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Analysis of Product Defects in the Installation of Part Stage Housing Left Using the Seven Tools Approach at Pt. Electronic

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A B S T R A C T

The fierce competition between industries today makes PT. Electronics must always be competitive. Product quality is the main factor in competing. Problems that arise at PT. Electronics is the quality of the cahill model printer product in the left housing stage that still has part defects. This study was conducted to determine the most dominant factors causing defects, identify the factors that cause part defects, determine the relationship between variable part defects and production results and also, to provide improvement proposals to PT. Electronics to reduce defective parts on the left stage housing. This study uses the 7 Tools method to find the root cause of the solved problem, Based on the results of the analysis of the data that was successfully collected, the results were obtained that the 6 types of defects obtained on the check sheet were defects, short mold, dirty, loose, scratch, bending, broken. Of the six types of disabilities, the highest percentage is scratch disability of 30.12%, Based on the fishbone diagram, it can be known that the occurrence of defects is caused by several factors, namely from humans, materials, methods, and the environment. The relationship between the variable defect of the part and the production result is stated to be quite normal and can still be controlled if there is improvement. And the proposed problem improvement obtained is to conduct training to hone employee skills, check materials and work areas repeatedly, and widen the workspace.

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INTRODUCTION

Science is growing, encouraging the emergence of various technologies and product innovations. The development of the industry has progressed very rapidly, every industry must be able to compete, especially in terms of the quality of the products produced. Therefore, the company must be able to meet customer desires and strive to be able to retain customers. The commitment of the company to maintain quality and customer desires with the implementation of various ISO quality management systems in the company, the company has undergone changes in the field of quality. However, the company cannot just run because in reality there are still products that do not comply with the set specifications or defective products.

Quality control is an activity that is carried out to monitor activities and ensure that the actual performance carried out is in accordance with what has been planned. Based on the above understanding, it can be concluded that quality control is a technique and activity or planned action that is carried out to achieve, maintain, and improve the quality of a product and service in accordance with the standards that have been determined by the company's leaders and can meet consumer needs.

Product quality is the overall characteristics of a product or the ability to satisfy an implied need. Product quality has an important role for consumers as a determinant of the level of brand loyalty to the product to be purchased. If the manufacturer does not pay attention to the quality of the product in accordance with consumer expectations, then the consumer will shift his purchase to other brand products.

In planning a production activity to run effectively and efficiently, it is necessary to produce production results with minimal failures or defects in a product. With the lack of defective products, the products made will have a good impact on the company's costs, which in turn the company provides good service and welfare for its employees.

PT. Electronics is a company engaged in the production of electronic manufacturing. The company manufactures different types of printers. The production process at PT. Electronics manufactures printers of carrey, cahill, cavani, costner, hookusi asp mecha and SIDM. This activity or production process includes warehouse, assembling, final inspection, quality, control, finish good. This research is taken on the production process (assembling) where the production process (assembling) focuses on producing cahill model printers starting from semi-finished goods to finished products.

In the business process, PT. Electronics wants to continue to improve product quality for customer satisfaction. To improve product quality by conducting quality control starting from the receipt of raw materials from suppliers, during the production process until the finished product. PT. Electronics maintains the quality of the products produced by performing the skills of human resources, so as to have a trained and skilled workforce.

Basically, seven tools can help companies in analyzing deviations or defects in a product or service that occurs and finding the cause of the product defect. With seven tools, it is hoped that product defects will not be repeated.

In its implementation, the production process at PT. Electronics are not spared from various obstacles and problems, one of the problems that often occurs is part defects during the installation of parts which are very dominant in the left housing process.

To realize a smooth production process, of course, several factors must be considered, including method factors, human factors, material factors, and environmental factors. As a support for the product results produced, there are no product defects.

