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Artículo Original

Quality Pizza: tools applied in Teresina-PI industry

Pizza de calidad: herramientas aplicadas en la industria Teresina-PI

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Abstract

The management of consumption of inputs and raw materials is essential to ensure quality and reduce costs. Firstly, an observation and verification was made to identify the origin of the leftover sausage-like input, in order to eliminate or minimize them, observing a possible reuse of the leftovers. Then, the causes of the stock of leftover "calabresa" were identified and a new application was proposed in the process for this input, developing a flowchart for improving the application process and the final destination of the input. The tools used were: Ishikawa diagram, PDCA cycle, 5S Methodology and company spreadsheets. Goals were set for losses, such as reaching a maximum of 1% daily of "calabresa' losses, establishing a model of control sheet for losses of inputs. In the collection and analysis of the data, it was followed respecting the RDC nº 216/2004, which provides for the Technical Regulation of Good Practices for Food Services. A new pizza flavor was introduced and approved for commercialization. In view of the results, it was possible to execute what was proposed, together with the company's quality control.

Keywords: Ishikawa diagram, quality tools, PDCA, pizza

Resumen

La gestión del consumo de insumos y materias primas es fundamental para asegurar la calidad y reducir los costos. En el presente trabajo primero se realizó una observación y verificación para identificar el origen de los sobrantes de insumos tipo salchicha, con el fin de eliminarlos o minimizarlos, observando una posible reutilización de los sobrantes. Luego, se identificaron las causas del stock de sobras de pepperoni y se propuso una nueva aplicación en el proceso para este insumo, desarrollando un diagrama de flujo para mejorar el proceso de solicitud y el destino final del insumo. Las herramientas utilizadas fueron: diagrama de Ishikawa, ciclo PDCA, Metodología 5S y hojas de cálculo de la empresa. Se establecieron metas para las pérdidas, como alcanzar un máximo del 1% diario de pérdidas de pepperoni, estableciendo un modelo de hoja de control por pérdida de insumos. En la recogida y análisis de los datos se siguió respetando el RDC nº 216/2004, que prevé el Reglamento Técnico de Buenas Prácticas para los Servicios Alimentarios. Se introdujo un nuevo sabor de pizza y se aprobó para su comercialización. A la vista de los análisis, fue posible realizar lo propuesto, junto con el control de calidad de la empresa.

Palabras clave: Diagrama de Ishikawa, Herramientas de calidad, PDCA, Pizza

1. Introduction

The application of quality tools leverages the performance and competitiveness of the organization, for the products and or services offered meet the customer's quality requirements. Therefore, implementations of quality tools provide customer satisfaction and reduce operating costs, minimizing losses and optimizing the use of own resources [1].

The present study focuses on the applicability of quality tools in a pizza industry Teresina-IP. The objective is to minimize the defects in the pizza making process that lead waste called "tips calabresa." The "calabresa tips" are cuts that do not fit the standard adopted by the company for the filling of the pizzas, causing the accumulation of this material in the company's frozen chamber and taking up unwanted space.

Thus, the continuous application of quality tools as part of the standard operating procedure (POP), reinforces the benefits of continuous improvement for the organization's processes and activities, so in this work the quality tools provided an analysis of the problem data which was identified by PDCA. Through the detailed analysis and detailed in-depth discussions on the results it was possible to identify the critical points of the defects to then build the diagnosis of the current situation and define what actions are needed to remedy the non-compliance. The relevance of this work is due to the fact that the pizzeria market in Brazil is growing exponentially, since this market generates R $ 22 billion per year, which is equivalent to the production of 1 million pizzas made per day in the country, therefore it is essential to identify and analysis of quality defects in this manufacturing sector [2].

The work is structured in a simple, concise and dynamic way in the following topics: Introduction, literature review with the definition of the concepts of the quality tools applied in the article, then the methodology, results and discussion with the weightings and inferences of the results achieved with the main recommendations and suggestions about the data and information collected and how to close the topic of the conclusion with the suggestions for the continuity of the work.

