

Evaluation of the Effectiveness of Implementing Control Systems in the Increasing of Food Safety

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Abstract- The effectiveness of using control systems in internal training of quality management and food safety is considered. In order to investigate the efficiency of used control systems and analyzing their feedback, the ratio of the frequency of the training to the turnover of staff is studied. Introducing one controlling method contribute to the food safety system, like HACCP, the role of controlling system in the practical application of these methods in production is studied. It is shown that the more experience an employee the more efficiently the employee participates in the system of quality assurance and safety.

Keywords: controlling system used in food safety, HACCP, food safety, quality, system integration, CCP.

1. Introduction

Over the past 50 years, quality control systems (with the primary goal of providing safer food products) are steadily growing within the discipline of food safety. Training in the food safety system, like HACCP, plays a large role in the practical application of these methods in production. Since the advent of human travel in space and the complexities and risks that can develop as a result of spoilage or contamination of rations in space, strict HACCP systems have been developed and distributed throughout the food industry.

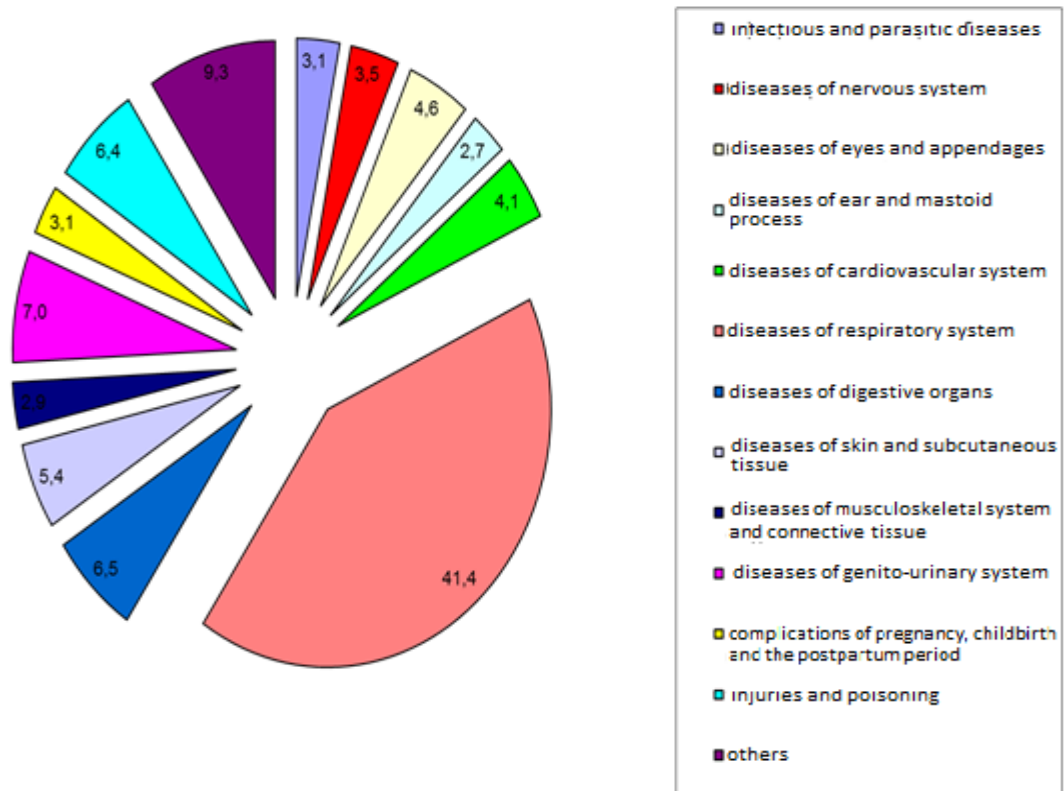
The Hazard Analysis and Control Critical Points (HACCP) program has been widely recognized throughout the world as the most effective means of managing food safety. Although HACCP has been criticized for several factors, it has proved its value to society by reducing the incidence of foodborne illness in the last 15 years (CDC, 2011). Recent changes in food safety regulations require that the principles of HACCP should be implemented in other industries and retail trade, like never before.

