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Implementação de ferramentas de qualidade em uma indústria de massas alimentícias recheadas

Implementation of quality tools in a stuffed pasta industry

Implementación de herramientas de calidad en una industria de pasta rellena

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Resumo

Este estudo objetivou promover melhorias através da implementação de uma combinação de ferramentas de qualidade (checklists, brainstorming, diagrama de Ishikawa, fluxograma, programa 5S, 5W1H, ciclo PDCA, treinamentos e Boas Práticas de Fabricação (BPF) em uma indústria de massas alimentícias recheadas de pequeno porte, em Maringá - Paraná, Brasil. A indústria está localizada no Noroeste do Paraná, Brasil, e tem uma capacidade de processamento de 5000 unidades de "salgados" por hora. A implementação das ferramentas de qualidade foi realizada de acordo com as etapas do ciclo PDCA. A efetividade das medidas adotadas foi mensurada por meio da comparação do total de porcentagens de conformidades e não conformidades antes e depois da implementação das ferramentas. Os resultados mostraram melhorias nos processos e produtos da indústria, devido ao aumento significativo das conformidades para 79.04%, enquanto antes da implementação das ferramentas era de 56,94%. Portanto, os resultados indicaram que a implementação de ferramentas de qualidade proveu melhorias, à medida que impactou no aumento de conformidades com os requisitos exigidos pela legislação (RDC 275 da ANVISA), bem como mudou a organização geral e qualidade da indústria.

Palavras-chave: Boas práticas de fabricação; Ciclo PDCA; Programa 5S.

Abstract

This study aimed to promote improvements through the implementation of a combination of quality tools (checklists, brainstorming, Ishikawa diagram, flowchart, program 5S, 5W1H, PDCA, training, and Good Manufacturing Practices (GMP) in a small pasta industry in Maringá - Paraná, Brazil. The industry is located in the Northwest of Paraná, Brazil, and has a processing capacity of 5000 units of "salgados" per hour. The implementation of the quality tools was carried out according to the stages of the PDCA cycle (plan, do, action, and check). The effectiveness of the measures adopted was measured by comparing the total percentages of conformities and non-conformities before and after the implementation of the tools. The results showed improvements in the processes and products of the industry, due to the significant increase in compliance to 79,04 %, while before the implementation of the tools it was 56,94%. Therefore, the results indicated that the implementation of quality tools provided improvements, as it impacted the increase in compliance with the requirements required by the legislation (RDC 275 from ANVISA), as well as changed the general organization and quality of the industry.

Keywords: Good manufacturing practices; PDCA cycle; 5S Program

Resumen

Este estudio tuvo como objetivo promover mejoras a través de la implementación de una combinación de herramientas de calidad (listas de verificación, lluvia de ideas, diagrama de Ishikawa, diagrama de flujo, programa 5S, 5W1H, ciclo PDCA, capacitación y buenas prácticas de fabricación (GMP) en una industria de pasta rellena pequeña, en Maringá - Paraná, Brasil. La industria está ubicada en el noroeste de Paraná, Brasil, y tiene una capacidad de procesamiento de 5000 unidades "saladas" por hora. La implementación de herramientas de calidad se llevó a cabo de acuerdo con Pasos del ciclo PDCA La eficacia de las medidas adoptadas se midió comparando los porcentajes totales de conformidades y no conformidades antes y después de la implementación de las herramientas. Los resultados mostraron mejoras en los procesos y productos de la industria, debido al aumento significativo de las conformidades. al 79.04%, mientras que antes de la implementación de las herramientas era del 56.94%, por lo tanto, los resultados indican Estoy convencido de que la implementación de herramientas de calidad proporcionó mejoras, ya que impactó el aumento de conformidad con los requisitos exigidos por la legislación (RDC 275 de ANVISA), así como también cambió la organización general y la calidad de la industria.

Palabras clave: Buenas prácticas de fabricación; Ciclo PDCA; Programa 5S.