2. Materials and Methods

Ishikawa diagram

It is one of the best known tools in quality management. The name refers to the Japanese engineer Kaorou Ishikawa (1915-1989) who created the diagram in 1943, in order to demonstrate the relationship between the effect and its possible causes [3]. The diagram is also known as cause and effect diagram or fishbone; define opportunities for improvement and what effects these points can have on the quality of a service or product [4].

The Ishikawa diagram is recommended to identify the possible causes of the selected defect, using the 6M methodology which means that the causes are related to the spines which are: method, material, labor, environment, measure and machine. It is a graphic form used as a methodology to search for the origin of non-conformities and their interrelationships in a process through the analysis and hierarchical representation of the causes of a certain defect (effect) [5].

Ishikawa diagram allows complex processes to be divided into simplified processes logically and in order of importance the causes that contribute to a problem, making them more controllable. This means that the effect would be divided into several other minor problems, that is, each cause would be studied individually and more specifically in a new diagram, thus increasing the view of the problem, enriching its analysis, making it easier to solve it [6].

The ishikawa diagram can be used to check and identify the factors that will influence a job to be done / performed, as a proactive way to anticipate problems and challenges. [7].

With simple logic flow shows the causes that lead to an effect, if negative, the causes can be eliminated and if positive, can join consistency in the causes that ensures continuity and standardization. The causes of the problem can be organized, according to the use of the so-called 6M's, method, raw material, machine labor, measurement and environment [8]. Figure 1 exemplifies the cause and effect diagram with the 6M in practice.

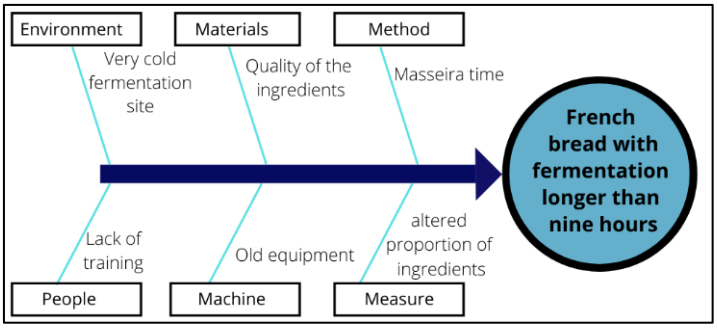

Fig.1 Example of Ishikawa Diagram using the 6M

The diagram can be applied in several areas by sharing knowledge about the problem and encouraging team members to visualize at the same time the possible causes of a problem in the process. Some situations may involve defect analysis, losses, failures among other product demand problems, the diagram provides further discussion on the s ituation that must be maintained or eliminated [3].

The Ishikawa diagram is a visual and graphic tool; this practicality facilitates the understanding of the process by everyone in the company and contributes to the improvement of the process, helping in making decisions around it [4]. It is a tool that can be adopted to raise the level of understanding of the people in decision-making, for the solutions of the problems and it is also possible to detail its causes, until a root cause [3].

PDCA cycle

In essence the PDCA cycle is continuous improvement process, it is used more for productive process environments, but that does not stop it from being used in other situations or environments, the letters show each step of this method where P (Plan) means planning, D (Do) Execution, C (Check) Control and A (Action) action [9].

P - Planning: this step consists of establishing goals and methods to achieve the proposed objectives.

D - Execution: perform the tasks created in the planning; collect the data that will be used in the next step in the process

C - Control: in this step it verifies, analyzes, effectively implements and controls according to the established goals

A - Action: here it is to act in the process according to the results, which may adopt as standard, or change the actions necessary to achieve the objectives.

The PDCA tool helps in improvements that have their results monitored through indicators, which are discussed and analyzed, can be started again by another PDCA cycle with suggestions for improvements that appeared in the first cycle [10].

