

Quality Control Analysis in Minimizing Production Complaints at PT. Betts Indonesia with Statistical Process Control Method

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Article Info

Article history

Accepted : October 5, 2024

Revised : Nopember 15, 2024

Accepted : December 15, 2024

Published : December 30, 2024

Keywords:

Quality Control

Production Complaints

Statistical Process Control

ABSTRACT

This study analyzes the implementation of quality control in PT. Betts Indonesia to minimize production complaints with the Statistical Process Control (SPC) method. Using a descriptive qualitative approach, the types of data were collected through several approaches, namely field observations, interviews with production staff, and analysis of complaint documents during the period from January 2021 to December 2021. The analysis was carried out using Statistical Process Control (SPC) tools including check sheets, Pareto diagrams, control maps, and fishbone diagrams. The results of the study identified critical defects such as Sideseam Failed by 29.8% and Wrong Label by 23.4% which accounted for at least 53.2% of the total complaints. Furthermore, the root cause analysis revealed four factors that were considered dominant, including: human error (improper machine operation), inconsistent materials (substandard raw materials), outdated methods (lack of standard procedures), and machine malfunction (old equipment). Recommendations include routine operator training, rigorous material inspections, process standardization, and preventive maintenance schedules.



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DOI: <https://doi.org/10.35891/jkie.v11i3.6192>

1. Introduction

In an era of globalization full of dynamics and increasingly competitive industry competition, product quality has become a major factor that determines the success of a manufacturing company. Quality is not only an indicator of consumer satisfaction, but also an important strategy in maintaining a market position and increasing the company's profits (Sarbullah & Sutrisno, 2021). Companies are required to produce products that not only meet technical specifications but are also capable of meeting customer expectations for reliability, aesthetics, and consistency (Goetsch & Davis, 2016). In this case, quality control becomes a key element in an effective and efficient production system (Mahaputra, 2021).

PT. Betts Indonesia is a manufacturing company engaged in the production of laminated tubes, products that urgently need high quality supervision in every stage of production. In practice,

companies face challenges in the form of increasing the number of products that experience complaints from customers within a certain period of time. The complaint is an indication that there is a discrepancy between the products produced and the specifications expected by consumers. If not handled seriously, this increase in complaints has the potential to lower the company's image and cause losses financially and long-term relationships with customers.

The problem of repeated complaints about products shows that there are weaknesses in the quality control system implemented by the company. This problem is not only related to physical damage to the product, but can also come from inconsistencies in the production process, operator error, and failures in the inspection system. Therefore, it is important to conduct a thorough analysis of the quality control system that is running, in order to identify the main causative factors of product defects that lead to customer complaints.

One of the relevant approaches in controlling and improving production quality is Statistical Process Control (SPC). This method utilizes statistical aids to monitor quality standards, measure variations in the production process, and provide corrective action before products fail to be mass-produced (Elyas & Handayani, 2020). SPC allows companies to not only control the final results, but also control the process from the beginning so that deviations can be minimized. With the use of tools such as control charts, histograms, and pareto charts, companies can visually analyze production data and make more objective, data-driven decisions.

The purpose of this analysis is to systematically identify the main causes of the high number of product complaints at PT. Betts Indonesia, as well as providing data-based repair solutions that can be applied in the company's production system. With the application of the Statistical Process Control method, it is hoped that the production process can run within the control limits that have been set, so that variations can be reduced, and the products produced are more consistent and meet the quality standards expected by customers.

2. Literature Review

Production Process Concept

The production process is a series of activities that aim to transform raw materials into finished goods that have added value (Assauri, 2018). According to Gaspersz (2004), the production process is the sequential integration of labor, materials, information, working methods, and machinery or equipment in a competitive environment (Assauri, 2018). The production process can be intermittent or continuous depending on the production pattern carried out.

Quality and Dimensions

Quality is the characteristic of a product or service that is able to meet or exceed customer expectations. According to the American Society for Quality (ASQ), quality includes the attributes of a product or service that impact customer satisfaction (Kotler et al., 2015). The Garvin (1987) dimensions of quality according include performance, features, reliability, suitability, durability, serviceability, aesthetics, and perception of quality.

Quality Control

Quality control is the process of monitoring and adjusting the process to ensure that the products produced are in accordance with the set standards. According to Gaspersz (2002), quality control includes the operational techniques and activities used to meet quality requirements. The main goal is to guarantee product conformity to specifications and reduce variations in the production process (Latifah & Rosyidi, 2018).