1. Introduction

It is known that in the global industrial context, adequate quality control management is essential to ensure the innocuous food production that meets market demands (Tutu & Anfu, 2019). Food safety is defined as the measures practice that controls the entry of any agent that promotes health risk or the consumer's physical integrity. This is an indispensable and mandatory factor for all industries in the food industry, since government agencies such as ANVISA (National Health Surveillance Agency) and Ministry of Agriculture, Livestock, and Supply (MAPA), in Brazil, have specific rules for the correct food handling and periodically inspect and perform inspection audits (Teixeira, 2019).

The quality programs and tools application are essential in the industry, since, from the process analysis, actions can be taken to correct any deviations. Thus, they are important instruments for quality management to obtain maximum efficiency and effectiveness (Kotsanopoulos & Arvanitoyannis, 2017).

In the face of the diversity of quality tools, the most often used by companies from different countries are 5S; 5W1H or 5W2H; Analysis of the Method and Effect of Failures

(FMEA); Benchmarking; Brainstorming; Checklist; Statistical Process Control (SPC); Unfolding the Quality Function (QFD); Ishikawa diagram, flowchart; Pareto's chart; Histogram; Poka-Yoke; Servqual; Six Sigma and Times Quality (Silva et al., 2017).

The maintaining of Good Manufacturing Practices during food processing requires the use of several quality tools (Tutu & Anfu, 2019). Good Manufacturing Practices (GMP) are standardized standards for achieve the identification and quality of a product and/or service in the food area, whose effectiveness is assessed through inspection and investigation (Barbosa et al., 2018). In this context, the RDC Resolution nº 275 of 21 October 2002, is a normative device that approved the regulation on the verification of GMP in producing establishments of industrialized foods (Brasil, 2002).

The implementation of GMP is based on the PDCA cycle, which is a control tool used to carry out a series of activities based on four phases: plan, do check, act. To locate problems, evaluate historical data, check action plans, optimize processes, and facilitate activities for employees (Song & Fischer, 2020). Therefore, the quality tools implementation can be done in four process steps through the PDCA cycle concepts: diagnostic, problem analysis, adjustments execution, verification, and corrective actions. The initial diagnosis stage usually involves the analysis of the establishment for the survey of non-conformities, through the application of visual inspections and checklists based on the country's legislation. Thus, tools such as Brainstorming, Ishikawa diagram, and Flowchart are used in the analysis of problems and 5S, 5W1H, Training, and GMP in the execution of the necessary adjustments, as well as in the stage of verification and corrective actions (Vale, 2019). In parallel, 5W1H means, in other words, (What (what will be done?), Why, Where, When, Who (by whom will it be done?) 1H: (How)) which, despite being very simple, it is well structured and useful, as it offers an adequate planning analysis, to seek solutions to the nonconformities presented (Almeida et al., 2019).

In large companies, the ease of access to quality tools is greater due to the support that the management systems offer. In contrast, micro and small companies, whether due to lack of economic investment and infrastructure, or lack of knowledge of the benefits of these practices, still face challenges in implementing quality management instruments (Curi & Santos, 2006).

In Brazil, the agribusiness chain transformed due to the challenges imposed on the sector, which led the biscuit and pasta industry to restructure, reaching a significant growth in sales in the last two decades due to the expansion of consumption in the domestic market and the expansion of supply via product diversification and differentiation (Lacerda, 2017). It is

worth mentioning that the stuffed pasta, popularly called "salgados", has great acceptance in the country.

In this sense, this study aimed to promote improvements through the implementation of a combination of quality tools in the production process in a stuffed pasta industry, in Maringá, Brazil. For this purpose, it was used the following quality tools: checklists, brainstorming, Ishikawa diagram, flowchart, 5S program, 5W1H, PDCA, training, and Good Manufacturing Practices (GMP).

2. Methodology

2.1. Industry characteristics

The study wasconducted in an industry located in Maringá, in the Northeast of Parana, Brazil. It is small in size (90 m²) with the capacity to process around 5000 "salgados" (in flavors cheese, meat, chicken, pepperoni, sausage, and kibe) per hour and has a team of 8 employees. The production area had the following types of equipment: mixer (Progás, PRMOG-07, Brazil), forming machine (Bralyx, New Duly, Brazil), ultra freezer (Projet, UCP-20S, Brazil), (Qualimax, 10.0, Brazil), cold storage room (Ethiktechnology, 412-TD, Brazil).