The PDCA Cycle is also called the Shewhart Cycle, the creator engineer Walter Andrew Shewhart (1891-1967) or Deming Cycle, to honor the famous “guru” of quality, referring to William Edwards Deming (1900-1993) who popularized this tool [9]. This tool helps to understand problems and how

to be solved; its continuity contributes to the development of processes. Applying this tool to improve customer service, it minimizes failures and modifies the routine in companies [11]. It is possible to observe the PDCA cycle in Figure 2.

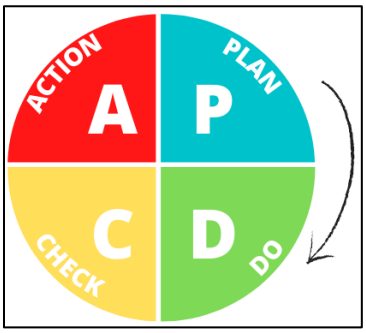

Fig.2 PDCA cycle

5S Methodology

At the end of 1950, the 5S methodology began to take over Japanese organizations after World War II with few natural resources and with the aim of contributing to the country's reconstruction process, the Japanese needing to rescue the image of the defeated country and using the minimum of possible resources to transform it into a force and regain it, seeking to value the population's self-esteem [12].

The 5S program includes a series of practices that the Japanese used in order to implement total quality, with the understanding that it would be a low-cost and effective tool. Thus, it was applied after the Second World War so that the country could realign itself in the midst of the crisis [13].

The 5S can be defined as a set of five simple concepts that, if practiced, are able to modify the desktop, targeting the best possible way the routine activities and attitudes of the people involved, functioning as a good way to start improving routine management [14].

The 5S program has as its main objective to propose the change of people's behavior, providing a total reorganization of the work environment, elimination of materials that are not being used, identification of materials, constant cleaning and the construction of an environment that provides physical health and mental and maintenance of the implanted order [15].

The 5S methodology is geared for efficiency, aimed at implementing changes in organizational culture at work and standardization of work detailing each activity, including motivational aspects, waste disposal, cleaning, organization and discipline [16]. The 5S has been applied with total quality methodologies, named for the five Japanese words that begin with the letter S: Seiri, Seiton, Seiso, Seiktsu and Shitsuke, which translated into Portuguese means use, organization, cleanliness, standardization and discipline, respectively [12].

The first S is the Sense of Use, where it concerns to identify what is and what is not necessary for the execution of the work, only those that are necessary for a certain work should remain. The second S is the Sense of Organization, where you must put in order and in an appropriate place what is necessary to carry out the work. In the third S comes the Sense of Cleanliness, as the name implies, cleaning the environment and keeping the environment clean for everyone. In the fourth S is the Standardization of sense, which means the implementation and standardization with discipline, in order to make the employees are aware of these practices and transform these new practices into everyday practices. The fifth S presents the Sense of Self-Discipline, which is the completion of the four other previous senses, so it is necessary that each person in the work environment has the determination and commitment to assume from now on [16].

The 5S brings several benefits to the company, such as improved safety, improved quality, increased efficiency, increased level of consumer satisfaction, reduced costs in the state, improved team spirit and the work environment and visual aspect of the environment, which allows the evaluation of each area through predefined attributes within each sense [17].

As a methodological approach, a qualitative and quantitative approach was used for the collection and general treatment of the collected data, with a greater qualitative focus, going through descriptive and analytical research, with a transversal temporal perspective. A unique case study of an industrial organization in the food industry that works with pasta production was used as one of the focus products: pizza (or pizza dough) where the quality tools were applied. Data collection was done through documentary research of data, information and company documents, in addition to direct observation of the location, production process and environment in general. After collection, the data were subjected to detailed analysis and inferences realistic for later consideration.