LITERATURE REVIEW

Previous research was used as the basis for thinking and information used in this study. A comparison of previous research can be seen in table as follows:

Tabel 1 Previous Research

No	Name and Year	Journal	Problems	Method	Result
1.	Ade Suryanto. (2023)	Quality Control Analysis of Defective Products Using the Seven Tools Method at PT. Morita Tjokro Gearindo	As a result of the total number of production, which was 663 during the 11th month, 179 product defects were recorded from 6 types of defect causes, including shaving scrat, over diameter, surface defects, deburing soaks, hobbing extinguishes and defects.	*Seven Tools*	PT. Morita implemented quality control using seven tools, thereby reducing product defects from 458.5 out of 663 units produced in November. To reduce defects, companies must employ experts in calculating the level of damage before and after production, applying absolute rules for smooth production.
2.	Refdilzon Yasra, Mulyanto, Ismail, Jaenuddin, Edycatur Wahyono. (2024)	Quality Control Analysis of Defective Components in the Pre Delivery Inspection Process Using Seven Tools	Factors that cause defects in components To find out and analyze whether the quality control carried out can reduce component *defect.*	*Seven Tools*	The company has implemented quality and control standards for components, but defects are frequent, with the highest percentage of Bevel Defects at 40%, followed by Visual Defects at

					31% and Degree Defects at 29%, caused by operator and employee inefficiencies.
3.	Wahyu Hadi Sutiyono, Annisa Fitria, Hilman Adiatma, Widya Setiafindari (2023)	Quality Control Using the Seven Tools Method to Increase Productivity at PT Jogjatex.	PT JOGJATEX, a textile knitting company, addresses the factors that cause product defects, the main problems that cause damage, and solutions to reduce defects.	*Seven Tools*	PT Jogjatex often experiences defects in fabric products, with the largest number being stop marks. The repair plan includes repairing defects, inspecting and maintaining frequently used machinery and equipment, and carrying out maintenance.
4.	Hakika Syaula Nurrajab S.P, Ade Momon. (2022)	Analysis of Tray Quality Control with the Basic Seven Tools Method in an Effort to Minimize Rejected Products at PT XYZ	PT XYZ faces a decline in quality and production, and difficulty competing with other companies due to the high level of defects in tray products, including bubbles, thinning, webbing, and inaccurate cutting results.	*Seven Tools*	The research revealed 9 defects in the production process of PT XYZ's tray products, including thinning, weaving, wrinkles, and bubbles. The main defect is the thinning defect, which affects the appearance and functionality. Quality control has not been fully controlled.
5.	Mochammad Rofieq, Renny Septiari. (2021)	Application of Seven Tools in Quality Control of 60 ML Packaging Plastic Bottles	Measurement of the resulting product variation and graphically allows determining a process to be within or	*Seven Tools*	With seven tools, it can be seen that the accuracy of the diameter of the bottle mouth greatly determines the quality of the 60 ml plastic bottle.

			outside the control limits. Good quality of 60 ml plastic packaging bottles is needed, as this relates to customer satisfaction.		The continuous performance of the machine greatly affects the quality of 60 ml plastic bottles, especially in the defect of the bottle mouth diameter. From the entire process, each factor or problem together will affect the quality of the 60 ml plastic bottle, so to control the quality, you must also control the factors or problems that exist at the same time.

Previous research that is relevant to this study is the author Ade Suryanto, who published a study entitled "Quality Control Analysis of Defective Products Using the Seven Tools Method at PT. Morita Tjokro Gearindo. "Evaluate problems such as shaving scrat, over diameter, surface defects, deburring somplak, hobbing extinguishing and handling defects. The proposed solution is that the company must place an expert in calculating the level of damage or defect of the product using statistical tools or devices, so that the number can be known with high accuracy and measurability, forming a supervisory team that is specifically tasked with inspecting defective products, before the goods are produced and after they are completed, implementing absolute rules so that production runs according to plan and runs effective in PT. Morita Tjokro Gearindo.

Theoretical Foundations

Quality

Basically a person makes a purchase to meet their needs. When someone buys something, they don't just see it from the outside, but the benefits obtained from the item. Therefore, the company is required to produce a good quality product. Product quality is the ability of a product to perform its functions, it includes durability, reliability, precision produced, ease of operation and repair, and other valuable attributes of the product as a whole.

Quality Control

Quality control is one of the techniques that needs to be carried out starting from before the production process runs, during the production process, until the production process ends with producing the final product. Quality control and supervision are activities carried out to ensure that production and operation activities carried out are in accordance with what is planned and if there are deviations, the deviations can be corrected so that what is expected can be achieved.