Nevertheless, very little is known about the effectiveness of HACCP training and the subsequent professional training of knowledge, since the success of HACCP depends on the preparation of HACCP and is based on the subsequent knowledge of workers involved in maintaining these programs in working order. This study aims to establish the effectiveness of control checkpoints (CCPs) by assessing the knowledge gained from HACCP training and its longevity for a long time among persons who are directly involved in the management of the CCP [1].

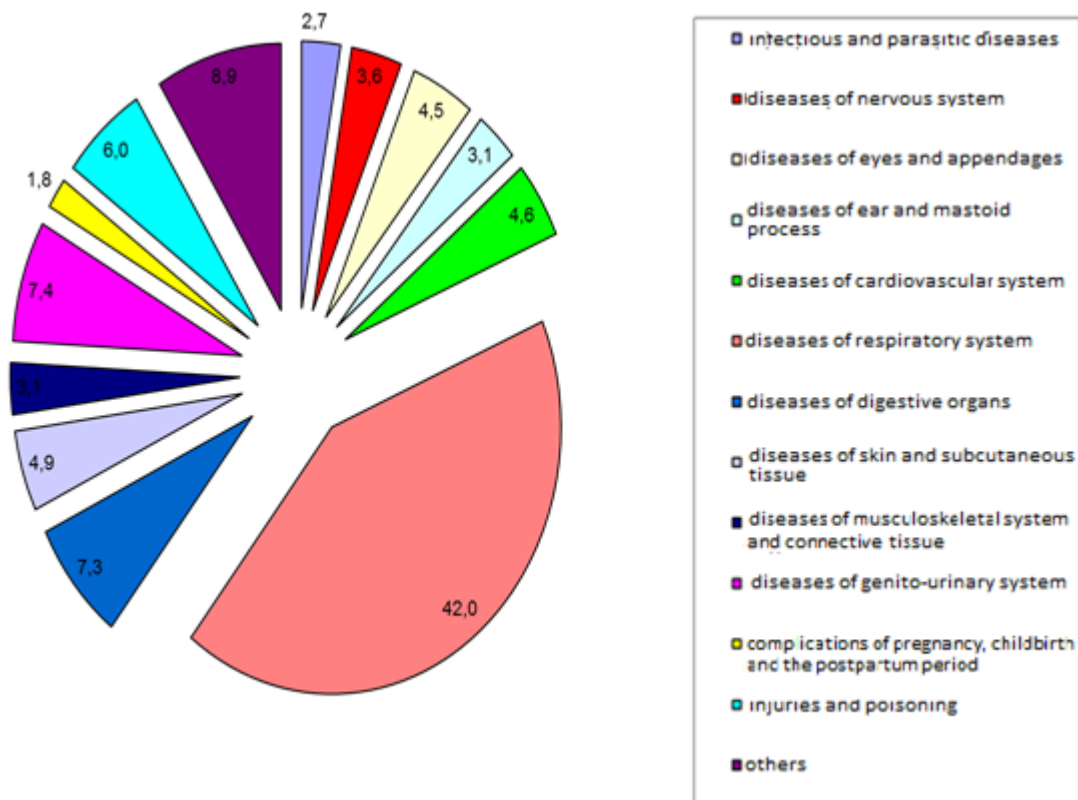
If to judge the holistic effectiveness of the HACCP system as a whole in the state, one can see the following picture: according to the statistics of the incidence of the population of the Republic of Kazakhstan, infectious and parasitic diseases for 2015 decreased by 15% compared to 2011, injuries and poisonings decreased by 6%. Although for this period, diseases of the digestive system increased by 12% [3]. The basis for the prevention of foodborne diseases of the State rests on the effectiveness of food safety systems, and the HACCP system is a fundamental element of these systems [6, 10].