2.2. Quality tools implementation

The quality tools implementation was performed by all industry employees, according to the following stages based on PDCA (plan-do-check-action) cycle steps (Table 1).

Table 1. PDCA Methodology.

PDCA	STAGES	QUALITY TOOLS
P	Bibliographic researches	Databases (scholar google, science direct)
	Survey of non-conformities	Visits in loco, visual inspection, and audit
	Data collection	Checklists
D	Problems analysis	Technical report
		Flowchart
		Brainstorming
		Ishikawa Diagram
	Strategies to solve the problems	5W1H
	Implementation of corrective measures	Training with food handlers
	Implementation of necessary adjustments	5S program and GMP
	Standardization	Review and update of SOP* and GMP** manual
	Microbiological water analysis	
C	Check of corrective actions	Data collected before and after the quality tools
		Questionnaire
		Participation certificate
A	A suggestion about the continuous job	Meeting

*Standard Operating Procedures

**Good Manufacturing Practices

2.2.1. Plan

First of all, bibliographic researches about the studied concepts and the tools used were carried out in databases like Scholar Google and Science Direct, to have content's mastery and check what would be possible to implement.

The survey of non-conformities was carried out through on-site visits, through visual inspection, audit with employees, and application of checklists, one based on Regulation nº 275 of the National Health Surveillance Agency (Anvisa, 2002) and other on the 5S program's requirements (Kiran, 2017).

The checklists were analyzed about the conformities, non-conformities, and items that are not applicable given the requirements imposed by the Brazilian legislation. Therefore, the percentages of compliance and non-conformities were calculated using Microsoft Excel 7.0 version 2013 software.

Additional relevant information to the study, such as the opinions and considerations

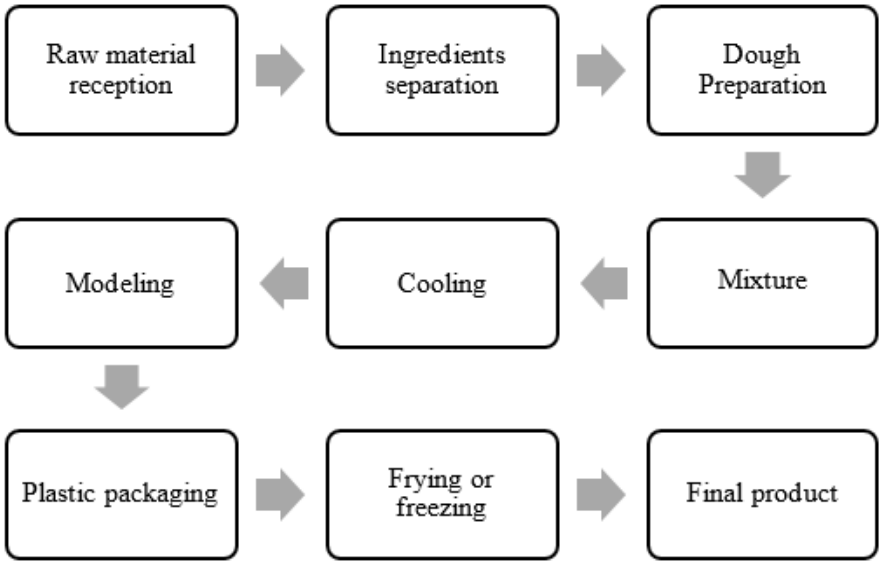
of employees about the work environment was also collected at this stage. Thus, the data obtained were compiled and presented to the company through a report.

2.2.2. Do

Through the checklist data about the raised points of conformities and non-conformities obtained by the planning stage, and from the production process analysis, it was possible to report to investigate with the industry managers, which were the process's critical points of control and thus characterize the main problems.

The flowchart of the company's production process (Figure 1) was used to map the areas that were worked on, the activities are divided into the reception of the raw material, production, and storage.

Figure 1. Flowchart of the company's production process.



