain are: the State Sanitary Inspection, Veterinary Inspection, the State Plant Health and Seed Inspection, the Agricultural and Food Quality Inspection, the Trade Inspection and the Regional Fishery Inspectorates (Jendza 2012).

Regulation no. 178/2002 also constitutes the legal foundation of the Rapid Alert System for Food and Feed of the European Union, RASFF UE. The system has been working within the European Community since 1979, but it was the publication of the General Food Law that gave the RASFF legal status. The RASFF is first of all a tool for information exchange between appropriate central authorities responsible for food and feed regulation in the member countries in cases when risk for human health has been identified, thus causing the need for steps such as recalling or seizing products (Kijowski and Konieczny 2008, Leuschner et al. 2013). The hazardous food product warning network as part of the RASFF UE in Poland is administered by the Chief Sanitary Inspector.

QUALITY MANAGEMENT SYSTEMS

Regulations have been introduced in the European Union countries and others around the world concerning the production and distribution of food. Law norms have also been introduced according to which there is an obligation to implement and apply some quality management systems [Codex Alimentarius, Leonkiewicz 2005, Morkis 2006, Nowicki and Sikora 2012, Kielesińska 2012, Skrzypek 2012]. With reference to the food industry, obligatory and non-obligatory (voluntary) systems can be mentioned.

Obligatory quality management systems

Obligatory quality management systems include:
- GHP (Good Hygienic Practice)
- GMP (Good Manufacturing Practice)
- HACCP (Hazard Analysis and Critical Control Point) (Morkis 2006, Janus and Kijowski 2007, Skowron 2008, Kielesińska 2012, Popis 2013).

In Poland, the obligation to implement and apply Good Hygienic Practice and Good Manufacturing Practice has been effective since July 20th 2000, while the obligation to implement and apply the HACCP system - since May 1st 2004.

GHP and GMP include initial requirements necessary to develop and implement the HACCP system. The implementation of these rules is carried out at the stage of food production, storage and quality control. Respecting these rules can constitute the basis for the implementation of food safety management systems [Gorris 2005, Morkis 2006, Janus and Kijowski 2007, Nowicki and Sikora 2012, Popis 2013].

Good Hygiene Practice (GHP) determines the actions which need to be taken and the hygienic conditions which need to be fulfilled and controlled at every stage of production and or distribution to ensure the health safety of food. GHP includes procedures and instructions concerning the execution of hygienic processes in the facility, which will particularly determine: the frequency and time of washing and disinfection of production space, production equipment, personnel, the frequency and scope of personnel training in the GHP area as well as protection against pests [Turlejska 2003,

Morkis 2006, Janus and Kijowski 2007, Nowicki and Sikora 2012, Popis 2013].

Good Manufacturing Practice (GMP) determines the actions which need to be taken and the conditions which need to be fulfilled for the production of food as well as materials and products intended for contact with food to be carried out in a way which ensures appropriate health safety of food according to its intended use [Morkis 2005, Janus, Kijowski 2007]. GMP encompasses every aspect of food production beginning with the main assumptions concerning the facilities: construction, technical and technological, through the requirements applied to raw materials, personnel, machines (equipment), all the way to the production process itself (procedures and practices as well as methods) and then to the storage and distribution of the manufactured product. GMP requires every element of food production to be defined in advance and specified resources to be delivered in an appropriate amount, in an appropriate place and appropriate time as well as to be used accordingly to their intended use. This practically means developing written procedures and instructions for the production process and requirements for the production process base such as obtaining raw materials, buildings and production surroundings, machines and devices, washing and disinfection, storage, transport and distribution; personnel, training, protection against pests. These clauses should be included in the Manufacturing Books [Turlejska 2003, Janus and Kijowski 2007, Nowicki and Sikora 2012, Popis 2013, Kafetzopoulos and Gotzami 2014].

The Hazard Analysis and Critical Control Point system (HACCP) is an independent food health safety management system which is specific for the food sector [Morkis 2006, McMeekin et al. 2006, Janus and Kijowski 2007, Fabisz - Kijowska and Kijowski 2008, Nowicki and Sikora 2012, Popis 2013]. The implementation of the HACCP system in production facilities which manufacture and distribute food should be preceded by introducing both GMP and GHP rules [Morkis 2006, Janus and Kijowski 2007, Fabisz - Kijowska and Kijowski 2008, Nowicki and Sikora 2012, Popis 2013]. The HACCP is a food control system required by the EU law in member countries, it ensures appropriate hazard identification and assessment as well as control at every stage of food production and distribution. Its aim is to identify risk and prevent problems related to health quality. It is executed through applying control methods and monitoring points considered critical in the conducted processes which are significant for consumer health. Sources of hazard may include events or factors: biological, chemical or physical, which have appeared during food production. The HACCP system is considered the most effective tool which allows to guarantee that food will not become polluted or contaminated and will be safe for the consumer. It is a proactive system which puts the emphasis on prevention instead of quality inspection [Janus and Kijowski 2007, Malinowska 2012, Nowicki and Sikora 2012, Szymańska - Brałkowska 2012, Kafetzopoulos et al. 2013].