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The structure of the incidence of the population in 2011 (according to the Ministry of Health of the Republic of Kazakhstan)



The structure of the incidence of the population in 2015 (according to the Ministry of Health of the Republic of Kazakhstan)

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THE OBJECTIVES OF THE STUDY – TO ASSESS THE EFFECTIVENESS OF INTERNAL TRAINING IN THE SECURITY SYSTEM

A deeper understanding of the effectiveness of HACCP based on the evaluation of professional knowledge training, training of food safety specialists and practitioners will help to have data concerning the aspects of HACCP preparation that can be used to expand training programs. This information can potentially be used to draw a correlation between training and changes in knowledge related to food safety in order to identify possible gaps in knowledge that may ultimately lead the enterprise to an inappropriate product and, accordingly, financial losses. This research can potentially serve as the basis for an enterprise, "how, when and who" should be provided for both improving food security and profit, since training does not require capital investment. [1,2] In addition, improving food safety through understanding training needs for food management can help practitioners, trainers and, most importantly, lead to an improvement in the quality of life of mankind. Thus, the study of the effectiveness of training in the HACCP system on bakery enterprise A of the Republic of Kazakhstan is the basis of the modeling of the integrated security management systems.

As a pilot study, this work extensively examines the results of HACCP knowledge training and its purpose for obtaining a basic level of information relevant to HACCP knowledge.

The research was based on the following tasks:

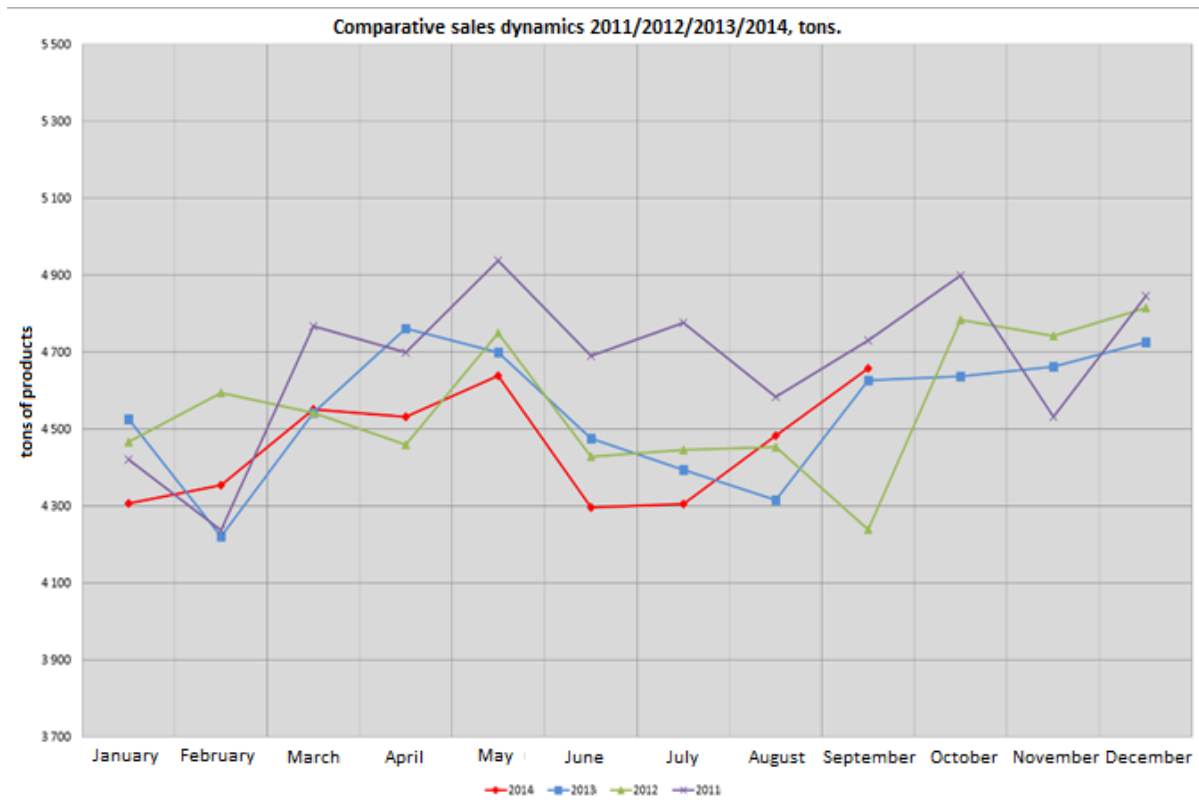
1. Study of the effectiveness of training in the HACCP system at a bakery enterprise A of the Republic of Kazakhstan for the purpose of modeling an integrated safety management system based on the international systems ISO 9001: 2015 and the HACCP system.
2. Participation of the employee in the system of ensuring the security of the enterprise;
3. Specific activities performed by an employee to ensure food safety;
4. Verification of HACCP effectiveness in the hazard chain, identification of applicable aspects;
5. Study of the adequacy of the HACCP training system.

