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Waste Identification and Root Cause Analysis in the Roasted Onion Seasoning Production Process at PT. AFI

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Abstract

PT. AFI is a manufacturing enterprise that manufactures a variety of seasonings, including roasted onions. The organization must consistently manufacture high-quality items by optimizing production outcomes and enhancing productivity. Nevertheless, waste impedes the company's efficiency in executing its production processes. Waste potential can arise in any company activities, as evidenced by PT. AFI's experience. This study seeks to detect and analyze waste generated during the production process of roasted onion flavoring. The waste manifests as poor products, transportation inefficiencies, unnecessary movement, and idle time. This article employs seven tools and a fishbone diagram as its methodology. The identification results indicate that the waste from defective items in production totals 7.25 kg. Furthermore, a transportation activity method necessitates a total duration of 30.52 minutes. Furthermore, excessive mobility during the production process is documented at 19.14 minutes. The identification results indicate multiple elements contributing to waste, including personnel, machinery, processes, materials, and environmental conditions.

Keywords: *manufacture; seasoning; waste, roasted onions; production.*

1. Introduction

The industrial world is experiencing intense competition with the development of the fourth industrial revolution. For businesses to survive and achieve peak success, several factors must be considered. Competition is related to a company's success in facing market competition. Consequently, the redesigning process for industrial systems requires the availability of useful tools [1]. The Indonesian food sector continues to grow rapidly with the increasing demand for delicious, nutritious, and easy-to-prepare food. The food seasoning sector is crucial to meet this need. Demand for food seasonings is increasing along with the growth of the Indonesian food sector, because spices play a crucial role in influencing the taste, aroma, and quality of a food product [2].

The use of spices has a significant impact on the taste of a dish. Spices are typically made by combining several spices and processing them through several stages to create unique flavors and aromas. Consequently, both at the household level and in large-scale companies, the food seasoning sector is crucial to the growth of the Indonesian food industry [3].

Businesses must always maximize production output and high productivity to produce high-quality goods. However, one challenge to a business's ability to operate its production is waste. Waste is defined as activities that do not add value along the process flow from input to output, according to Gaspersz [4]. Material resources, time, and capital are all wasted, resulting in direct and indirect cost losses. Overproduction, waiting time, excessive transportation, nonconforming goods, excess inventory (unnecessary inventory), excess movement (unnecessary movement), and product defects are all examples of production waste.

In the manufacturing sector, enhancing production processes is essential for improving corporate competitiveness [5]. A primary difficulty encountered is waste, manifesting as non-value-added activities, excessive resource consumption, or inefficiencies in the production process [6]. This waste immediately increases operational expenses, reduces productivity, and creates discrepancies between actual output and established targets [7]. In response to these issues, numerous organizations are adopting the lean manufacturing methodology, a management system aimed at enhancing efficiency by eliminating non-value-added tasks and

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optimizing the production process [8]. By understanding the categorization of each action, organizations can enhance production processes by eliminating unnecessary waste and developing more efficient improvement plans [9].

Seasoning is a fundamental flavouring utilized to augment the taste of foods, comprising one or more spices [10]. Indonesian cuisine is abundant in spices, mirroring the varied cultures and customs of the archipelago [11]. Zarwinda and Elfariyanti assert that contemporary society predominantly favors fast meals, prompting individuals to expedite food preparation while maintaining flavor satisfaction [12]. In response, ready-to-use seasonings are now offered in paste or powder form for a variety of foods, including soto (Indonesian soup), rawon (Indonesian beef stew), fried rice, and Balinese spices [13]. Alongside commercially packaged seasonings, numerous wet instant seasonings are available in bulk in traditional markets. The presence of these wet quick spices illustrates the potential for creating local instant seasonings [2]. High-quality food must not only provide essential nutrients but also provide safety for consumption. Law number 18 of 2012 regarding food defines food safety as the state and measures taken to prevent food from risks associated with physical, chemical, biological, and other contaminants that may lead to disruption, loss, or harm to human health, while also respecting beliefs, religion, or culture [14].