3. Results and Discussion

It was found that the company dealt with in this study is using the leftovers of inputs called "calabresa tips" in an inefficient way. These leftovers are nothing more than the leftovers of the calabresas that do not come out in the standard when processed or cut for the filling of the pizzas, thus accumulating the leftovers in the company's frozen chamber in large quantities and taking up unwanted space.

Based on this problem, the tools described in the theoretical framework were used to find solutions to the problem described. Thus, it sought to verify the origin of these leftovers. Then the possibilities for improvements were observed that could be implemented in order to eliminate the identified problem. Finally, a process improvement flowchart was created, showing the best way of final disposal of the input so that it tries to be solved or to reduce the leftovers, together with the analysis of a better use for those that are already stored, either with sales, donation, reprocessing or new product.

In the management of control of inputs currently in the company has been changing little by little, with the daily control being done, by spreadsheets and being launched in Excel and stored in the cloud for access and control of everyone involved in the production of the factory. Figure 3 shows the input loss control spreadsheet model that is currently being used, where the ground loss is the loss that can no longer be used and the clean loss is the one that we will analyze and give a better disposal.

From the daily input of loss control spreadsheet (Figure 3) which was presented to the manager, it started the use of PDCA. Firstly, goals were set for the losses, looking for a maximum of 1% daily losses of "calabresa", looking for the causes that may be causing the constant problems and presenting solutions.

The data were collected and the cause and effect diagram was applied to find out what eventualities and problems exist, as shown in Figure 4. And, with that, subsidize the presentation of solutions to try to solve the problem of large losses of "calabresa".

Several possibilities for improvement were found according to the cause and effect diagram. The first to be done was the storage of the inputs in the correct way and in the right place, as there were inputs in the wrong places, such as the "calabresa" itself, which must be kept under refrigeration at temperatures below 5ºC, or frozen at the same or lower temperature. The 18th, in a freezing chamber or freezer according to RDC nº 216/2004, which provides for the Technical Regulation of Good Practices for Food Services, of the Ministry of Health of Brazil.

DAILY INPUT LOSS CONTROL		
DATE	LOSS (GROUND) KG	LOS (CLEAN) KG
RESPONSIBLE: GUILHERME FERNANDES OBS: REGISTER ALL THE INPUTS THAT WERE DISCARDED ON THE DAY		