2. Methods

The research was carried out by conducting a survey of the employees of the enterprise. The questionnaire is focused on studying the opinion of employees in the field of effectiveness of the food safety systems used, regardless of the actual existence of these systems. This can be seen in the question: which of the following food safety systems is used in the enterprise to ensure the safety of the products. [9] In variants of the answer to this question, those systems were proposed that have not officially confirmed the actual application at the given enterprise. This approach was used to identify the human potential for the enterprise in the field of food safety. The questionnaire also examined the ratio of the frequency of training conducted to the turnover of staff, the actual effectiveness of the developed documented procedures, the difference in knowledge in the field of food safety between an employee who works directly at a critical control point and an employee who is not responsible for a control point. The questions concerning control critical points made it possible to study the information on their actual effectiveness.

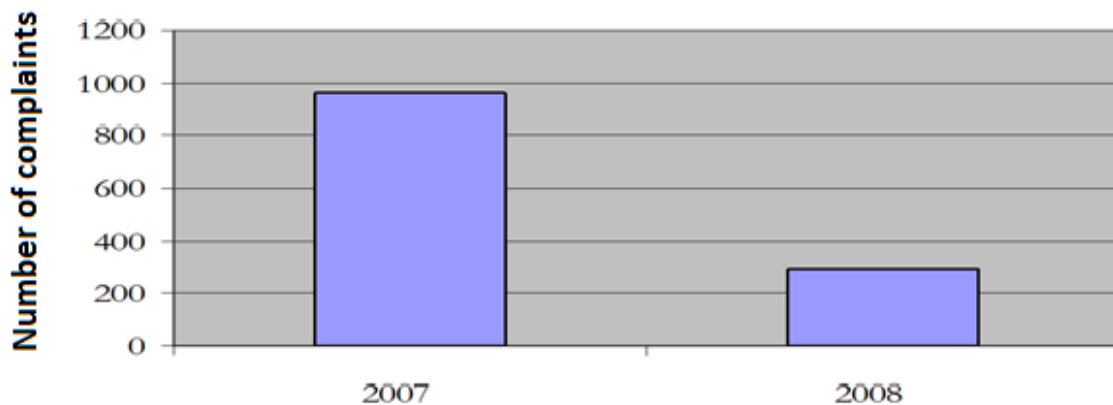
3. Object of Study

The object of study is one of the largest modern enterprises of the Republic of Kazakhstan and implemented the system of HACCP in 2008 one of the first. Changes in the sales of finished products of a bakery enterprise A in recent years in physical terms is as follows:



Everything starts from the moment when the manager decides to rebuild the entire management system with a focus on quality and safety [4]. Today all the personnel of the enterprise are oriented to produce high-quality and safe products. The analysis of complaints about the quality and safety of the products of this enterprise after the introduction of the HACCP system is as follows:

Comparative analysis of complaints received in 2007 and 2008

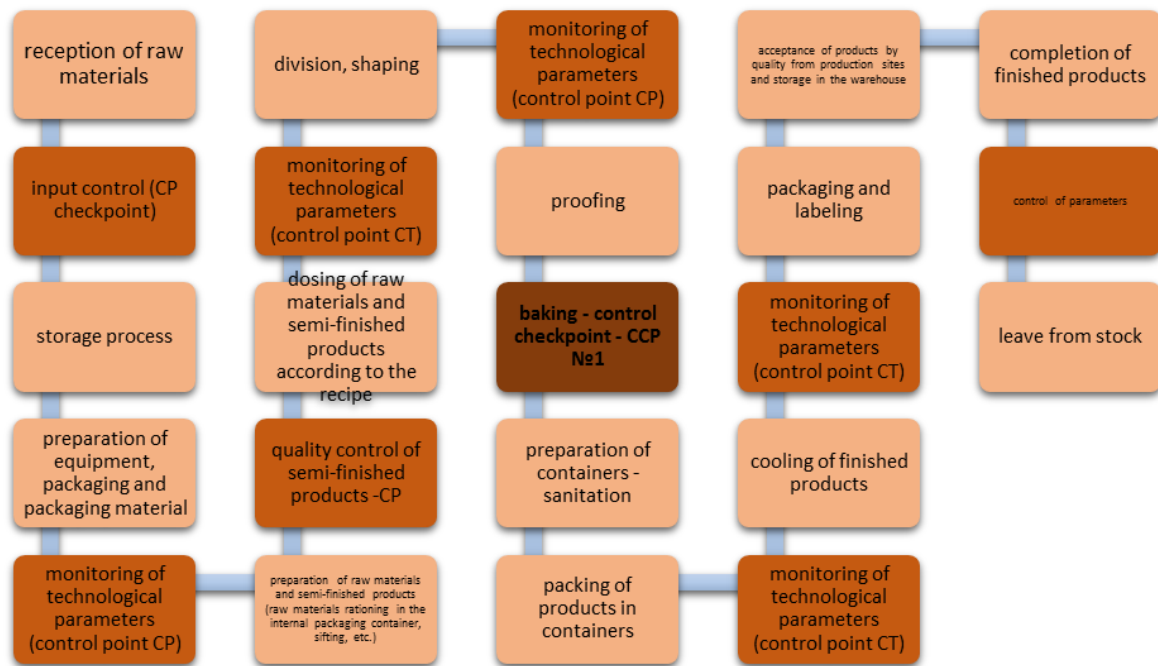


4. Results

Block diagram 1. To create a simulation of the integrated quality management and safety system based on ISO 9001: 2015 and the HACCP system, this production process flowchart was created:

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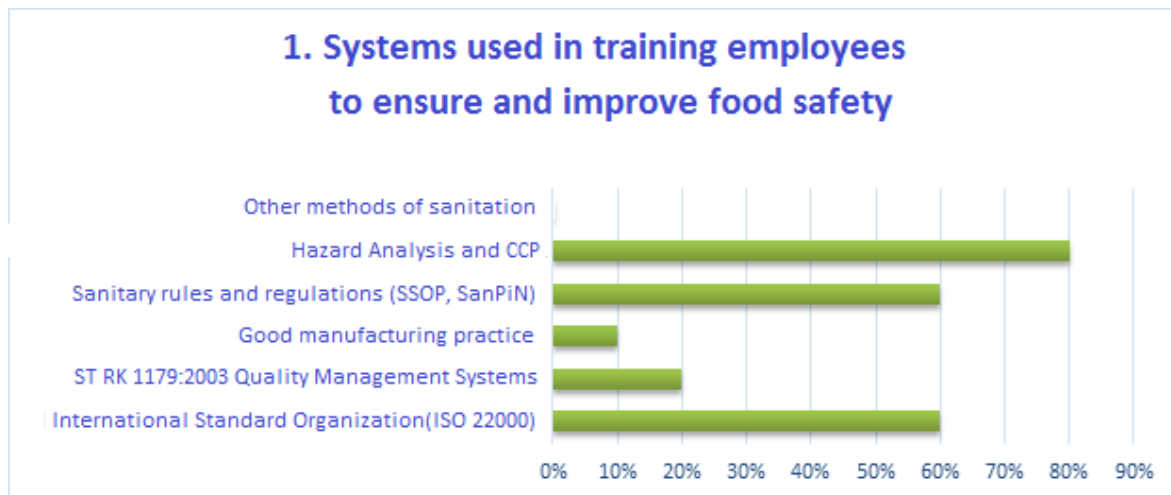


At this production site, one critical control point is defined - the baking process. Since this stage is the stage at which management can be applied and which is essential for preventing or eliminating the factor causing food hazard or reducing it to an acceptable level [7,8]. The critical limit of this CCP is established, the HACCP plan is as follows:

CCT №1		Management activities	Performance monitoring				Critical limit	Corrective actions			Control
Production stage	Hazardous factor		Procedure	Periodicity	Responsible	Records		Procedure	Responsible	Records	Responsible
2	3	4	5	6	7	8	9	10	11	12	13
Bakery products	Biological, growth of microorganisms	Compliance with the requirements of technological instructions, recipes Compliance with the calibration schedule of measuring instruments and the plan for technological control of processes in production	Observance of technological modes of baking and temperature control in the center of the crumb	According to the plan of technological control of the process of production sites	Operator of gas stoves, baker	Approved forms	The temperature in the center of the crumb is not less than + 93 ° C Taking into account the error of the meas	Work with the personnel; Monitoring of measuring instruments and repair of equipment; Compliance with the requirements of documented procedures Quality control of finished products;	Operator of gas stoves, baker, shift supervisor, masters, process engineer, ch. energetic, chemical engineer, metrol	Approved forms	Responsible executors

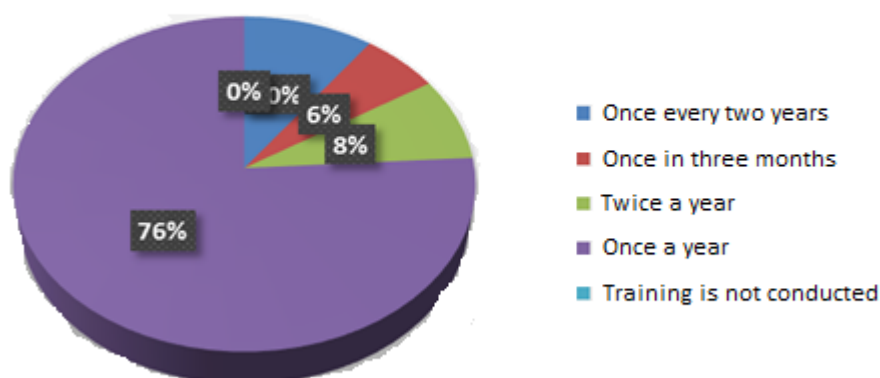
	areas					uring devic e (+ 1oC) in the range of + 94oC		ogical engine er		
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The survey involved 50 employees, including those responsible for monitoring at a critical point. Results of the study:



Based on the results of the research, the company mainly conducts training on the system of hazard analysis and critical control points, it is necessary to expand the amount of information for a deeper understanding of the security management system.

2. Frequency of training in the field of food safety management system

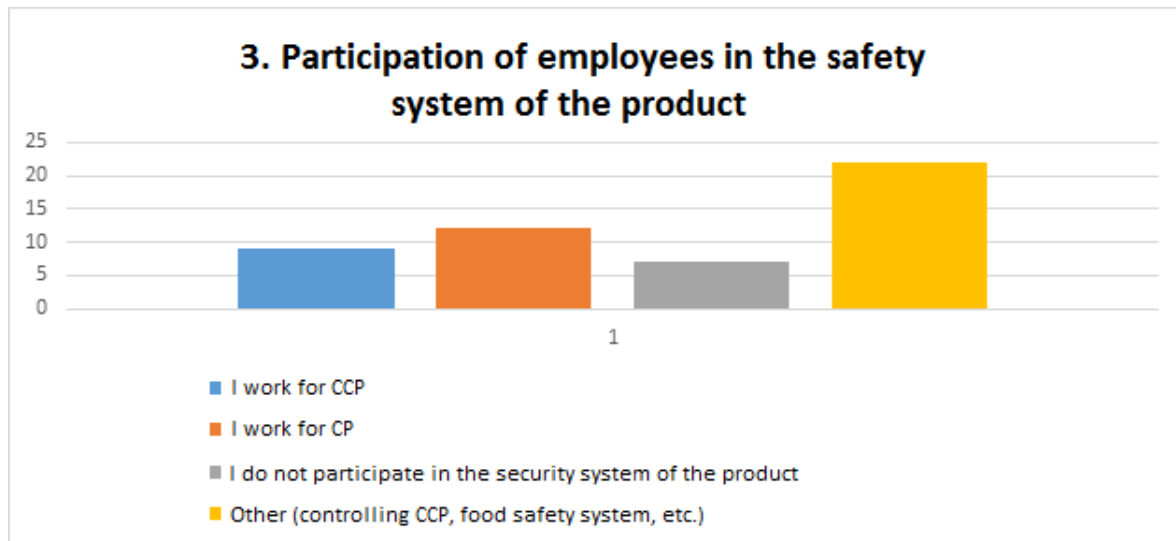


According to the documented procedure of the enterprise, training is conducted once a year. Those workers who recently got a job basically answered once a quarter or once every six months, because employees confuse induction instruction on the HACCP system with training (in the company all newly admitted employees conduct induction instruction on the HACCP system, on the policy of the enterprise in area of the security management system). Nevertheless, the recommendation is to adhere to a certain ratio of the frequency of

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training conducted with the turnover of staff. That is, in case of increasing staff turnover, it is necessary to increase the frequency of training.