PT. AFI, a player in the food seasoning processing sector, recognizes the important role spices play in influencing the taste and quality of food, thus meeting market demand for ready-to-use seasoning products. The company produces a variety of seasonings used by both the culinary sector and retail consumers. One of its flagship products is the roasted onion seasoning, which uses roasted onion as a key component to produce the savory flavor and distinctive aroma of roasted onions. The production of roasted onion seasoning is highly dependent on the quality of roasted onion seasoning used. Quality factors, including flavor, color, and texture, are essential for ensuring the uniformity of the final product. Small changes in these attributes, such as increased bitterness, darker color, or poor texture, can compromise the quality of the final product or possibly hinder the production process.

The company cannot produce the roasted onion seasoning internally and must source it from external suppliers. This reliance on suppliers can lead to various problems, including supply delays, quality inconsistencies, and significant waste in the production process. This scenario illustrates the importance of identifying potential waste categories to improve the efficiency and effectiveness of PT. AFI's production operations. This article aims to identify the types of waste generated during the production process of roasted onion seasoning and the associated variables. Furthermore, the contribution of this article is to integrate process flow mapping, the identification of the seven wastes, defect data and fishbone analysis to determine priorities for process improvement.

2. Experimental Methods

This research uses a qualitative descriptive case study approach at PT AFI, which produces roasted onion seasoning. The population in this study encompasses the entire production process, while the sample was purposively selected based on production data from August to October 2025. This study uses various data collection approaches, including a literature review on lean manufacturing, seven types of waste, roasted onion seasoning production, and company-provided data. The data consists of direct field observations of the roasted onion seasoning production process and interviews with PT. AFI decision-makers, as well as supporting documents. The data are then processed and evaluated using an operational process map to examine operational and inspection procedures for roasted onion seasoning. Meanwhile, a process flow map is accompanied to illustrate the sequence of roasted onion seasoning production process. This analysis uses the seven tools method, which consists of the following tools: flowchart, histogram, and fishbone diagram. The seven tools constitute a collection of instruments commonly used in quality control processes. This strategy is deemed essential quality as a critical factor in sustaining a company's competitiveness in the globalized economy. Using the seven tools, organizations can identify and address diverse quality issues in both manufacturing and service sectors, thereby ensuring the sustained maintenance of product and service quality [15]. The identified factors are raw materials, machinery, personnel, methodologies, and the environment [16].

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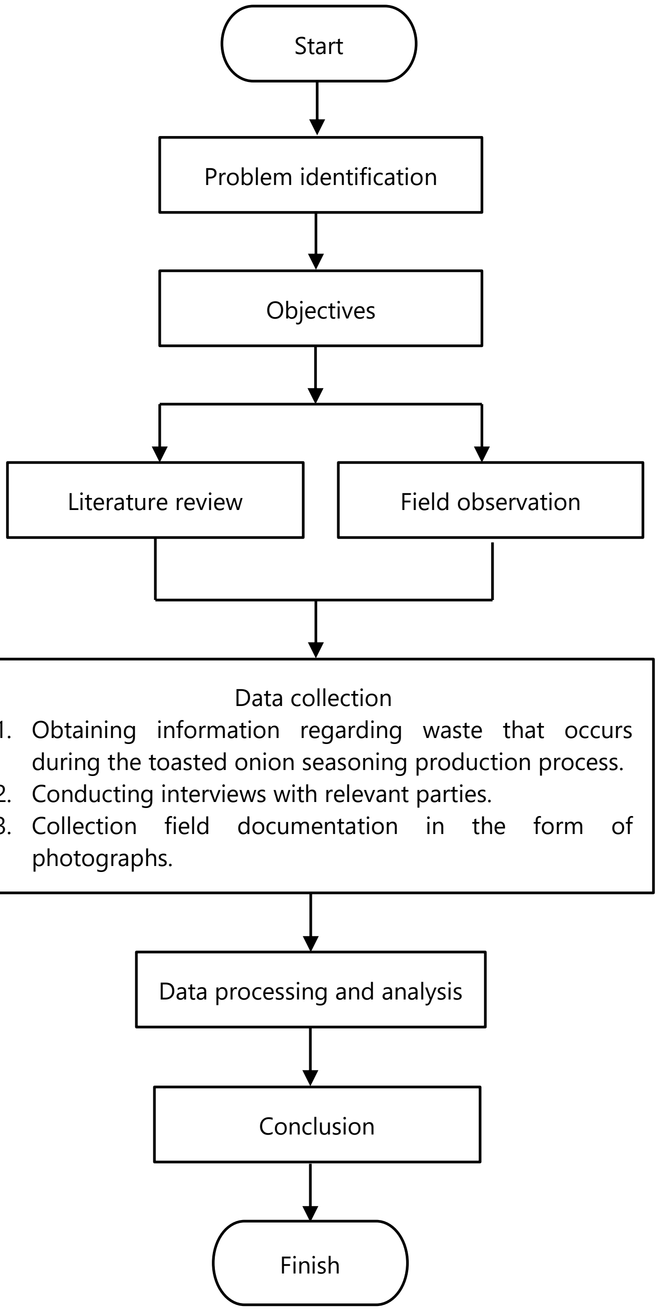