Source: Authors.

In this way, meetings with company employees and managers were done and a Brainstorming was applied as an essential tool. Therefore, the Brainstorming was carried out for 1 hour by hearing the involved people in the process (operators and managers), leading to making a list of potential causes.

The Ishikawa Diagram was used to analyze the root causes of the process's problems, which were pointed out through the Brainstorming. In this sense, the problems cause that were organized according to their origins, which are: method, measurement, material,

environment, manpower, and machine (Figure 2).

Besides, to seek the blocking problems, an action plan has been drawn up for each non-conformity according to the 5W1H tool. The type of non-compliance was included, the responsible person for acting, the execution moment, the execution place, why the action should be performed, and how. The action plan was outlined with the participation of industry managers to be in line with the industry possibilities.

2.2.2.1. Implementation of corrective measures

The non-conformities were discussed with the industry employees and, then, training with food handlers was carried out to expose the implementing importance of some quality tools, such as the 5S program and notions of good manufacturing practices, in the continuous improvement process in all sectors of the present unit.

The short course lasted 2 hours and was performed with 8 employees in both the processing area and the sales sector. To prevent the reappearing problems, internal audits were carried out and the results of changes were subsequently released. To maintain quality control in the company and to encourage all the employees to participate, routine visits were made throughout the work.

The 5S program and Good Manufacturing Practices implementation were carried out continuously and gradually during this work. Moreover, the process activities standardization was requested to the administrative sector and the monitoring was under the responsibility of the company owner. During the implementation stage of quality tools, the SOP's (Standardized Operating Procedures) were revised and updated, as well as the Manuals of Good Manufacturing Practices (GMP), aiming to improve production processing.

2.2.3. Check and action

The evaluated conformities verification and the quality tools implementation was carried out by comparing the percentage of data collected before the planning step and after the quality tools implementation.

An evaluation of the company was carried out using a questionnaire, to address how much the employees absorbed the Good Manufacturing Practices since the subject was addressed in conjunction with the concepts of the 5S program and thus, the compilation of the obtained answers in the questionnaire. Finally, a certificate of participation was given to

employees because of the addressed concepts.

2.3. Microbiological water analysis

The microbiological water analysis used in the food production was carried out at different points (taps) of the company, which is the first collection point the bathroom tap, the second one in the production kitchen, and the third in the commercial kitchen. The samples were collected in a sterile flask, kept under refrigeration and they were taken to the laboratory, soon after, microbiologically analyzed in duplicate as to the coliforms number at 35ºC and 45ºC (Brazil, 2003).

3. Results and Discussion

3.1. 5S Program

The 5 senses of the 5S program were evaluated before (planning stage) and after the implementation of the quality tool, according to the requirements established by the checklist.

According to the results obtained, all senses had their requirements improved after the application of corrective measures in the industry. The increase in conformities was significant since before the application of the 5S program there was 22.4% and then 67% of conformities were obtained concerning all senses in general (Table 2). Therefore, it is understood that the sense of use, ordering, and self-discipline represented the lowest compliance rates before the implementation of the 5S program.

Table 2. Percentages of compliances before and after implementation of the 5S program.

Percentage of Compliances (%)		
Senses	**B5S**	**A5S**
Use	17	68
Ordination	8	72
Cleanliness	38	73
Health	42	63
Self-Discipline	7	59
Average	22.4	67

*B5S - average percentage of compliance before the 5S program implementing. * A5S - average percentage of conformities after the 5S program implementation.

Also, the non-conformities description was performed for better detail of the collected information by the application of the checklist (Table 3). It is noticed that before the 5S tool implementation, the quality of the industry's working environment and productivity was compromised. In this sense, about the sense of health, the inadequacy of personal protective equipment (PPE) was observed, in addition to the lack of emergency exit and risk maps in production.

The sense of discipline analysis showed, among other points, as the disorganization of industry records and documents implies failures in quality assurance and, consequently, directly impacts the continuous improvement process.