Fig.3 Daily input loss control

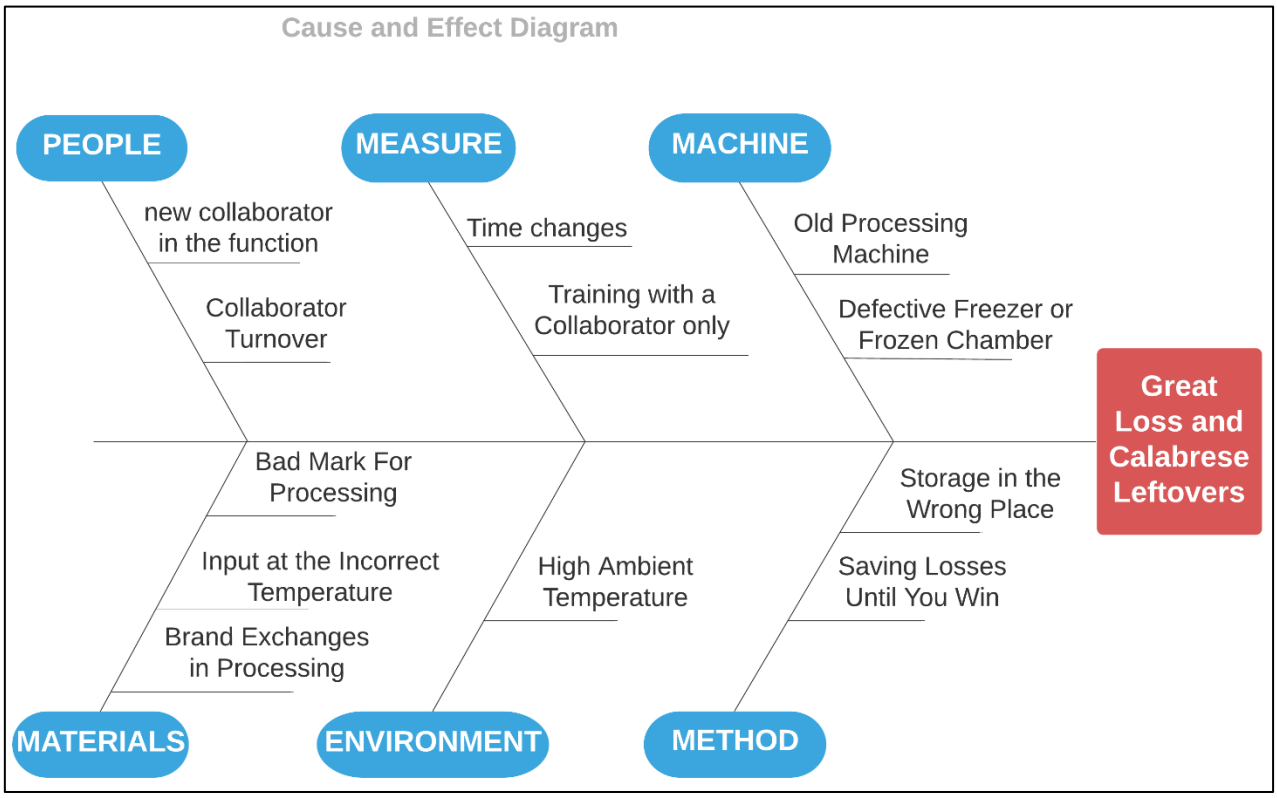

Fig.4 Cause and effect diagram of the losses of Calabrese

The brands that presented the most problems were analyzed and returned to the suppliers for not using them in the future, checking the temperatures and if they needed maintenance of the chambers

and the freezer, maintenance of the "calabresa" processing machine, also the maintenance of the air conditioner that it had not been executed for 2 months, and its period according to the manual is every 1 month.

The training of employees was applied only to those who would carry out the processing from now on, it was clarified that the processing of a brand must be done from the beginning of the day to the end for a better control, oriented towards cleaning the place applying the 5S methodology focusing on the processing sector, at the end of the working day and only processing the input when it is at the correct temperature, always trigger the company's quality control when there is any doubt or any other problem with the input in general.

The old process was presented to the manager as shown in Figure 5 and given a suggestion of use for the leftover "calabresa" that was stored in the frozen chamber until it expired and were discarded.