Figure 1. Research flowchart

This led to the identification of seven categories of waste as outlined by Taiichi Ohno: overproduction, inventory, errors, movement, overprocessing, waiting, and transportation. Specific waste types were used to assess the number of errors in the roasted onion seasoning product and identify the highest defect rate. Furthermore, contributing factors to waste were identified using seven techniques, including fishbone diagrams, and corroborated through interviews with PT. AFI. Figure 1 illustrates a flowchart of the research techniques.

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3. Results and Discussion

3.1. Production Process Flow Chart

The roasted onion seasoning production process at PT. AFI involves several stages in converting raw materials into finished goods as presented in Table 1. The roasted onion seasoning process at AFI uses equipment and supplies that meet food industry production standards. The description of each process is presented in Table 2.

Table 1. Toasted onion seasoning production process data

Activities	Production code	Production activity details	Production time (minutes)	Distance (m)
Raw material checking	I1	Checking incoming and received raw materials	15.3	15
Storage	T1	Taking tools and materials from the warehouse	1.54	10
	T2	Moving tools and materials to the production floor	2.42	10
Raw material screening	P1	Carrying out screening of raw materials	15.38	5
	T3	Putting the sifting results into a container	0.35	3
Raw material weighing	T4	Transferring the sifted raw materials to the scales	2.26	2
	P2	Weighing all raw materials according to the formula	13.47	1
Mixing process	T5	Putting the weighed raw materials into the mixing machine	10.19	2
	P3	Performing the mixing process for each ingredient	30	2
Product quality checking	I2	Controlling the quality of finished products	15.21	15
Finished goods process	T6	Putting finished products into packaging	14.11	2
	P4	Weighing each finished product	7.52	2
Packaging and mark labeling	P5	Packaging and labeling for each product	20.33	2
Product saving	P6	Moving toasted onion seasoning to the storage warehouse	3.35	10

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Table 2. Description of each process