Non-obligatory quality management systems

Non-obligatory (voluntary in the unified market of the European Union) quality management systems, which can be applied in food industry enterprises include:

- Total Quality management (TQM),
- Quality Management System according to ISO 9000 series norms (ISO 9001),
- Food safety management system according to the ISO 22000 norm,
- World Class Manufacturing (WCM),
- Quality Assurance Control Points (QACP),
- International Food Standard (IFS),
- Global Standard Food (BRC),
- Proprietary Enterprise Quality Management System
- GlobalGAP (Morkis 2006, Popis 2013).

Total Quality Management (TQM) is a management method based on the engagement and cooperation of all employees and utilising all the accessible material resources of a given facility to achieve its optimal functioning as well as customer satisfaction. TQM is not directed at food safety, but instead at economical or organisational effects because the main aim of the system is achieving customer satisfaction, ensuring long-term success for the enterprise and bringing benefits to organisation members

as well as the society. TQM can be explained in the following way:

- Total - every person in the company is committed to broadly-understood quality (if only possible, so are the customers and suppliers)
- Quality - customer expectations are entirely fulfilled
- Management - managers at every level, especially the highest, support and actively engage in implementing a pro quality corporate culture.

ISO 9000 is the name given to a family of norms developed to provide guidelines on the basis of which a quality management system can be effectively implemented and maintained.

The ISO 9000 norm family includes three norms:

- ISO 9001 "Quality management systems - requirements". The basic, international norm of the 9000 series, which includes requirements for the implementation and certifications of such systems and is the foundation on the basis of which certification is carried out.
- ISO 9000 "Quality management systems. Fundamentals and vocabulary" constitutes an introduction to norms concerning quality management. It describes the basics of quality management systems and defines the terms used in these norms.
- ISO 9004 norm "Quality management systems. Guidelines for performance improvements" contains guidelines concerning improving a quality management system. It is helpful when maintaining a quality management system.

The ISO 9001 norm contains requirements for a quality management system. It is one of the most popular standards compliance with which is confirmed by external certifications. The number of ISO 9001 certificates issued worldwide is incomparably larger than that of other kinds of certificates concerning management systems. The ISO 9001 norm is applicable to every organisation irrespectively of its size and type. Every organisation which wishes to keep pace with the customers and present a good level of management and customer service as well as take care of its future development can find a useful tool in a Quality Management System based on the ISO 9001 norm. Apart from enterprises, quality management systems are nowadays commonly introduced in offices, hospitals, schools, police stations and other public as well as private institutions.

Norm EN ISO 22000:2005 Food safety management systems - Requirements for any organisation in the food chain was published in 2005. In 2006, on the other hand, its Polish version was created: PN-EN ISO 22000:2006 Food safety management systems - Requirements for any organisation in the food chain. This norm's structure is close to norm PN-EN ISO 9001:2009 "Quality management systems - Requirements" and to norm PN-EN ISO 14001:2005 "Environmental management systems - Specification with guidance for use". The ISO 22000 norm is supplemented by norms: PKN-ISO/TS 22003:2007 "Food safety management systems - Requirements for units conducting audit and certification of food safety management systems" and norm PN-EN ISO 22005:2007 "Traceability in the food and feed chain - General principles and basic requirements for system design and implementation [Wysokińska - Senkus 2010].

The aim of the international ISO 22000 norm is to harmonise the requirements concerning food safety management of enterprises in the food chain on a global level. It is particularly helpful to enterprises which are attempting to achieve a coherent and integrated food safety management system [Fabisz-Kijowska and Kijowski 2008, Nowicki and Sikora 2012, Fernández - Segovia et al. 2014].

The international norm determines the requirements concerning a food safety management system for an organisation in the food manufacturers' chain, which has to prove its ability to control threats to food safety in order to ensure that the food is safe while consumed by people. The ISO 22000 norm defines food safety as "assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use". According to the ISO 22000 norm, an organisation shall establish, document, implement and maintain an effective food

management system and update it when necessary accordingly to the international norm requirements.

The ISO 22000 norm requires the organisation to reach an adequate hygienic standard, necessary to ensure food safety through effective planning, establishment and implementation of actions including: PRP (prerequisite programs), OPRP (operational prerequisite programs) and/or the HACCP Plan - necessary to manufacture safe products [Frgemand and Pietrasik 2006, Słowińska 2006, Mokrosińska 2006, Fabisz - Kijowska and Kijowski 2006, Fabisz - Kijowska and Kijowski 2008, Skowron 2008].

The international ISO 22000:2005 norm constitutes the foundation for the development, implementation and certification of a food safety management system. The normative approach to the issue of safety assurance which it employs simultaneously carries the universality characteristic due to which it can be applied in all enterprises operating in the food industry regardless of their size [Fabisz - Kijowska and Kijowski 2008, Skowron 2008].