Factors that affect quality control include: process capability, product specifications, acceptable level of nonconformity, and quality cost. The commonly used types of quality costs are prevention costs, assessment costs, internal failure costs, and external failure costs.

Statistical Process Control (SPC)

SPC is a systematic approach using statistical techniques to monitor and control the production process. SPC uses control charts, histograms, Pareto charts, and other tools to detect process irregularities and identify the root causes (Selvamuthu & Das, 2018).

Kaoru Ishikawa introduced the concept of the Seven Tools of Quality which includes: Check Sheet, Control Chart, Cause and Effect Diagram, Pareto Diagram, Histogram, Scatter Diagram, and Stratification. These tools are used in SPC to improve product quality and support data-driven decision-making.

3. Methodology

Research Object and Location

This research was conducted at PT. Betts Indonesia which is located in the Ngoro Industri Persada (NIP) Blok L No.1, Ngoro – Mojokerto. The object of the research is focused on the production quality control system to minimize complaints from customers. The selection of the location is based on the company's actual problems, namely the high number of product complaints which indicates that the implementation of quality control is not optimal.

Types of Research

This study uses a descriptive qualitative approach with the Statistical Process Control (SPC) method. Descriptive qualitative research aims to describe the phenomenon in depth based on facts in the field. This method was chosen because it is able to identify the root cause of production complaints through quantitative data analysis (such as control charts and Pareto diagrams) combined with qualitative interpretation (interviews and observations).

Data Collection Methods

- a. Direct Observation, by monitoring the production process and the critical points that cause defects.
- b. In-Depth Interviews, with production managers, QC supervisors, and operators.
- c. Documentation, in the form of analysis of complaint documents and product inspection records.

Data Analysis with SPC Method

The steps in the analysis of the SPC method are as follows:

- a. Check Sheet:
Classification of complaints based on the type of defect.
- b. Pareto Diagram:
Identify 20% of the types of defects that account for 80% of complaints (Pareto principle).
- c. Control Chart (p-Chart):
Monitor the stability of the production process and outliers causing defects.
- d. Fishbone Diagram:
Root of the problem analysis with the 4M (Man, Machine, Material, Method) approach.

4. Results and Discussion

1) Data Collection Results

Data collection was carried out based on a check sheet that summarized the number and types of production complaints from January to December 2021. This data includes complaints that occur on all production machines such as AISA, NILPETER (NLPTR), and ARPECO (ARPC). This check sheet is the basis for the analysis process using the Statistical Process Control (SPC) method.

Table 4.1 presents an annual recapitulation of complaints based on the type of machine. The types of complaints that appear include:

Table 1. Check Sheet Complacant

NO	BULAN	MESIN																												TOTAL			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		NLPTR	ARPC	
1	JANUARI	1		1										1											1								4
2	FEBRUARI				1																			1		2		1	1		4		10
3	MARET		1					1									1		1				1	1						1		7	
4	APRIL			1																				1							1		3
5	MEI	1					1											1		1				2								6	
6	JUNI																												2			2	
7	JULI				2		1						1		1			2											1	2		10	
8	AGUSTUS						1											1				1										3	
9	SEPTEMBER			1	2																		1	2								6	
10	OKTOBER				2						1													1	1							10	
11	NOVEMBER				2				3																					1		6	
12	DESEMBER			1	1	2	1																	1	1							7	
	JUMLAH	2	1	4	10	2	3	2	5	3		1		2		1		1	4	1	1	1	2	9	3	2		2	1	9	2	74	

2) Analysis with Statistical Process Control Method

a. Check Sheet

A check sheet is used to document the frequency of each type of product defect. From the check sheet table, it can be seen that the most common types of complaints during 2018 were Sideseam Failed and Wrong Label.

b. Histogram

The histogram shows the frequency of complaints which makes it easier to visualize trends per month. For example: February and July are the months with the highest complaints (10 complaints). Types of complaints such as Miss Register and Cap Loose occur in several months repeatedly, namely in January, February, and July. The histogram in the 3 months is described as follows:

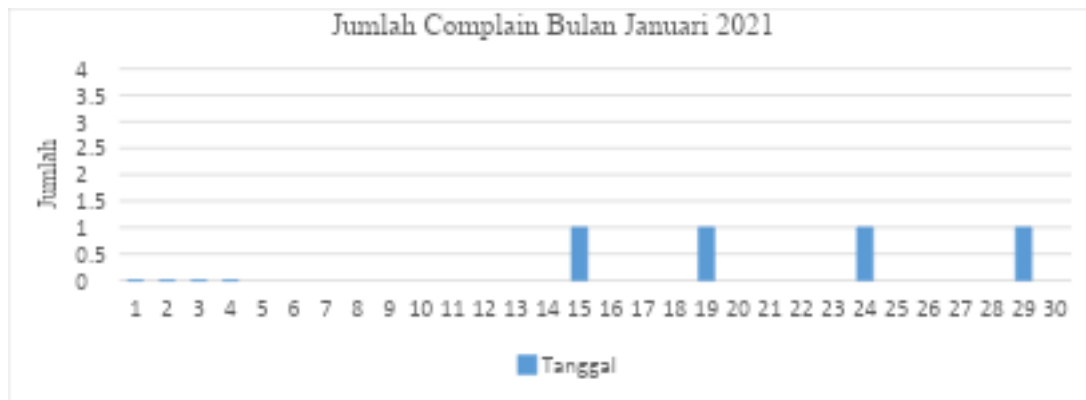


Figure 1. Number of Complaints in January 2021

Based on the picture above, it can be seen that the Complaint from the Customer obtained by PT. Betts Indonesia during January 2021 was a total of 4 complaints, which occurred on the 15th, 19th, 24th, and 29th, respectively.

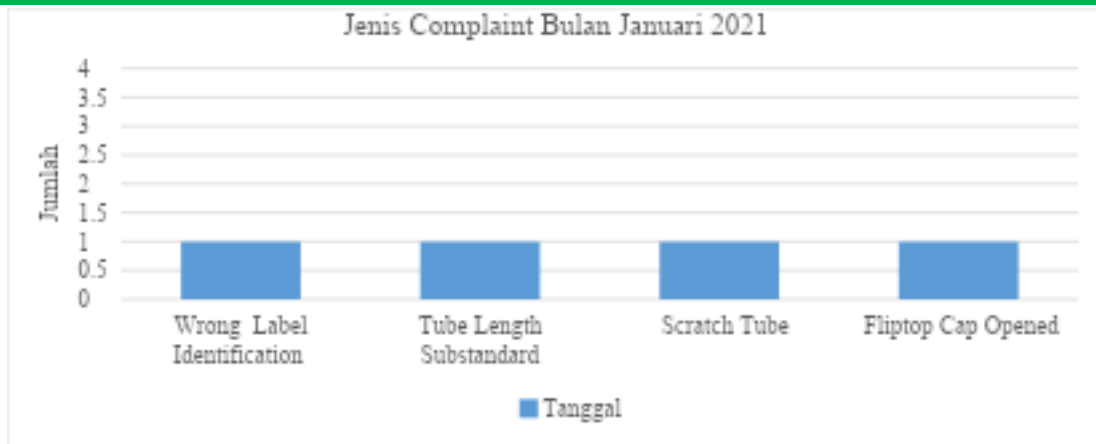


Figure 2. Types of Complaints in January 2021

Based on the picture above, it can be seen that the type of Complaint obtained by PT. Betts Indonesia during January 2021 are Wrong Label, Tube Length Substandard, Scratch Tube, and Fliptop Cap Opened.

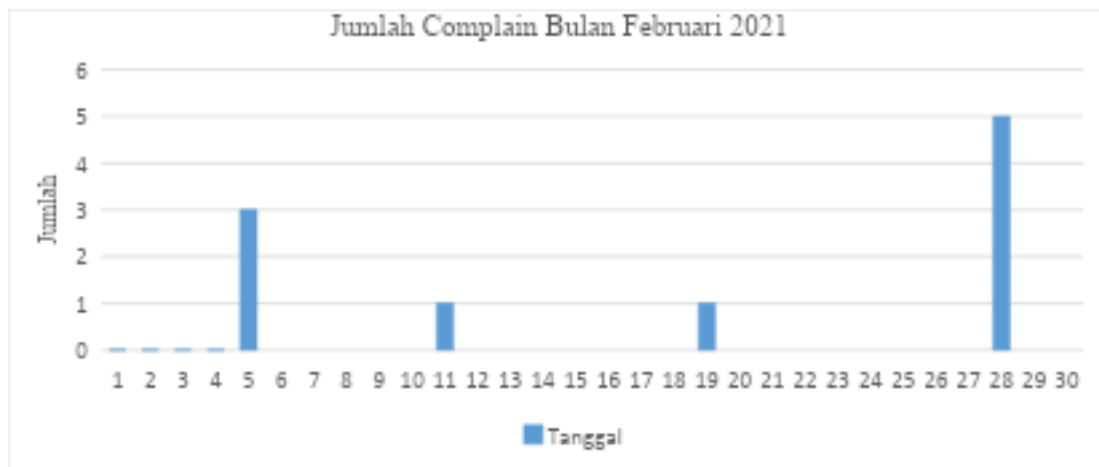


Figure 3. Number of Complaints in February 2021

Based on the picture above, it can be seen that the Complaint from the Customer obtained by PT. Betts Indonesia during February 2018 was as many as 10 complaints, which occurred on the 5th as many as 3 times, the 11th, the 19th and the 28th as many as 5 complaints.