No.	Type of work	Description
1	Raw material inspection	The quality of the raw materials received is assessed at the initial stage. Additionally, an organoleptic inspection is performed on incoming raw materials. If the raw materials meet standards, they advance to the screening stage. Any raw materials that fail to meet established standards are returned to the supplier.
2	Raw material screening	Raw materials that have passed quality control are then screened to ensure their particle size and texture meet company specifications. If the screening results are still unsatisfactory, the material will undergo additional screening until the desired results are achieved.
3	Raw material measurement	After screening the raw materials, the next phase is to weigh them according to the established formulation. This weighing procedure ensures that each raw material is used in the correct quantity and in accordance with the specified composition. Accurate measurements are crucial for maintaining formulation consistency and ensuring proper ingredient proportions. Ensuring precision in the weighing process consistently maintains product quality and achieves uniformity in each production batch.
4	Mixing	After all the raw materials have been weighed according to the formulation, they are placed in a mixer for 30 minutes. The purpose of this step is to ensure that all ingredients are thoroughly mixed to produce a homogeneous dough. Mixing time must be carefully controlled, as mixing too quickly can result in an inhomogeneous dough, and mixing too long can affect flavor stability due to certain temperature limits.
5	Product quality check	After the mixing process is complete, the Quality Control department inspects the product to ensure it meets established standards for taste, texture, color, and moisture content. If any part of the product falls short of standards, it is sent to the correction stage and remixed for approximately thirty minutes.
6	Product screening	Products that have passed the next inspection process will undergo a re-screening stage. This step is carried out to ensure that the final product's appearance is completely uniform and meets the company's quality standards.
7	Product weighing	After the production process is complete, the product is weighed to ensure it meets the standard of 25 kg.
8	Packaging and labeling	The final stage in the production process is packaging the product into the company's designated packaging. Afterward, the product is labeled with complete information and ready to be shipped to the warehouse or delivered to customers.

3.2. Operational Process Map for Roasted Onion Seasoning

One way to display work activities in a logical, systematic, and detailed sequence is to create a work map. Several operators are responsible for each stage of the production process for toasted onion seasoning at PT. AFI. Labor involvement is crucial to the production process, as most of the work is still done manually. However, the process is supported by a variety of relatively simple production equipment. This equipment helps operators perform their tasks more efficiently and effectively. This equipment is used from raw material preparation to processing and packaging the finished product.

The production process is still heavily influenced by manual activities, so each work stage requires good coordination and organization to ensure the process runs smoothly and in accordance with established company

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operating procedures. Furthermore, direct operator involvement at each stage of the process can impact processing time, accuracy, and product quality. The operational process map for roasted onion seasoning from PT. AFI is as follows: An operation process map (OPC) is a diagram that shows the sequence of operational and inspection stages that an object undergoes, from raw materials to finished products.

PT. AFI requires 146.95 minutes to complete the entire stir-fry seasoning production process, as shown in the operational process map in Figure 2. The time includes 11 activities: 8 operational activities totaling 113.26 minutes, 2 inspection activities totaling 30.34 minutes, and 1 storage activity totaling 3.35 minutes at the final stage of production.