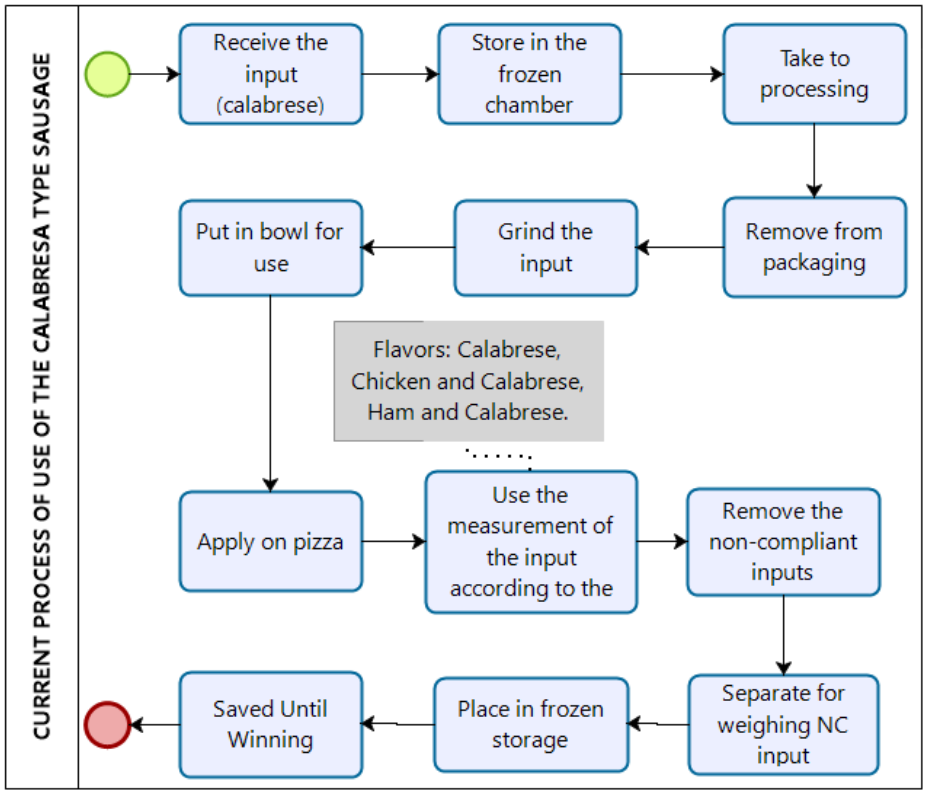

Fig.5 Old process of using Calabrese type sausage

A new process was tested and presented for the "calabresa" input (Figure 6) and a new pizza flavor called "Pizza Toscana or Pizza Festa" that contains sauce, mozzarella, crushed "calabresa" (leftovers), corn, olives and oregano.

The pizza party is currently being sold at the direct sales branches of direct sales to the final consumer with the so-called pizza festival, presented on October 13, 2020 with advance sales and closed on October 21, 2020, all units have been sold. Pizzas in the branches before the closing date.

The new pizza flavor was accepted by the customers of the company's own direct sales store to the final consumer, with positive feedback on the taste, price and quality of the product that met and exceeded customer expectations, with which the company will hold another festival again as quickly as possible to remove more inputs from the factory, not letting the quality standard drop, remaining a company that satisfies the customer and remains a quality company [18].

With the control and application of the objectives and goals established in the planning, in the first month of reaching the goal of 1% daily of the losses of "calabresa" over the days as shown in graph

1 below, and application in pizzas and adopted as standard the control of daily input losses (Figure 3) and the application of the new process of using “calabresa” sausage (Figure 6).