World Class Manufacturing (WCM) is an enterprise management system. Its aim is to manufacture products which meet world standards and present the best manufacturing class. The result of this is the best world class manufacturing in the field of product quality, price, quickness and reliability of delivery, flexibility and innovation.

Quality Assurance Control Points (QACP) is a system which ensures appropriate food quality. It can be based on the HACCP system. Analogical methods and procedures are used for those systems. The HACCP, however, only concerns health safety, while the QACP is a broader system encompassing the entire product quality assurance (Janus and Kijowski 2007).

International Food Standard (IFS) has been developed for the purposes of auditing suppliers who cooperate with networks of so called private label manufacturers. The main aim of the IFS standard is to confirm whether the supplier is capable of delivering a safe product compliant with valid law regulations and norms. Furthermore, the IFS introduces uniform requirements and transparency in the supply chain (of raw materials and the final product). The IFS standard is based on the principles of a quality management system as well as the HACCP system and is supported by the expectations for prerequisite programs, that is the set of Good Manufacturing Practices - GMP, Good Hygienic Practices - GMP and Good Laboratory Practices - GLP. The IFS also follows the guidelines of the Global Food Safety Initiative (CIES), an organisation associating key, global companies in the food market [Słowińska 2008, Kielesińska 2012, Nowicki and Sikora 2012, Popis 2013, http://www.iso.org.pl/miedzynarodowe-standardy-zywnosci-ifs].

The BRC Food Standard determines the requirements which a producer and a supplier should fulfil in order to ensure the health safety of food as well as proper hygienic and production conditions. The Food Standard requires the company to introduce the HACCP protocol, an effective and currently documented quality management system and constant control of appropriate norms concerning products, processes, personnel and environment protection. Numerous advantages result from possessing the BRC Food Standard Certificate for the certified enterprise as well as its associates. It is a vast document, at the same time focused on safety, quality and legal aspects of an operation and it also has clear principles based on the HACCP protocol. The BRC norms are based on a standardised system of reports and documents precisely matched to their requirements. Moreover, the whole model is complementary to already existing quality management systems such as ISO 9001 or HACCP and the rules of GMP and GHP [Słowińska 2008, Kielesińska 2012, Nowicki and Sikora 2012, Popis 2013, http://www.iso.org.pl/brc-food1].

A proprietary Enterprise Quality Management System is implemented by some food industry enterprises, especially those with foreign capital. Such demands are made by mother companies to unify the management system.

BRC Global Standard - Food establishes requirements for manufacturers of processed food, basic products delivered as brand name retail products, brand name food products or food and product ingredients for gastronomy, catering and food manufacturers. The certification applies to products created and stored on premise. The standards do not apply to wholesale, import or distribution and storage outside of the company's premises [Popis 2013, http://www.iso.org.pl/brc-food1].

SUMMARY

The methods, recommendations or guidelines presented here only constitute a part of a broad spectrum of solutions targeted at achieving high quality of manufactured products. Irrespectively of which one we choose, it is necessary to remember that quality control is by definition a conscious effort of an enterprise regarding the issue of the quality of goods or service and the essential share of responsibility rests upon the management. In fact, good quality is not a matter of coincidence, but a result of planned and coordinated actions of all the departments encompassing design, engineering and technical work, quality production preparation and its planning, product manufacturing standards and personal requirements as well as staff training and improvement. Meanwhile, the aim is to eliminate all the negative factors which can negatively affect the quality of obtained products.

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ZARZĄDZANIE JAKOŚCIĄ I BEZPIECZEŃSTWEM ŻYWNOŚCI

STRESZCZENIE. Zapewnienie jakości i bezpieczeństwa żywności są to obecnie najważniejsze cele jakie stawiają sobie przedsiębiorstwa zajmujące się produkcją i obrotem żywności. Dlatego w krajach Unii Europejskiej wprowadzono regulacje prawne dotyczące produkcji i obrotu żywnością a także unormowania prawne wprowadzające obowiązek wdrożenia i stosowania niektórych systemów zarządzania jakością..

Słowa kluczowe: jakość żywności, bezpieczeństwo żywności, GHP, GMP, system HACCP, ISO 22000, BRC, IFS

QUALITÄTS- UND SICHERHEITSMANAGEMENT VON LEBENSMITTELN

ZUSAMMENFASSUNG. Qualitäts- und Sicherheitsmanagement von Lebensmitteln stellt heutzutage eines der wichtigsten Ziele, die vor den lebensmittelherstellenden und -umsetzenden Unternehmen gestellt wird, dar. Daher wurden in den EU-Ländern Rechtsregulationen bezügl. Lebensmittelherstellung und -umsetzung sowie die Rechtsnormierungen, die die Pflicht der Einführung und Anwendung von ausgewählten Qualitätsmanagement-Systemen obligatorisch machen, eingeführt.

Codewörter: Lebensmittel-Qualität, Lebensmittel-Sicherheit, GHP, GMP, HACCP-System, ISO 22000, BRC, IFS

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