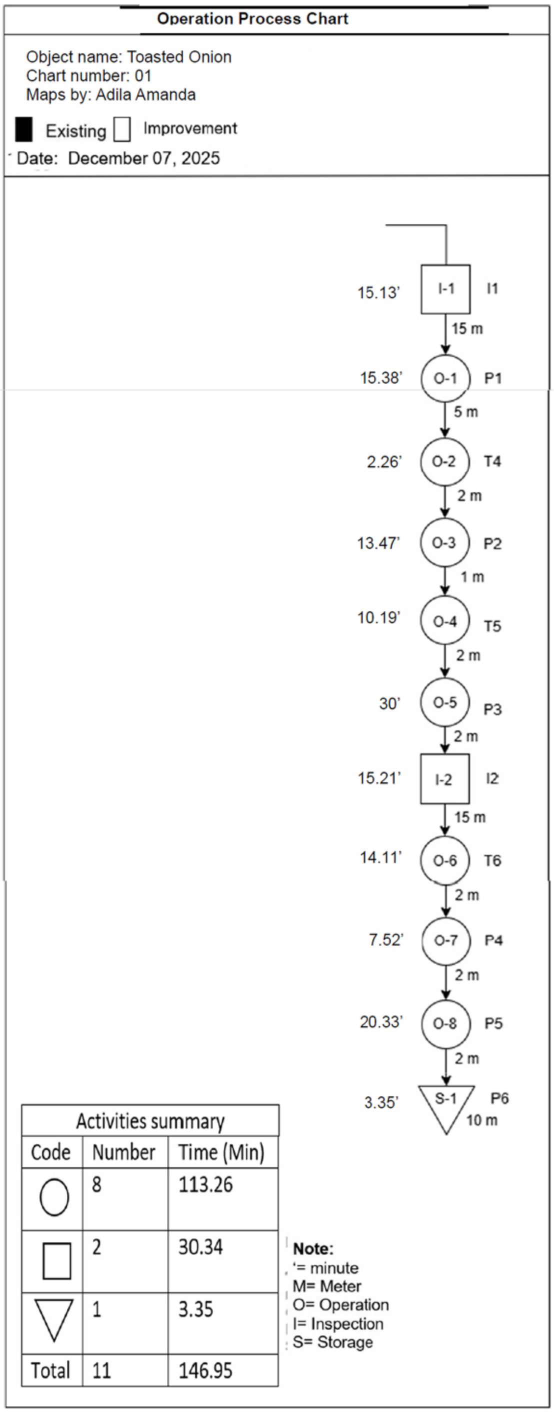

Figure 2. Map of the roasted onion seasoning production operations process

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3.3. Toasted Onion Seasoning Production Process Flow Chart

The Toasted Onion Seasoning production process at PT. AFI is carried out using machinery and a number of activities that still require operator labor. This combination of machine tools and manual labor ensures that each stage of the process proceeds consistently and in accordance with standards. The sequence of activities in the process flow map is shown in Figure 3.

Process flow chart			
Activities	Number	Time (minute)	Jobs : Toasted onion production
○ = Operation	5	90.05	
□ = Inspection	2	30.52	Map No. : 02
⇨ = Transportation	6	30.34	
D = Delay	0	0	By : Adila Amanda
△ = Storage	1	3.35	
Total	14	154.26	Date : 13/12/2025

No.	Activities	Code ○	□	⇨	D	△	Distance (m)	Time (minutes)
1	Checking of incoming and received raw materials		●				15	15.13
2	Taking tools and materials from the warehouse			●			10	1.54
3	Moving tools and materials to the production floor			●			10	2.42
4	Carrying out screening of raw materials	●					5	15.38
5	Putting the sifting results into a container			●			3	0.35
6	Transferring the sifted raw materials to the scales			●			2	2.26
7	Weighing all raw materials according to the formula	●					1	13.47
8	Putting the weighed raw materials into the mixing machine			●			2	10.19
9	Performing the mixing process for each ingredient	●					2	30
10	Quality control of finished products		●				15	15.12
11	Putting finished products into packaging			●			2	14.11
12	Weighing each finished product	●					2	7.52
13	Packaging and labelling for each product	●					2	20.33
14	Moving toasted onion seasoning to the storage warehouse				●		10	3.35

Figure 3. Process flow chart

Based on the production process flow map in the Figure 3 for toasted onion seasoning, it can be seen that PT. AFI requires a total of 154.26 minutes to complete the production process, from receiving materials to final product storage. This total time comprises 14 interrelated activities: 5 operational activities totaling 90.05 minutes, 6 transportation activities totaling 30.52 minutes, 2 inspection activities totaling 30.34 minutes, and 1 storage activity totaling 3.35 minutes. This breakdown shows that, in addition to operational activities, the transportation and inspection processes also account for a significant portion of the overall production time.

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3.4. Types of Waste in Toasted Onion Seasoning Production

To identify the types of waste that arise in the toasted onion seasoning production process at PT. AFI: direct observations were conducted on every activity during the production process. These observations focused on potential sources of waste at each stage. Based on the observations, the waste identified in the toasted onion seasoning production process is as follows.