In parallel, the non-conformities found in the cleanliness sense, such as some moths on the walls and flies in the environment, the trash without a lid, and the storage of dangerous foods are considered risks in the quality food production (Table 3). Failures in hygiene cause Foodborne Diseases and the presence of insects in the environment put consumers' health at risk (Anversa et al., 2020).

In this way, the obtained results by the senses of use and ordering showed how much they can negatively affect the quality of the produced products, as it was observed the presence of furniture and equipment (cabinets and refrigerators) not used in the manufacturing process, which can result in flaws in the process. Besides, the lack of order in productivity can generate a misunderstanding by some food handlers.

Table 3. Non-conformities found in the industry and corrective measures based on the 5S program.

Senses	Non-conformities	Corrective measures
Health	Inadequacy of PPE.	Agreement with management, to purchase tapes and identify important locations and seek training for the extinguisher.
	Incomplete uniformization.	Exchange of instructions and instructions for employees
	Incorrect use of caps.	
	No risk maps, emergency exits, and fire extinguishers in production.	
	Use of sharp knife to stir the dough	
Self-discipline	Disorganization of the document control folders.	Awareness meeting with management to remain the organization of document folders.
	Flies in the food handling environment.	
	Employees do not know about company policy.	Meetings and training to review company policy and quality programs.
	Non-applicability of quality programs.	
	There is a lack of internal meetings with employees.	
Cleaning	Moths on the walls.	Application of cleaning schedule and adjustment of routine.
	Trash without a lid	Acquisition of suitable bins for use.
		Awareness of employees through training and organization.
Use	Refrigerator not working.	Change to new equipment and dispose of useless ones.
	Broken containers.	
	Outdated and useless spreadsheets.	Update of spreadsheets and transfer to employees.
Ordination	Lack of identification in all areas of the company.	Identification of areas
	Unidentified drawers, cabinets, and shelves.	Identification to facilitate the use of employees;
	Joint storage of packaging for food and cleaning products.	Separation of cleaning products and places in an identified place.
	Disorganized benches and tables.	Organization and awareness application through training.

Source: Authors.

According to the NBR ISO 9000: 2008 standard, quality is the totality of the characteristics of an entity (process, product, organization) that gives it the ability to make the needs explicit and implicit, that is, it is the suitability for use (Conterato & Castro, 2016).

Tonon et al. (2018), implemented the 5S quality system, as a tool for improving a meal service at a private school in a small city in São Paulo and found that the tool made it possible to improve quality service, in addition to greater profitability and well-being of employees.

3.2. Good Manufacturing Practices

To check the adequacy regarding the implementation of Good Manufacturing Practices, of 164 items were evaluated following the Brazilian legislation, using the checklist requirements of resolution RDC 275 of 2002 from ANVISA, which aims to meet the appropriate hygienic-sanitary conditions for the production of safe foods (Brasil, 2002).

According to the diagnosis made before the implementation of Good Manufacturing Practices, the industry under study was at 56,94% in compliance with the legislation.

Among the questions that make up all sections of the checklist (Table 3), 20 items did not apply to the establishment, thus, the results were analyzed based on the remainder, 144 questions. Given this, the items 'building and facilities' and 'food production and transportation' were the ones with the highest non-conformity rates. The percentage of non-conformities concerning Good Manufacturing Practices is shown in Table 4.

Table 4. Percentage of non-conformities about Good Manufacturing Practices.

Rated item	Percentage of non-conformities before (%)	Percentage of non-conformities after (%
Building and facilities	18,75	12,50
Equipment and furniture	4,86	0
Handlers	5,55	1,38
Food production and transportation	9,0	5,0
Documentation	4,9	2,08

Source: Authors.

In another investigation, Tutu & Anfu (2019) evaluated 200 companies from the home-based food industry in the ten regions of Ghana (Africa) and reported that 84% did not have any form of food safety management system. Companies that had some form of Food Safety Management System were operating based on ISO 22000 (0.5%) or Good Manufacturing Practices (15.5%).

