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IMPLEMENTING THE QUALITY ASSURANCE SYSTEM AND ASSURING HEALTH SAFETY IN THE LIGHT OF INCREASING BREAD QUALITY

Radosław DROZD[1], Radosław WOLNIAK[2]

[1] Gdansk University of Technology, Department of Informatics in Management; rdrozd@zie.pg.gda.pl, ORCID: 0000-0003-1797-4488
[2] Silesian University of Technology, Organization and Management Department, Economics and Informatics Institute; rwolniak@polsl.pl, ORCID: 0000-0003-0317-9811
* Correspondence author

Purpose: The aim of the article is to presents rules, requirements, and norms for quality management and health safety assurance systems among small and medium bakeries.
Design/methodology/approach: The literature research and the critical analysis of both, the national and foreign subject literature have been used as the research methodology.
Findings: The article presents rules, requirements, and norms for quality management and health safety assurance systems among small and medium bakeries. This group of businesses does not have the obligation of implementing or certifying specific systems. They are, however, implemented in order to increase the quality of the bread or reach a better market position. Also, the results of a 2022 study of 53 bakeries' implementation of individual quality management systems are presented in the paper. The study shows an important role of the implementation of coordinated systems in the increase of quality of bread. Theoretical considerations and the results of a questionnaire study allowed the author to discuss and explain why neither the TQM system nor the BRC standards were implemented in small- and medium-sized bakeries.
Practical implications: Practical implications include taking into account the indicated determinants that implementing the quality assurance system and assuring health safety in the light of increasing bread quality will be an important solution in making a number of decisions by managers and bakery owners in terms of strategic use of them.
Originality/value: Proper implementation of the rules for implementing the requirements and regulations regarding quality management systems and ensuring health safety on the example of small and medium-sized enterprises in the baking industry - allows you to build and maintain a long-term competitive advantage in small and medium-sized bakeries in the baking industry. The results of research on the implementation of quality management systems and ensuring the health safety of bread confirm the legitimacy of using integrated quality systems. They will have a fundamental impact in the long-term perspective of innovative management of bakery managers and owners.

Keywords: quality management systems, health assurance systems, TQM complex management system, small and medium enterprises, increase of bread quality.

Category of the paper: research paper.

1. Introduction

Bread constitutes the fundamental element of each Pole's diet, and when approached rationally, can serve an indispensable role of regulating one's gastric tract and satisfying the majority of an organism's daily energy quota (ca. 25-30%) (Dziwkosz, 2008; Gambuś, Litwinek, 2011). In Poland, bread has always been, is, and likely will long be the fundamental food product. Among all bakery product volumes, bread constitutes around 70% (Ambroziak, 2012).

In this context, issues related to bakery product quality are valid in a constant way, and different papers on the subject mainly focus on the impact of the entry material quality (Drozd, 2021). According to the author's knowledge, there are no mentions of implementing quality management systems and assuring health safety in the baking industry in the available academic sources. This research gap is mainly the effect of difficulties in collaborating with the companies that protect their in-house information.

In the light of food regulations, responsibility for health safety of food is the duty of the manufacturer or the company that introduces the product to the market[1]. Therefore, it is important for bakeries to abide by the quality norms that are part of quality management systems and assure health safety. Additionally, it is important for such companies to evaluate the systems in use (Drozd, 2021).

Bread, just like any other product, can be described by a set of quality features that reflect the consumer expectations (Balon, Dziadkowiec, Sikora, 2016; Frąś, Gołębiowski, Bielawa, 2006). The goal of delivering quality to consumers is to assure that quality requirements are delivered through a quality management system (Dobrowolska, 2000; Luning, Marcelis, Jongen, 2005). Such a system is a coordinated set of requirements that presents a specific structure of activities (Kijowski, 2004). Currently, the term is used in a variety of meanings, as a set, a combination or a connection of the elements of the set with specific relations (Hys, 2018).