3.4.1 Defects (Product Defects)

Product defects in the toasted onion seasoning production process can be observed not only in the final product but also at every stage of production. One source of defects can arise from the quality of the raw toasted onion powder received from suppliers, particularly in taste, which tends to be more bitter than the company's established quality standards. This discrepancy renders the raw materials unusable for production, necessitating returns to the supplier. This situation is influenced by several factors, including variations in the quality of raw materials from suppliers, suboptimal inspection processes at the receiving stage, and the company's heavy reliance on external suppliers. Furthermore, potential defects can arise at subsequent stages, such as during sieving, where lumps or unwanted particles may still be present. During the mixing stage, deviations in the resulting mixture's characteristics that do not meet the company's established standards can also indicate process defects, ultimately affecting the quality of the finished product. To determine the level of defects occurring during the toasted onion seasoning production process, production data were summarized over a specific time period. The data of weekly to facilitate analysis of defect patterns and trends is presented in Table 3.

Table 3. Defective toasted onion seasoning products for September 2025

Week	Production (kg)	Defect (kg)	Percentage (%)
1	800	1.5	0.8
2	400	1	0.25
3	1200	2.75	0.23
4	800	2	0.25

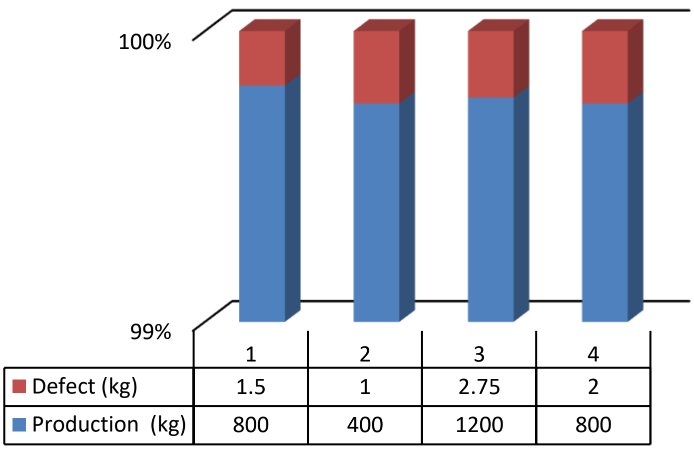

Figure 4. Histogram diagram of toasted onion seasoning defects in September 2025

Furthermore, information from the PPIC department indicates that each production batch yields 400 kg of finished product. Therefore, to meet production requirements for September 2025, total production reached 3.2 T. Of this production volume, 7.25 kg of defects were recorded, indicating that although the production process was proceeding according to plan, there was still potential for quality discrepancies requiring further attention and analysis at certain production stages.

3.4.2 Overproduction

Based on interviews and observations during the internship, it was discovered that PT. AFI produces toasted onion seasoning in response to customer purchase orders (POs). In a single PO, the company can receive approximately 12 T of orders. However, product delivery to customers is not carried out all at once, but rather in installments or portions according to customer demand and delivery schedules.

This situation forces production activities to be carried out in accordance with delivery needs. In practice, the company does not overproduce; it produces seasoning in quantities to be delivered. For example, if 1.2 T of mixing is performed in one day, while the customer only requests 800 kg, the remaining 400 kg of production is stored as buffer stock. This inventory is then used in the next shipment, so the company only needs to produce the required amount.

With this production system in place, the average production of toasted onion seasoning at PT AFI ranges from 3 to 3.5 T per month. The production volume is adjusted to the needs stated in the purchase order (PO). This PO-oriented production pattern allows the company to control output levels to meet market demand. This way, the company can minimize the risk of overproduction.

3.4.3 Transportation

Based on the process flow map presented in Figure 3, it is known that during the toasted onion seasoning production process at PT. AFI, several material transfer or transportation activities occur between process stages. Overall, these transportation activities require a total time of 30.52 minutes. This time contributes to the total production process duration, but does not directly add value to the resulting product.

Transportation activities include moving raw materials and equipment from the storage area to the production area, transferring screened materials to the mixing stage, and transferring the finished product to the packaging area. These transfer processes are designed to support a smooth production flow, but in practice, they increase process time and can cause inefficiencies if the distance between workstations is not optimally designed.