According to the block diagram No.1, in the technological process of production, in addition to CCT, there are also control points (CTs). These are the processes that also need to be controlled, but the characteristics do not apply to CCP. They are designated as control points. This survey was conducted to examine the responsibility of employees who are directly responsible for control and control-critical points. According to the results of the survey, all employees feel responsible for the safety system of the product they produce. Also, all participating workers are aware of the nature of the microbiological hazard that occurs when the critical limit is violated:

Question/answer	Yes	No	I don't know	Another answer
Are monitoring activities carried out according to the instructions / regulations / procedure	50	-	-	-
You know the critical limit of the critical control point with which you work	50	-	-	-
Do you maintain any records of monitoring the CCP	42	8	-	-

Of the participating workers in the research project, 83% have a working experience of 6 to 10 years at the enterprise, the remaining 17% have worked less than 5 years.

5. Conclusion

As a result of the research, all the tasks were studied and the following conclusions were drawn:

1. The study of the effectiveness of internal training in the security management system is the basis for modeling an integrated safety and quality management system based on the international systems ISO 9001: 2015 and the HACCP system
2. From training depends the effectiveness of the implemented system to ensure the safety of products
3. The frequency of the training was consistent with the turnover of staff. That is, in the case of increasing staff turnover, the frequency of training has increased.
4. The degree of participation of employees in the security system depends largely on the length of service at the enterprise - the more experience, the more impact the employee takes in the safety system of the products.

Based on different systems - the quality management system, the environmental management system, the HACCP system, international, traditional, domestic, the entrepreneur can from each system take for the introduction those highlights that are suitable for its production, for the mentality of the people who work for him, for its infrastructure and create its own integrated management system. The system at the enterprise is developed on the basis of the most basic logic - providing the society with quality, safe useful products, and enterprises profit.

References

- [1] Anandappa, Marienne A., "EVALUATING FOOD SAFETY SYSTEMS DEVELOPMENT AND IMPLEMENTATION BY QUANTIFYING HACCP TRAINING DURABILITY" (2013).Theses and Dissertations--Animal and Food Sciences.Paper 19. http://uknowledge.uky.edu/animalsci_etds/19
- [2] Kahindi, Bright Barestus, "Food Safety Management Practices of Small and Medium Sized Food Industry Enterprizes in Tanzania" (2016).Masters Theses & Specialist Projects.Paper 1562. <http://digitalcommons.wku.edu/theses>
- [3] <http://gorstat.gov.kz>
- [4] Bortanova Zh., Uazhanova R.U., Bektemisova Zh., Tungishbaeva U., Kazhymurat A., Mukhamedieva M., Ualiulla B., «The role of international food safety standards in the rules of the world trade organization»., 2017.
- [5] Tungyshbaeva U.O. "Modeling of integrated bakery enterprise security management system", materials of the international scientific – practical conference «QUALITY MANAGEMENT: SEARCH AND SOLUTIONS», Shanghai, China, 2016. <http://regionacadem.org>
- [6] IS ISO 22 000 - 2005: Food safety management systems. Requirements for use by any organization working in the food chain – p.44.
- [7] Kanthera V.M., Matison V.A., Sazonov Yu.S. Food safety management systems based on the international standard ISO 22 000 .: Monograph. -M.: Printing house RAAS, 2006.
- [8] Donchenko L.V., Nadykta V.D. Food safety. - Moscow: "Deliprint", 2005. - 521 p.
- [9] Quality systems. Food quality management based on the principles of HACCP. General requirements. ST RK 1179 - 2003. <http://online.zakon.kz>
- [10] Uazhanova R.U., Rosiyanov Yu.F. Monograph.