In the food industry, the prevailing systems of assuring quality and ensuring the food safety are as follows (Karaszewski, 2005):

1. Good Manufacturing Practice – GMP, and Good Hygienic Practice – GHP.
2. Hazard Analysis and Critical Control Points analysis – HACCP and the Quality Assurance Control Point System – QACP.
3. Documents issued by the International Organization for Standardization – ISO.
4. The requirements of the British Retail Consortium – BRC and the international (German-French-Italian) International Food Standard – IFS.

[1] Food law is a set of international, EU, and local legal norms that regulate the production and sales of foodstuffs.

The requirements, rules, and regulations of the systems listed above will be presented in sections 2-5 below, and related to the baking industry.

2. GMP and GHP

The rules of Good Hygienic Practice, GHP, are strictly focused on all the aspects of hygiene in food production, in reference to personnel, rooms, transport, packaging, and ingredients. GHP encompasses activities that assure food safety. They ought to be taken into account and controlled at all stages of food production. In the past, only the finished product was scrutinised. Currently, control is applied to all stages of production, from ingredients and materials, through production and storage to the consumer purchasing food.

According to GHP, food products should travel only in one direction along the production chain. They should not reverse their progress nor cross paths with other processes. Individual parts of a manufacturing facility are to be split into dirty and clean sections. Other GHP rules apply to e.g.

- technical state of the buildings,
- designing buildings and machines with hygiene rules in mind,
- quality of technological water,
- proper disposal of waste water,
- proper collection and disposal of solid waste, including hazardous waste,
- order within rooms,
- personnel hygiene, including control of possibility of spreading diseases,
- company disinsection and disinfection.

The company's staff ought to undergo training in the hygienic requirements constituting GHP. Each company is required to establish their own GHP programme or instructions, which are the basis for the implementation of a HACCP system (Staszewska, 2002).

Good Manufacturing Practice, GMP, consists of activities that ought to be taken, and conditions that ought to be met, to ensure that food production results in food of proper health quality, in accordance with its intended consumption.

The general rules of GMP include the issues related to: machines and resources, hygiene of food production, requirements for ingredients, intermediary products, and finished goods, controls and inspections, record, protocol and documentation storage, and management.

In order to satisfy GMP, it is essential to take care of the proper technical state of the company, i.e. proper ventilation and lighting, location of production and warehouse machines. In warehouses for equipment, ingredients, and chemicals, it is imperative to ensure proper storage conditions and space, in accordance with the volume of the stock and finished goods that will be stored within these rooms.

The staff of a GMP-compliant company should undergo checks in the area of preventing infections of food. Equipment used in food production ought to be kept clean, which is assured by introducing procedures for washing and disinfection. Yet another important aspect is the permeation of insects, birds, and rodents into the facilities.

Each staff member of a GMP-complaint company ought to ensure, before starting work, that they have the necessary ingredients and half-finished products at their disposal, as well as whether the equipment they would start working with is in proper condition and clean. During work, staff ought to be observant and keep their workspace clean. Work should be undertaken in ways that do not lead to spoiling of the products, equipment, and rooms. If a staff member is unsure about how a task should be performed, they ought to ask their superiors or check relevant procedures and instructions for the task in the company documentation.

Following GMP assures proper control of the sanitary and technical state of equipment, machines, and rooms, and provides basis for the analysis of the parameters of the operations undertaken in the production process.

Good Manufacturing Practice, GMP, is a set of standards for industrial production, especially in food and pharmaceutic industries. GMP assures high quality and cleanliness of ingredients of a product, as well as complete control over the origin and quality of ingredients and the whole manufacturing process. The implementation of such practices raises the safety level of finished goods (Kołożyn-Krajewska, Sikora, 2010).

According to D. Kołożyn-Krajewska, GMP in food industry aims at shaping nutritional value, health safety, and organoleptic features of food. The main activities within GMP, undertaken by food manufacturers, are (Kołożyn-Krajewska, Sikora, 2019).

1. Maintaining required hygiene in natural environment.
2. Assuring proper conditions in the storage of equipment, chemicals, and foodstuffs.
3. Assuring proper technical condition of all the facility.
4. Preventive measures against insects and rodents.
5. Optimal location, lighting, and ventilation of manufacturing facilities and warehouses.
6. Managing water and waste.
7. Checking the health condition of staff members.