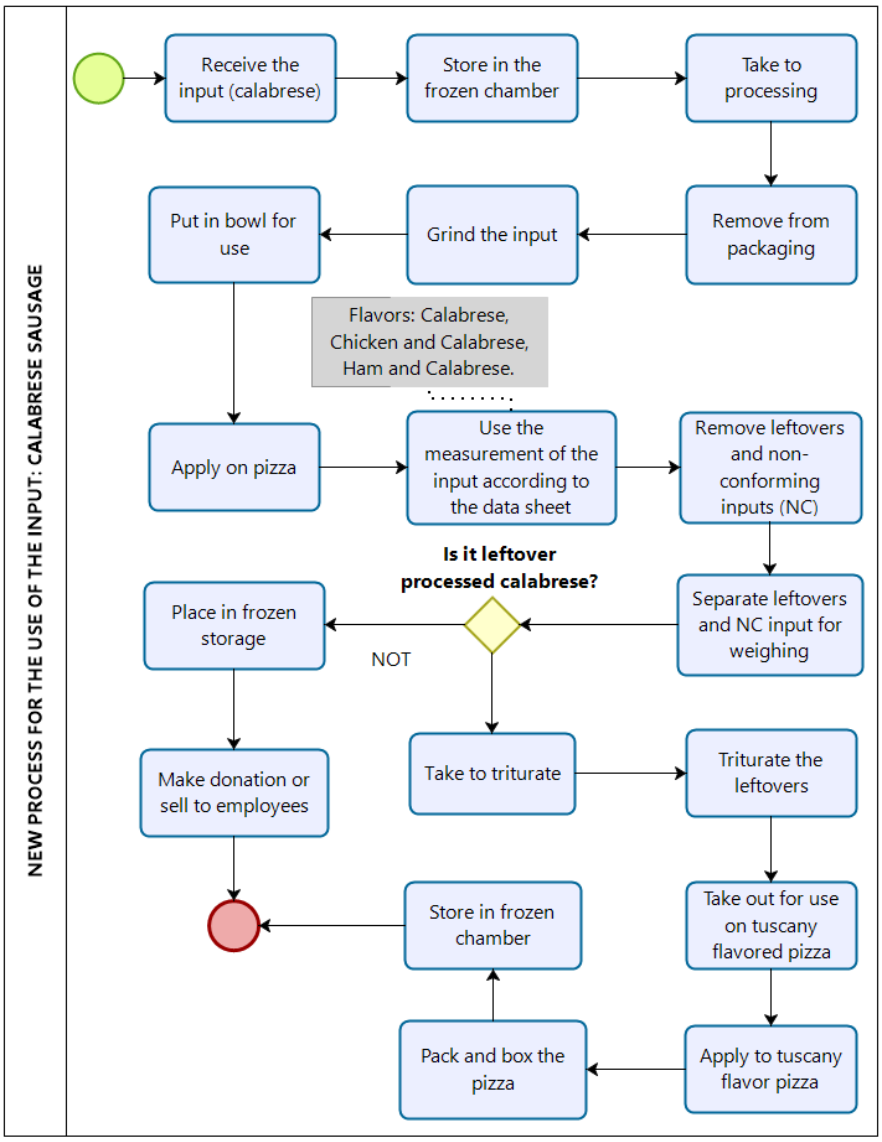

Fig.6 New process for using Calabrese sausage

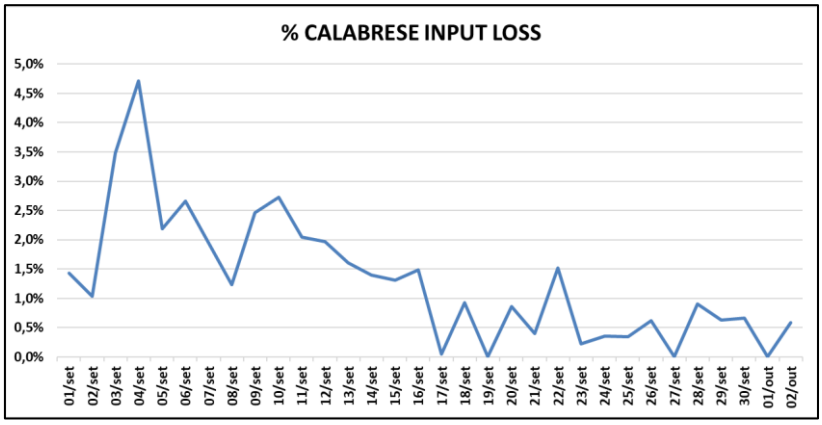

Fig.7 Calabrese input losses in the months of September and October 2020

It is noticed that there was a small change on September 22 to 1.5% loss, caused by a test carried out by the quality control and the purchasing sector, of a sausage brand of the “calabresa” type that it was not approved for use, but when it returned to the next day's frequent use mark, it had already returned to the goal of 1% daily loss of input.

4. Conclusions

In view of the analyzes, it was possible to execute what was proposed, how to identify the causes of the problem in question, propose a better use of the input and directly a new form of profit for the company and presenting a new process in the destination of the input. This study can be extended to other companies in the pizzeria business, as there are similar difficulties in the pizza manufacturing process. Therefore, it is recommended to standardize the use of quality tools, defining them as routine procedures.

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Conflict of interests

The authors declare that there are no conflicts of interest.

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