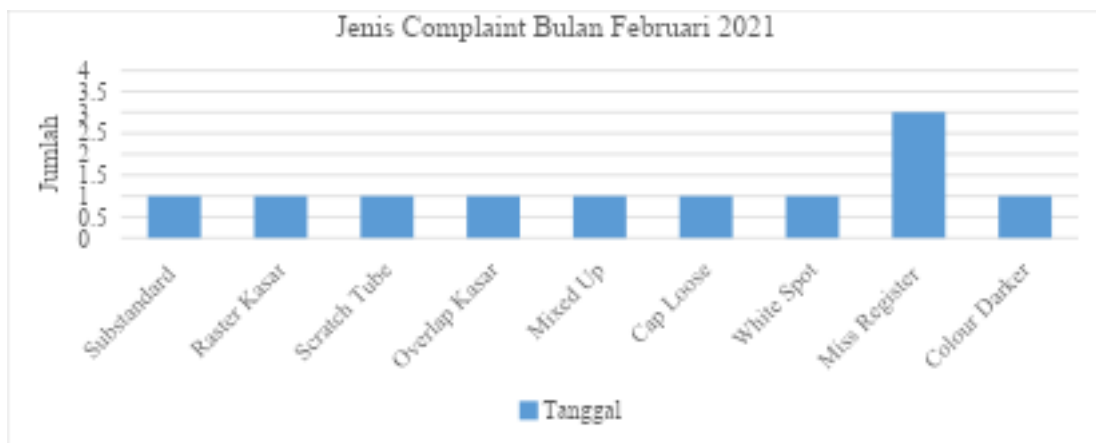


Figure 4. Types of Complaints in February 2021

Based on the picture above, it can be seen that the type of Complaint obtained by PT. Betts Indonesia during February 2018 are Substandard Colour, Rough Raster, Rough Overlap, Mixed Up, Cap Loose, White Spot, Colour Darker, which amount to 1x and Miss Register as much as 3x each.

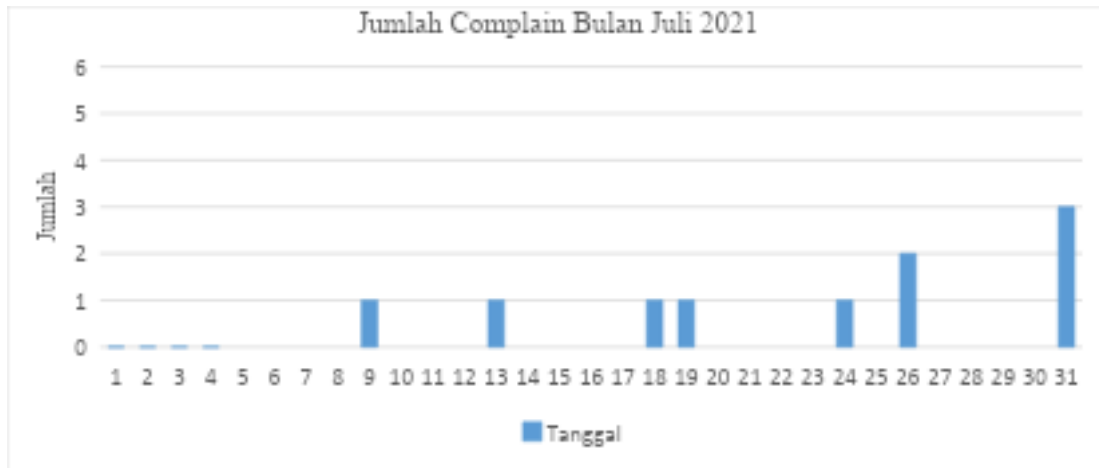


Figure 5. Number of Complaints in July 2021

Based on the picture above, it can be seen that the Complaint from the Customer obtained by PT. Betts Indonesia in July 2018 was as many as 10 Complaints, which occurred on the 9th, 13th, 18th, 19th respectively occurred 1x, the 26th was affected 2x and 3x occurred on the 31st.