The goal of GMP is to assure the highest standards of hygiene in the workplace, assuring the quality of the finished product, and the unification thereof. GMP rules are a norm in branches of the industry where it is imperative to not allow for any pollution of the product, mainly in food and pharmaceutic industries. GMP starts with ingredient purchases, and proceeds through storage, production, and packaging, to the storage and sales of the finished product. It also encompasses the creation of numerous procedures that are related to the whole of the manufacturing process, i.e. equipment, staff, trainings, workplace, transport, maintenance, disinfection, etc. GMP assumes the use of adequate amount of resources at predefined stages of production and in accordance with an established procedure.

Good Manufacturing Practice encompasses activities that efficiently combine manufacturing procedures with control and oversight ones, and so is a system that defines manufacturing procedures, as well as control procedures that are developed and issued by institutions. It requires that a manufacturer develops of written procedures, or instructions for parts of the complete manufacturing process.

The fundamental difference between GHP and GMP is that the former mainly focuses on aspects of hygiene, while GMP encompasses the total range of production-related aspects. In order to trace the differences better, the author used the example of bread baking equipment, which are important for both GHP and GMP.

GMP focuses on the location of equipment, installation thereof, the technical state, maintenance, rules of operating in case of failures, etc. It is visible that all the factors are mainly serve the acceleration and improvement of production.

On the other hand, GHP dictates the materials for the construction of equipment and machines so that their clean state can be maintained easily and so that they do not react with the ingredients, the frequency of washing and disinfection of the individual equipment pieces and machines and with the use of what chemicals such operations are to be performed, etc. As can be seen, all the aspects are linked to the safety of food.

Because of intersections between GHP and GMP and numerous similarities between the practice systems, the companies that want their operations to be based on such practices ought to implement the two sets simultaneously (Turlejska, 2003).

GHP and GMP are rules of operation when manufacturing food, that serve to eliminate all the microbiological, chemical, and physical threats. The rules are compulsory in all the companies and are required by law.

3. Hazard Analysis and Critical Control Points analysis – HACCP and the Quality Assurance Control Point System – QACP

In the European Union, HACCP is a system that has been in power as of December 14, 1995, and introduced by the Directive 93/43 EEC of June 14, 1993 on the hygiene of foodstuffs. In Poland, the HACCP system has been introduced in January 1, 2004 in e.g. companies that imported and sold foodstuffs, excluding small and medium companies, and ratified with the May 11, 2001 law on health conditions of food and feeding. Companies that are subject to HACCP need to implement the system but do not need to certify it.

HACCP is a specific system of assuring safety of food (Drozd, 2022; Kołożyn-Krajewska, Sikora, 2010). It is a preventive system defining all the potential and actual risks for a consumer's health along the manufacturing process, be it biological, physical or chemical,

and preparing preventive measures for the emergence of these risks. If necessary, Critical Control Points (CCP) are established (Kowalska, Wierpachowski, 2008).

In the course of baking bread, all three types of health threats – physical, chemical and microbiological – can potentially arise (Staszewska, 2002).

Within the category of physical threats, we can enumerate foreign objects, dust, dirt, moisture, or overheat due to atmospheric conditions.

The second category of health threats are chemical threats, i.e. residual quantities of pesticides, microtoxins and metals that are harmful to health that reach the manufacturing process together with the ingredients. The threats internal to the manufacturing process are the residual quantities of chemicals for the maintenance of equipment and machines, forbidden additives, overdoses of permitted additives.

Among the three categories of risk, the microbiological threats are the most severe. Microorganisms are single-cell organisms that are invisible to the naked eye. They are found in the entirety of the human habitat. There is no object or a living being that would be free of the numerous microorganisms. Not all these organisms are harmful – there is a large group of microorganisms that are beneficial and are actively used in manufacturing processes, such as yeast, lactic acid bacteria, or some moulds.

Critical Control Points are based on the analysis of threats and present: place, ingredient or production stage where a health-relevant threat ought to be controlled. It is a necessary step to detect threats and minimise or eliminate them before a product reaches the consumers.