In this way, a checklist was created to address non-conformities and corrective measures implemented to maintain Good Practices (Table 5). As these results show, many

items needed for some adjustments to reduce hazards that would compromise food safety, employee health, and quality parameters. As an example, in the item "building and facilities" there were physical facilities such as unhealthy windows and doors, with cracks, peeling, and the floor did not allow water to drain into the drain. Thus, all relevant and influential aspects of maintaining good practices are covered in Table 5.

Tutu & Anfu (2019) reported that the main challenges faced by small food companies in implementing the Food Safety Management System are the result of inadequate knowledge about processes that have implications for food safety as well as infrastructure and proper handling of food equipment. processing plant.

On the other hand, in a study conducted by Kipper et al. (2019), verifying the hygienic-sanitary conditions and food handling through checklists in food trucks in Santa Catarina (Brazil), it was found that the hygienic-sanitary conditions of mobile kitchens are unsatisfactory, requiring more intense inspection.

Table 5. Industry non-conformities regarding GMP during the diagnostic stage and the corrective measures implemented.

Rated item	Requirements	Non-conformities	Corrective actions
Building and facilities	The internal and external areas must be free of objects in disuse or foreign to the environment.	Objects in disuse in the external area.	Passed on to the board and carried out the removal of objects, destined for disposal.
	Physical installations such as floor, wall, and ceiling must have a smooth, waterproof, and washable coating. They are intact, kept free of cracks, infiltrations, and peeling. The external openings must be provided with millimeter screens.	Window screens with holes.	Changing screens for windows.
	When present, drains must be siphoned, and the grids must-have devices that allow them to close.	Rusty and peeled external doors.	Covering the surface with lubricating liquids and sanding the surface.
		Open drains, without closing system.	Installation of siphon drains and grids in suitable locations.
Equipment, furniture and fixtures	Equipment, furniture and utensils that come into contact with food must be of a material that does not transmit toxic substances, odors or flavors. They must be kept in an adequate state of conservation and resistant.	The utensils are mostly plastic.	Replacement of the most used utensils with stainless steel ones.
	Periodic maintenance of equipment and utensils, as well as calibration of instruments and recording of the performance of these operations.	Temperature recording worksheets are not used.	Deployment of spreadsheets in a visible place and insertion of a schedule for recording the temperature.
Establishment hygiene	The cleaning must be carried out by proven employees.	- There is no one responsible for hygiene operation.	It was suggested to hire a person focused on cleaning, outsourced employment agencies.
Handlers	Health control of handlers must be registered and carried out in accordance with specific legislation	There is no periodic supervision of the health status of the handlers.	Suggestion for a Medical Occupational Health Control Program.
	Manipulators must have personal cleanliness, presented in clean and preserved uniforms.	Uniforms not compatible with the activity.	Survey of appropriate uniforms and footwear and transfer to the board.

	Food handlers must be trained periodically in personal hygiene, food handling and foodborne illness	Absence of a continuous training program.	Suggestion of establishing a training routine at least once a year for GMP.
	Raw materials, ingredients, and packaging must be inspected at reception.	Raw materials, ingredients, and packaging are not inspected at the reception.	Creation of a spreadsheet for monitoring the receipt of perishable products.
Food production and transportation	Raw material labels and ingredients must comply with the legislation.	There are no standard labels on the packaging.	Creation of standard labels, and insertion in packaging.
	There must be quality control of the final product.	Quality control of the final product is not applied.	A suggestion of some simple initial controls to suit the routine.
Documentation	Described POP must be fulfilled.	Outdated POPs	Necessary updating of POPS and transfer to employees through training, in addition to the insertion of management staff insight.