3.4.4 Motion (Work Movement)

According to the process flow map in Figure 4, the total time spent on work movements was 19.14 minutes. This movement occurs when operators retrieve raw materials and production equipment from the storage area, move sifted materials to the mixing area, and perform other supporting activities throughout the production process.

These movement activities are essential to the smooth running of the production process. However, if operator movements are not designed effectively and structured, this can result in wasted time and energy. Operators must move repeatedly, which ultimately increases fatigue and extends the overall production time.

Furthermore, excessive movement can reduce the company's targeted work efficiency, especially if the distance between workstations is significant or the production area layout is not optimally organized. Therefore, this aspect of motion is one of the factors that must be considered in efforts to improve the efficiency of the toasted onion seasoning production process at PT. AFI.

3.4.5 Excess Processing

Waste in the form of excess processing in the toasted onion seasoning production process at PT. AFI can occur when work steps are performed beyond established standard requirements. This excess processing occurs, among other things, in the repeated inspection of raw materials when quality discrepancies are found, such as toasted onion powder tasting more bitter than company specifications. Furthermore, the sieving process may be repeated if lumps or undesirable particles are found. A similar situation can also occur during the mixing stage, when the resulting mixture does not meet quality standards, requiring adjustments or extensions in the process time. These activities do not add value to the product but still consume time and electricity, thus categorizing them as excess processing waste.

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3.5. Identifying Factors Causing Waste

Based on interviews with relevant parties within the company, information was obtained on the factors causing this waste, and it was analyzed using a fishbone diagram (cause-and-effect diagram) to identify the root causes affecting the production process. Figure 5 shows the waste issues across several main categories. In the machines/tools category, technical constraints were identified, such as suboptimal or excessive use of mixers. In the Methods category, problems arose from the lack of clearly defined worktime and quality standards, resulting in inconsistent production. Furthermore, in the People category, operator fatigue and a lack of precision in workmanship also impacted process efficiency. Environmental factors also played a role, particularly the relatively hot workspace temperature. In the Materials category, variations in raw material quality contributed to inefficiencies.