The HACCP system, unlike the previously used random check system of the finished product, is based on the controls within the manufacturing process starting with the ingredients and ending with the final product.

The idea of HACCP is to exchange the search for the faults of a product for the prevention of the emergence of faults. It is obvious that monitoring all the stages of a manufacturing process, including the ingredients, is not feasible. However, by defining CCPs and focusing on monitoring them, it is possible to prevent threats and take corrective measure in a timely manner (Sadowska,2000).

The fundamental premise behind the implementation of HACCP is to guarantee the safety of food. Food poisoning and infections are major threats to the health of the contemporary people (Turlejska, Pelzner, 2003).

The availability of safe food is a point of interest of not only the consumers; manufactures also ought to be interested in providing safe food. By implementing HACCP, the food manufacturer gives a guarantee that their food is safe to eat. It is of special importance in the light of the manufacturer's liability for damages caused by foodstuffs that violate conditions of health safety. A consumer gets a guarantee of their purchased food being safe. Therefore, the HACCP system meets the expectations of both the manufacturer and the consumer (Ładoński, Szołtysek, 2005).

A system which is broader than HACCP and encompasses the complete product quality assurance is QACP – Quality Assurance Control Point system. HACCP refers merely to the assurance of health safety and in case of implementing it, the company establishes Critical Control Points, CCPs. In QACP, control points are established and their parameters are defined with reference values. Therefore, the basic assumption of the system is its preventive character. However, its implementation is not obligatory. Specifically, the system takes into account the quality of primary production, especially of those ingredients that influence the quality of the finished product. The QACP standard covers the whole food production chain, starting from ingredients and proceeding to the final product consumers. However, the methods and procedures of QACP may be applied to individual sections of the manufacturing process. This instrument is one of the most efficient methods of quality assurance. QACP needs to be implemented as a system. For both systems, i.e. HACCP and QACP, the same methods and procedures are developed. However, QACP serves to assure quality from the viewpoint of the consumer, with focus on the sensoric and nutritional properties, while HACCP is related only to the assurance of food quality (Kołożyn-Krajewska, Sikora, Fabisz-Kijowska, 2001).

4. ISO

The International Organization for Standardization, ISO, unifies global norms in order to prevent technical barriers in international trade. The idea of a quality system based on ISO standards is in stablishing procedures that cover all the company activities and that define responsibilities. The adoption of ISO standards is voluntary.

In food manufacturing and processing, the most common ISO standards come from the 22000 and 9000 series of ISO documents.

The international management standards of ISO 22000 define rules for planning, implementing, and functioning, as well as oversight of, food manufacturing processes and derived processes, such as packaging of food products, storage of food, etc. The ISO 22000:2005 system (in Poland: PN EN ISO 22000:2006) is related to the management of food safety – it defines requirements for organizations in the whole food production chain (PN – EN ISO 22000-2006).

The family of ISO 9000 norms is based on the general rules of “describe what you do”, “do what you have described”, “prove that you have done what you have described”. In practice, all the important procedures need to be defined and established, and company performance must follow them and be controlled afterwards.

ISO 9000 norms are the basis for defining quality management and control systems. They are not intentionally focused on the safety but rather generally understood quality. The adoption and implementation of one of the ISO norm models requires defining and implementing a company's high quality standards and assuring their repetitive character (Grudowski, 2003).

The main differences between the ISO 9000 standards that define the scope and normative capabilities are:

- ISO 9001 is a norm assuring quality in companies involved in the processes of designing/ developing production, making implementations and installations, as well as providing services (Urban,2012),
- ISO 9002 is a norm for assuring quality in the manufacturing processes, implementations and installations, or services,
- ISO 9003 is a norm for assuring quality in the process of final inspections.

ISO 9000 is a set of quality norms that encompass: product testing, staff training, documentation, supplier relations and policies, as well as corrective measures (Grudowski, 2006). Upon the satisfaction of these norms, the manufacturer applies for a quality certificate and their activities are controlled by an ISO organisation. ISO auditors perform an overview of the company activities against the norms for an ISO applicant or in order to renew the certificate. When preparing for an ISO audit, types of activities whose improvement may lead to increased quality are defined (Fraś, 2001).