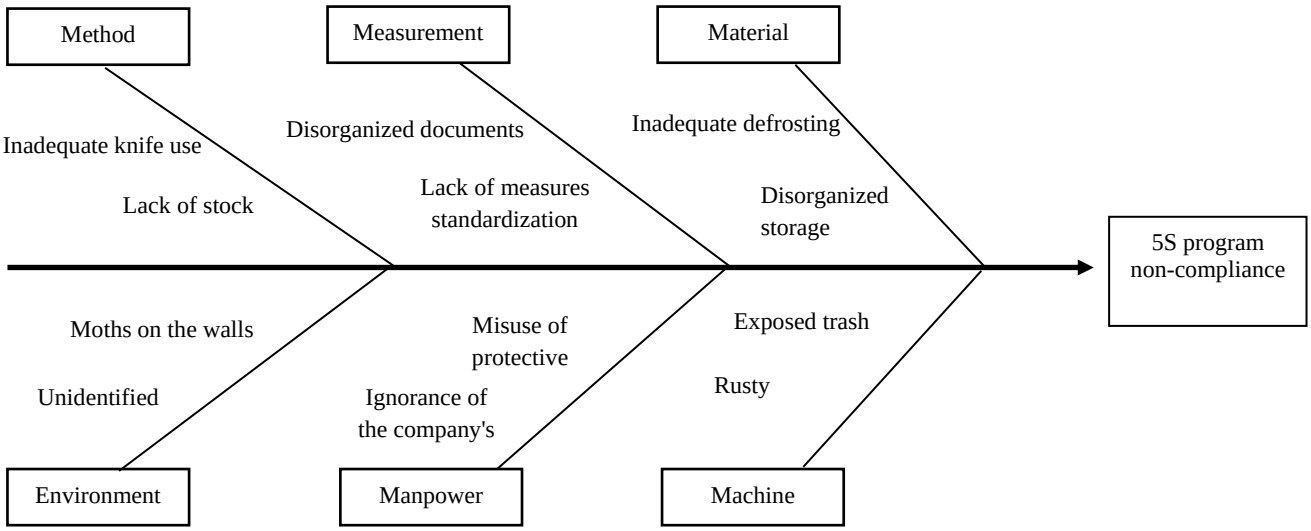
Source: Authors.

In this context, the industry can be classified in group 1 (76 to 100% of the items in the RDC 275 ANVISA checklist) with 79.04% of compliance with the legislation after the implementation of quality tools.

3.3. Ishikawa Diagram

From the evaluations of the points raised of conformities and non-conformities, and from the analysis of the production process, an Ishikawa diagram was drawn and analyzed, to investigate which were the critical points of control of the process and thus characterize the main problems (Figure 2).

Figure 2. 5S program non-compliance Cause-Effect Diagram.



Source: Authors.

According to the information raised by the diagram, it was noted that the main possible causes of the existing problems were related to non-compliance with the parameters described in the 5S program and the requirements of Good Manufacturing Practices (GMP).

The Cause-Effect Diagram, also known as the Ishikawa Diagram or Fishbone Diagram is, by definition, a tool that analyzes hazards at all processes stages (Varzakas, 2016). Da Silva et al., (2018) evaluated the causes of excessive queuing time in a university restaurant through the application of the Ishikawa diagram and obtained through the diagram analysis that it is an applicable method to the problem and it shows satisfactory results, a practical and visual way to show what are the causes of the problem.

Therefore, the breakdown of the diagram in families (6M´s method) allows us to check quickly and systemically the precursor causes of the problems in question.

3.4. 5W1H

From the data mentioned, action plans were drawn up with the 5W1H tool (Table 6).

Table 6. An example of an action plan elaborated for each non-conformity detected after the initial diagnosis.

5W	What?	Provide complete uniformity of employees
	Where?	Everywhere in the industry
	Why?	The uniform is a barrier between the manipulator's body, the manipulation environment, and food.
	When?	When it is possible
	Who?	Industry owner
1H	How?	Address the importance and function of personal cleanliness so that the owner buys the complete uniforms.

Source: Authors.

From the action plan, it was possible to establish actions to reduce the non-conformities found (Table 6). It was possible to carry out most of the proposed activities, however, those that required greater investment, external techniques, authorization from municipal agencies, among others, were highlighted and suggestions were made on possible procedures.

In summary, the action plan implemented through the 5W1H tool was essential for the execution of the necessary adaptations for the industry's compliance with the legislation in force.