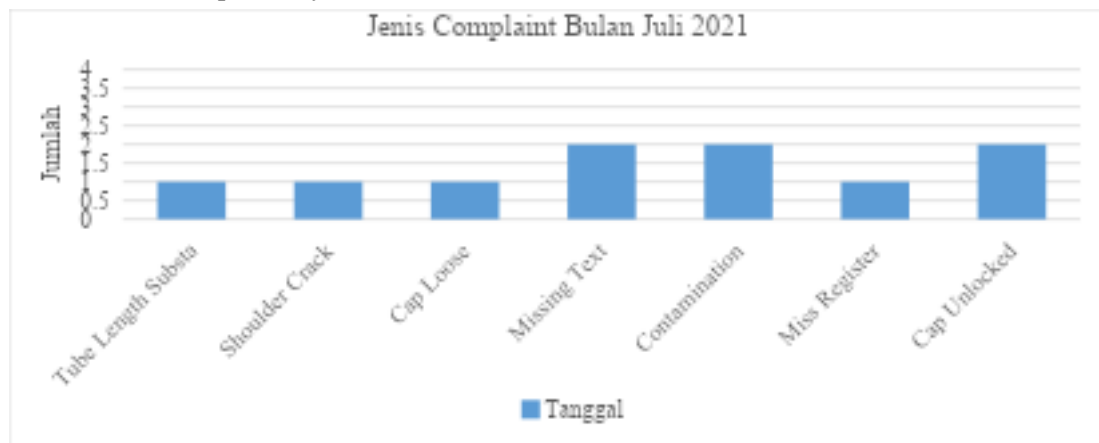


Figure 6. Types of Complaints for July 2021

Based on the picture above, it can be seen that the type of Complaint obtained by PT. Betts Indonesia during July 2021 were 10 complaints consisting of Cap Loose, Tube Length Substandard, Shoulder Crack, Miss Register, which occurred 1x each and Missing Text, Contamination, and Cap Unlocked occurred 2x each.

c. Control Chart

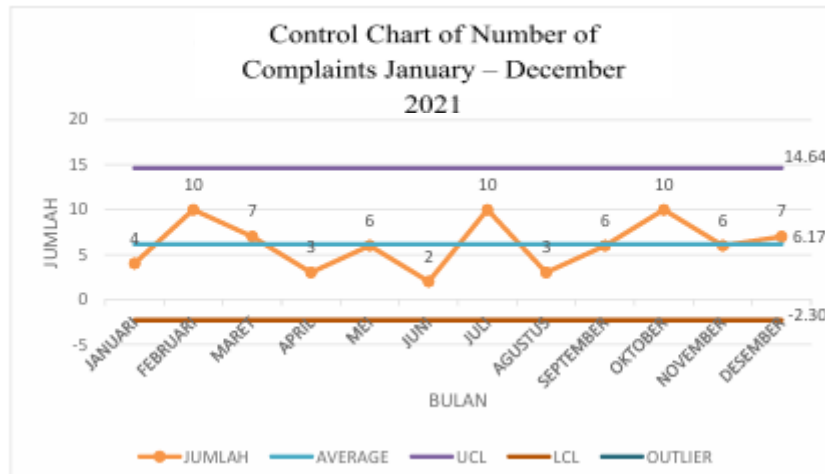


Figure 7. Control Chart of Number of Complaints January – December 2021

The graph above illustrates that the data is controlled, this is because all data is within the upper limit (UCL) and the lower limit (LCL).

d. Fishbone diagram (Cause-effect diagram)

After making a Control chart, the next step is to make a Fishbone Diagram, used to analyze what factors are the causes of product damage (Complaint), while the factors that affect and cause product damage (Complaint) in general can be classified as follows:

1. Worker / human (Man), i.e. worker/human being who is directly involved in the production process
2. Raw Materials (Materials), which are components in producing a finished product.
3. Machines, which are machines and various equipment used during the production process.
4. Method, which is an instruction or work order that must be followed in the production process.

Based on the results of the analysis and interviews conducted with the company, it can be obtained that several problems that occur related to the quality of the products produced by PT. Betts Indonesia thus causing a Complaint.