5. IFS and BRC international standard requirements

Food manufacturers are obliged to assure the health safety of their products, by e.g. implementing the mandatory GHP, GMP, and HACCP rules. They may additionally implement the ISO 22000 standard. However, retailers also require their suppliers to be certified according to IFS and/or BRC (Balon, Sikora, 2016).

Quality assurance and health safety systems are implemented in food manufacturing companies to achieve optimal conditions for food production that result in optimal quality but are also safe, such that will meet the customer requirements. In order to unify the requirements for quality and health safety of food, obligatory systems and programmes were introduced that guarantee safety and the meeting of specific quality parameters. However, in contemporary economy reaching and maintaining a competitive position on the market necessitate the implementation of more advanced standard. Growing popularity of voluntary systems developed according to the ISO 22000 norm, the International Food Standard (IFS), the British Retail Consortium (BRC) global norm on food safety, is caused by increased awareness and

requirements of all the stakeholders (such as collaborators, customers, suppliers). Both the IFS and BRC standards are applied to verify quality in food industry.

IFS is a standard dedicated to all food manufacturers and the participants in the food manufacturing chain, especially to retailers that sell food items in their chains and under their brand names. It is meant as a tool for regular, independent and objective assessment of food distributors. Food suppliers to e.g. large supermarket chains are evaluated according to IFS. The audit standards of suppler evaluation are related to the following areas (Popis, 2013):

- top management responsibility,
- quality and safety management system,
- resource management in the HR area,
- planning and production processes,
- measurements, analysis, improvements,
- food protection and external inspections.

BRC integrates the regulations of the ISO 9000 series standards, HACCP, and GHP/GMP, as well as defines other particular requirements that need to be met in order to guarantee the safety and required repetitive quality level of the final product (Nowicki,2010). The global BRC norm contains requirements for the manufacturing of food products, packages that protect the food, and storage and distribution of the goods. The standard was designed for food manufacturers that provide their products to retail chains under the chains' brand, however, retail chains use it to audit also other manufacturers.

6. Methodology

The way of implementing quality management and safety assurance systems was discovered through a questionnaire (Czernek, 2015) among 53 bakeries, 52 of which are located in the Pomeranian voivodeship, and one in the Warmian-Masurian voivodeship – however this single bakery also supplies its products to a major share of the Pomeranian area, including the Tri-City agglomeration and the city of Reda.

The baking industry is an integral part of the local internal market. The local market is the primary source of ingredients for the baking industry, as well as the primary sales area (Daniela, Mierzwa, Bartczak, 2017). The Pomeranian voivodeship was selected as the research area as it was most familiar to the author.

The questionnaire study, in the light of company intellectual property protection, cannot be limited to preparing a questionnaire, sending it to the recipients, and waiting for answers. In order to collect the data, multiple discussions needed to be held with bakery representatives. The author received 53 responses from the 113 identified bakeries in the Pomeranian area.

The small- and medium enterprise structure of the bakeries in 2022 looked as follows:

a) micro-enterprises, up to 10 staff - 41.5%,
b) small enterprises, up to 50 staff - 47.2%,
c) medium-sized enterprises, up to 250 staff - 11.3%.

Taking the above into account only in terms of small and medium enterprises, all small bakeries constitute 88.7% of the market, while medium-sized bakeries account for 11.3%. The structure of bread manufacturers in Poland as a whole was not known for the time. The REGON (national registry of enterprises in Poland) shows around 12 thousand companies that indicated production of bread and fresh bakery products at the end of 2020.

7. Methodology

The questions on GMP and GHP were asked to receive an overall picture of systemic quality management. The delivery of GMP and GHP is mandatory and is monitored, as well as audited internally and externally. Therefore, all the respondents confirmed the implementation of these rules.

Among the 53 responses, 15 have been certified according to HAACP, i.e. 28.3%. In small and medium businesses, which the researched bakeries qualified as, the certification according to HACCP is not mandatory – the only compulsory area is to implement HACCP rules.