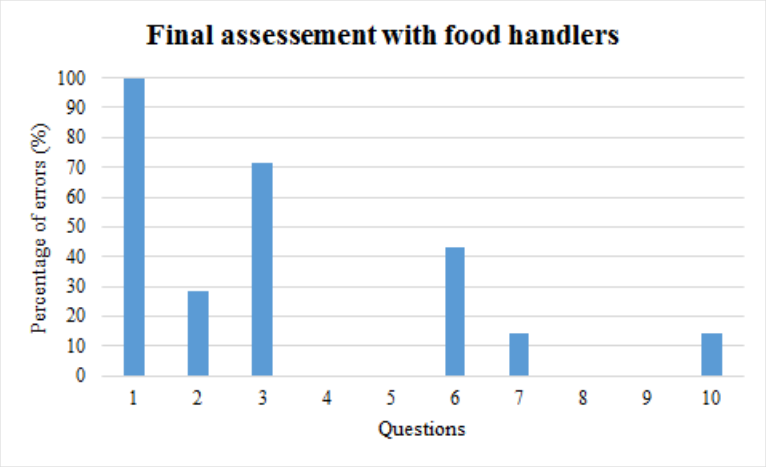
3.5. Training and final assessment

From the data obtained, it was possible to assess that the level of knowledge of employees about Good Manufacturing Practices is still low, which implies the need for intervention through training with greater frequency. Moreira et al. (2019) evaluated cassava processing industries and presented unsatisfactory results after the application of the Good Manufacturing Practices Checklist (LVBPF), requiring more effective action by regulatory bodies in the inspection of activities and joint actions with the owners of the agro-industries to obtain better quality and food-safe products.

It was observed that several participants had little or no knowledge regarding more specific items assessed in the questionnaire. The questions analyzed were: 1. Can food contamination by mold cause disease? 2. Is it ideal to buy, prepare large quantities of food and save leftovers to consume after a few days?; 3. What would be the proper way to defrost food?; 4. Check the correct alternative on the types of meat that we can find cysticerci such as solitary or tapeworm; 5. Which products are most suitable for washing fruits and vegetables?;

6. Is it advisable to wash all types of meat before preparation?; 7. When should the establishment's doors and windows be cleaned?; 8. When cleaning the channels and drains, at what time? 9. Check the correct way to manually clean utensils and store them; 10. When receiving food, it is important to evaluate what?

Figure 3. Final assessment about Good Manufacturing Practices.



Source: Authors.

Besides, those with the highest percentage of errors were number 1 (related to microbiological aspects), 3 (cold chain concepts), and 6 (correct pre-preparation of food). Therefore, with the application of the evaluation, it was clear that the training of the company's employees must be carried out continuously and is more than fundamental since competitiveness in the food sector is one of the factors to be considered when investing in training. , and more, the awareness of those involved in the process is essential for the successful implementation of quality control tools. Purwantiningrum et al. (2018) reported that it is challenging to improve food security in developing countries. How Good Manufacturing Practices is one of the prerequisite programs that must be applied before implementing food security.

3.6. Microbiological water analysis

The result of the microbiological analysis for the water samples was obtained by the research of coliforms at 35 and coliforms at 45 ºC for the water samples, it was negative in the 3 samples from 3 collection points of the company, the first being the bathroom tap, the

second the production kitchen and the third kitchen sales area of fried "salgados". Therefore, the water used is of quality and does not pose any risk to the consumer. The microbiological water analysis in the food industry is very important because it is used in the food production, so it must guarantee that it will not be a contamination way for some bacteria and viruses that cause diseases, for example, diarrhea, anxiety, and vomiting to consumers (Simensato & Bueno, 2019).

4. Final Considerations

Therefore, this study proved to be propitious and successful since all the quality tools applied in the company significantly helped in increasing the compliance proportion with the requirements required by legislation, concerning the dynamics of the quality control cycle in institutions providing food services.

Finally, the need to implement the quality tools addressed is indisputable, considering that it is only possible to reach a maximum stage of total quality management if the prerequisite programs are at acceptable levels of effectiveness. Besides, it is worth mentioning that, it offered guidance to the microenterprise for the development of a quality management system and showed paths to its sustainable success.

As a suggestion of future studies, it is indicated to monitor the development of good practice in the company's daily routine to maintain the commitment to the results achieved.

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