Table 2. Cause-and-effect problems

No	Faktor	Masalah yang terjadi
1	<i>Man</i>	a. Tidak melakukan inspeksi b. Tidak menjalankan prosedur / intruksi kerja c. Kurang teliti d. kelalaian
2	<i>Material</i>	a. pemeriksaan kurang ketat b. Mutu bahan baku tidak sesuai standard c. Kerusakan material
3	<i>Method</i>	a. Prosedur tidak di update b. Standar kerja yang tidak jelas
4	<i>Machine</i>	a. Mesin yang sudah tua / Aus b. Kurangnya perawatan / pemeliharaan mesin c. Kerusakan mesin

The following is the use of a cause and effect diagram (Fishbone Diagram) to find out the cause of Complaints from Customers obtained by PT. Betts Indonesia :

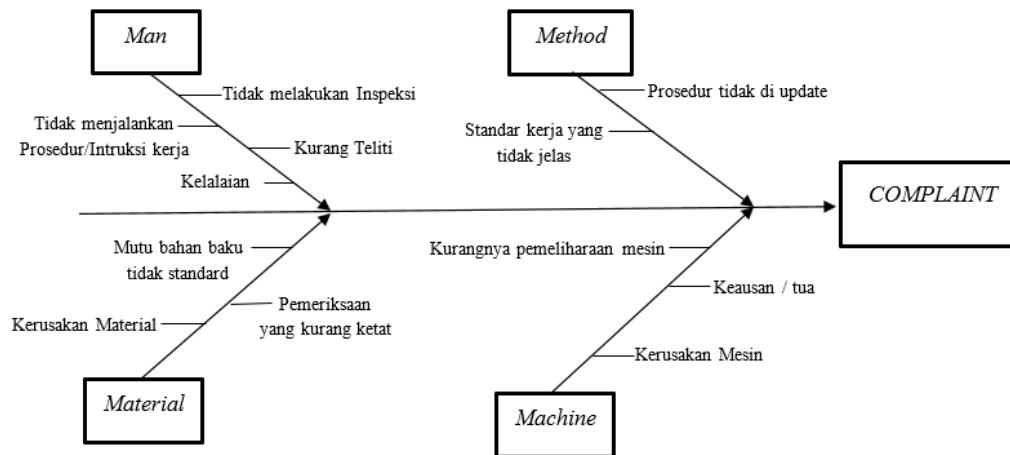


Figure 8. Fishbone diagram

Once the factors causing the problem are known, the next step is to plan countermeasures. PT. Betts Indonesia has been responding to complaints by first identifying the type. If it is not fatal, the product will be reworked/resorted; If fatal, the product will be scrapped. Proposed countermeasures at PT. Betts Indonesia is as follows:

1. Man

Labor greatly affects production results. Errors due to negligence, lack of thoroughness, or not performing inspections have an impact on quality. The solution is socialization of the importance of maintaining quality, strict supervision of work procedures, and a performance appraisal system in the form of providing bonuses for good results and punishment for defective products to increase motivation.

2. Material (Material)

Unstrict material inspection may degrade the quality of the product. The solution is to increase the testing of raw materials to standards, maintain storage space, and use old stock first before new stock.

3. Method

Unupdated working methods can cause errors, such as in the packing process. The solution is to develop clear and detailed work standards, accompanied by verbal explanations, and immediately update procedures if there are changes.

4. Machine (Machine)

Many machines are old and under-maintained, causing frequent breakdowns. The countermeasures are to replace unsuitable machines, carry out regular maintenance, and provide spare parts so that the production process is not hampered.

3) Discussion

From the results of the analysis of check sheets and histograms, it can be concluded that:

- The dominant causes of complaints are visual defects such as Wrong Label and Miss Register, as well as structural defects such as Sideseam Failed.
- AISA machines are the machines that most often experience complaints, indicating the need for increased maintenance or operator training.
- The SPC method has been proven to help map complaint trends and become the basis for decision-making in improving quality.

4) Follow-up Improvements

Some recommendations that can be applied by PT. Betts Indonesia to reduce the number of complaints:

- a. Improve operator training, especially on machines with high complaint rates.
- b. Establish additional visual inspections at the final stage of production.
- c. Use tools such as control charts to detect processes that are starting to become unstable.

5. Conclusion

Based on the results of the research, it can be concluded that the implementation of Statistical Process Control (SPC) has succeeded in identifying the pattern of production complaints at PT. Betts Indonesia. Two main types of defects (Sideseam Failed and Wrong Label) account for more than 50% of the total complaints, with the root of the problem related to human, material, method, and machine factors. Analysis of fishbone diagrams revealed that 68% of problems stem from operator indiscipline in following SOPs and 22% due to unscheduled machine maintenance.

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