The QACP system is not mandatory, however, it has been implemented by seven of the bakeries for their whole production chain. The standard encompasses the complete production chain, starting with ingredients and ending with the final product, however methods and procedures may be applied to parts of the process. QACP needs to be implemented as a system. The instrument is one of the most efficient quality assurance methods.

In food manufacturing and processing, quality systems according to ISO 9000 and 22000 are the most common. ISO 9000 certification was found in nine of the respondents, and three implemented ISO 22000. All on all, 11 bakeries, 20.8% of the study group, were certified according to ISO – international standards for food manufacturing aimed at quality and safety of bakery products. Neither of the two certificates are mandatory.

The IFS requirements, in the form of a certificate, were confirmed in three bakeries, i.e. 5.7%. They are mainly required by retail chains.

Among the researched companies, there have been none with a BRC certificate as well as none that were interested in the Total Quality Management (TQM) complex quality management concept.

8. Discussion

The concept of complex quality management is related to all the areas of activity of a company and makes a holistic picture of pro-quality activities of an organisation (Borys, 2013). Among all the bakeries researched in this study, 41.5% were microbusinesses that employed up to 10 staff, and 27.2% were small enterprises. In both these types of business, the owner plays the largest managerial role. Subject literature quotes three fundamental roles of the owner of a small company: entrepreneurial, managerial, and technical (Wasilczuk, 2013). TQM, on the other hand, necessitates the involvement of all staff members. According to the TQM philosophy, complex quality management is achieved through strategy, processes, training, motivating, involvement, tools, and resources (Skrzypek, 2000). Micro-, small- and medium-sized bakeries in Poland do not guarantee the above formalised management methods. These companies focus mainly on their technological process.

Both the IFS and BRC international standards are used to verify quality in food industry. Large retail chains use them as indicators for the selection of suppliers, including baking product suppliers (Nowicki,2010). Ifs and BRC are meant as regular, independent, and objective tools of food distributors. Meeting IFS requirements was confirmed with certificates in three of the respondents, i.e. 5.7%. Bakers were not interested in the BRC standard. The conversations held with bakery representatives proved that IFS is of greater interest to them.

9. Summary

Apart from nutritional functions, bread may also serve to improve one's health. This is the type of product a contemporary consumer is interested in (Dziwkosz, 2008). Harsh market competition is a current problem of bakeries. The increased social demands on bread quality necessitated the introduction of new systemic solutions in which quality is of strategic importance.

The study results in the implementation of quality management systems and health safety assurance systems for bread manufacturing confirm the legitimacy of the implementation of integrated quality systems.

Among all the requirements and rules of the individual systems that influence the increased quality of bread, are:

1. Good Hygienic Practice/GHP:
    - increased hygiene of bread production, especially that of ingredients, personnel, rooms, transport, and packaging.

2. Good Manufacturing Practice/GMP:
   - care of proper technical and sanitary conditions, such as lighting, ventilation, placement of equipment for production and storage, storage conditions, ingredient quality, complete control of the whole manufacturing proces,
   - maintenance of the required hygiene levels in the natural environment, as well as maintenance of water and waste water.
3. Hazard Analysis and Critical Control Points/HACCP:
   - defining the potential and actual health threats to the consumer in the production process: physical, biological, and chemical, and defining preventive measures. If necessary, defining Critical Control Points/CCPs.
4. Quality Assurance Control Point System/QACP:
   - defining control points and their reference parameters and values for defining product quality, i.e. bread.
5. ISO-based quality system:
   - defining and implementing company's internal high quality standards and assuring their repetitive performance.
6. IFS and BRC international certificates:
   - unification of requirements for quality and health safety in order to assure safety and the required repetitive quality level of the final product, i.e. bread.

The rules of the quality management systems that are not derived from law were also delivered with the bakeries that were in the study group, as seen below:

1. HACCP (certificate) 28.3% bakeries,
2. QACP (for entire production) 13.2% bakeries,
3. ISO (certificate) 20.8% bakeries,
4. IFS (certificate) 5.7% bakeries.

Also, one of the bakeries in the study group was certified for ecological production, and one had the "Quality/Tradition" certification.

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