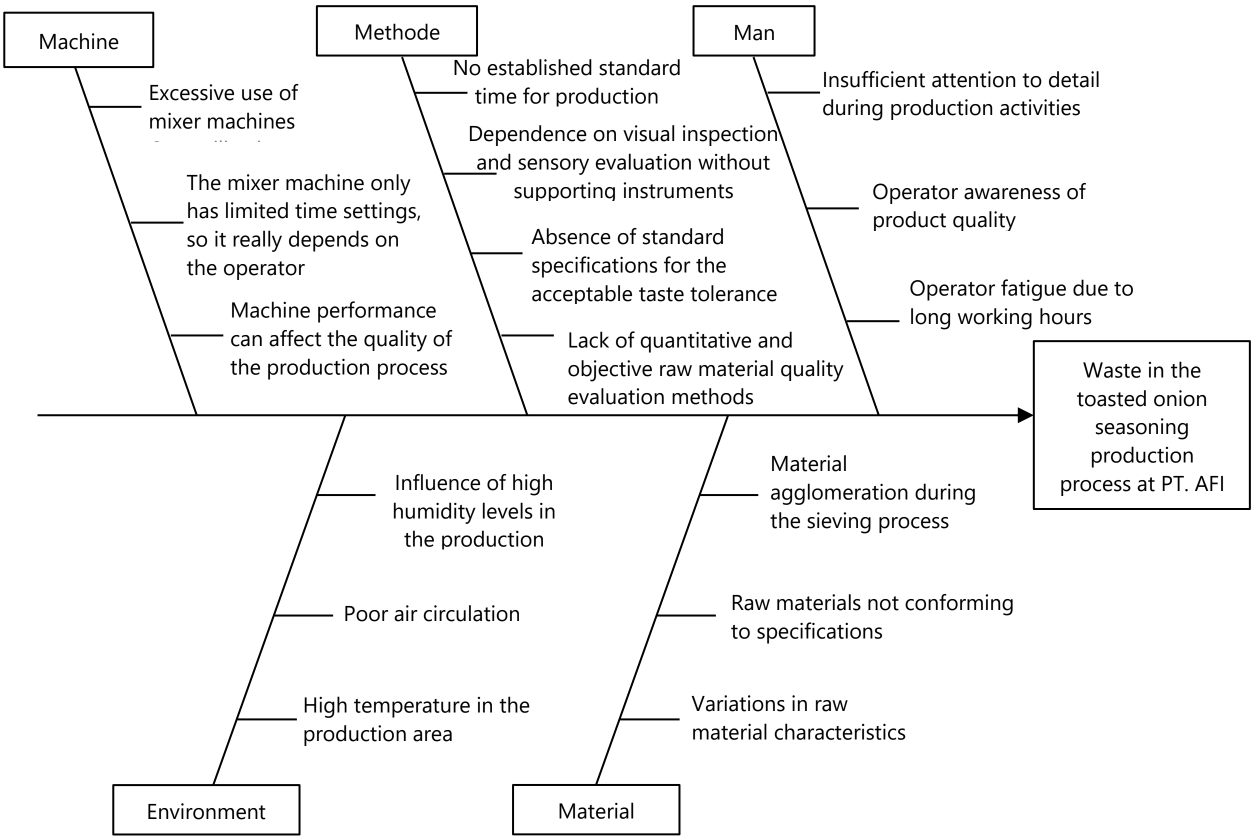

Figure 5. Fishbone diagram of factors causing waste at PT. AFI

3.6. Discussion

The findings of this study underscore the significant impact that industrial engineering techniques and methodologies can have on productivity improvement across a range of industries. The application of these methodologies, as detailed in case studies, provides important insights into their effectiveness and the practical challenges they pose. This presentation integrates these findings, compares theoretical assumptions with empirical evidence, and explores broader implications for practice and future research. The application of the seven wastes and seven tools in the case analysis yielded findings that the company had previously overlooked. This study successfully identified several unnecessary wastes in the production process. The Lean Manufacturing methodology, including the seven wastes and seven tools, facilitated significant improvements. The systematic waste-identification methodology inherent in Lean principles identified activities requiring attention and improvement. This study aligns with related studies on the application of industrial engineering tools and practices to increase productivity across various sectors [17]. These strategies significantly improve operational

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performance by systematically eliminating inefficiencies and optimizing operations. The implications for the future of lean manufacturing will emphasize sustainability, leveraging real-time data analytics for proactive environmental management [18]. Organizations will use data on energy consumption, emissions, and resource use to adopt sustainable manufacturing methods. Real-time monitoring will improve energy efficiency, minimize waste, and encourage the use of renewable resources, in line with sustainability goals and regulatory mandates.

4. Conclusion

Types of waste in the toasted onion seasoning production process include defects, transportation, motion, and overprocessing. Defective waste is indicated by defective products during the September 2025 production period, with a total of 7.25 kg of defects out of 3.2 T produced. The highest absolute number of defects occurred in Week 3; however, the defect rate was comparable to that of Weeks 2 and 4 after normalizing by production volume. Furthermore, transportation and motion waste are evident in the continued movement of materials and operator movements that do not add value. In the process flow map, a total transportation time of 30.52 minutes and a total motion time of 19.14 minutes are presented. Meanwhile, excess processing occurs due to repeated steps such as re-sieving, adjusting mixing times, and repeated quality checks, resulting from inconsistencies in raw materials and processing outcomes.

Factors causing waste in the toasted onion seasoning production process at PT. AFI originate from several key aspects: methods, materials, machines, people, and environment. From a method and material perspective, waste is primarily driven by inconsistent raw material quality from suppliers and the lack of standardized tolerance limits for taste, potentially resulting in substandard products. From a machine perspective, limited mixer settings and performance can impact the uniformity of mixing results. Furthermore, human and environmental factors contribute through differences in operator work consistency and suboptimal production room conditions.

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