Product

Product "is everything (including physical objects, services, places, organizations, ideas, or persons) that can or is able to offer a producer to be requested, sought, bought, used, or consumed by the market in order to meet its needs and desires". Based on the definition above, it can be concluded that a product is everything in physical or non-physical form, that is offered by producers to be requested, sought, purchased, used or consumed by consumers as a fulfillment of their needs or problems.

Defective Products

Defective products are products that result from a production process that does not meet standards but is economically more profitable when repaired than directly sold. In other words, the cost of repairing defective products is still lower than the sales results of the defective products after repair. A defective product is a unit of product that does not meet production standards and can be technically and economically repaired to be sold as a good product or remains a defective product

Seven Tools

Seven Tools The concept of seven tools comes from Kaoru Ishikawa, a well-known quality expert from Japan. According to Ishikawa, 95% of quality problems can be solved with seven tools. Seven tools is one of the statistical tools to find the root cause of quality problems, so that it can control the quality of defective products. The statistical tools used in the seven tools method.

METHODOLOGY

The research of the scientific paper entitled "Analysis of Product Defects in the Installation of Part Stage Housing Left Using the Seven Tools Approach at PT. Electronic", the type of research used is quantitative research. The quantitative research method is research whose results are presented in the form of descriptions using numbers and statistics. Quantitative research methodology is a scientific method to obtain valid data with the aim of being able to find, prove and develop knowledge so that in turn it can be used to understand, solve and anticipate problems in a certain field. With this Quantitative Research, it is hoped that it can explain in detail the problems that occur at PT. Electronics regarding defective parts on stage housing left.

RESEARCH RESULT

The stage housing left on the product is an important component in electronic products, especially in *cahill* model printers. Not only installing the left *casing* on the printer on the *stage housing left* but also installing several other covers such as :

- ***Tank Cover***

A tank cover is a part of a printer case designed to cover an ink or toner tank. It is a part located on the top or side of the printer and serves to protect the ink or toner tank from dust, dirt, direct light, and physical damage, The main function of the cover tank is to maintain the cleanliness, availability, and quality of the ink or toner in the printer, thus ensuring consistent and quality prints.

- ***Paper Support RASF***

Paper support RASF stands for "*Rear Auto Sheet Feeder*" which is one of the features on the printer. Paper support RASF is a mechanism on the printer that allows the user to automatically load paper from the back of the printer. This is different from the manual *feed* feature, where the paper is manually inserted one at a time. By using RASF's paper support, users can load more paper into the printer at the same time, which is useful for printing large numbers of documents without having to constantly manually insert paper. This feature is often used in situations where users want to print a large number of documents or longer documents.

- ***Housing Left***

Housing left (Left printer case) is the outer part that covers the internal part of the left side of the printer. installed to help protect the internal parts of the printer from dust, dirt, and physical damage. This helps to maintain the cleanliness and safety of the printer.

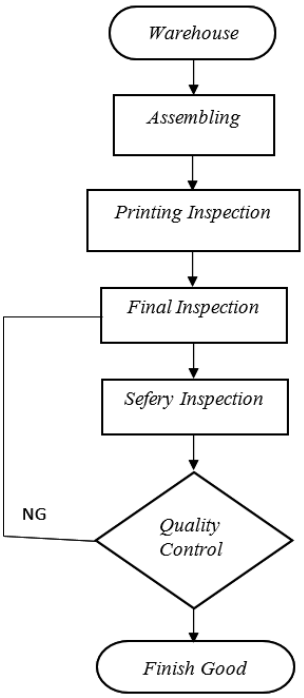
The exterior of the printer is also designed to provide a good appearance and aesthetics that blend in with the overall design of the printer. This includes aspects such as color, texture, and overall design. And it is also designed to hide the internal components of the printer that may not need to be accessed by the user on a regular basis. This helps to create a neat and organized look. In addition, it can also provide additional structural support for the printer, helping to maintain the overall sturdiness and stability of the device.

After making sure that everything is installed properly according to the standard and there are no defective parts, it will be distributed to the next *stage* and will be sent to the customer as a *finished good* product.

Picutre 1. Printer Cahill

Material Flow PT. Electronic

Material Flow Diagram functions as an analysis and planning tool that helps in determining material flow patterns in a production process. This diagram is used to illustrate the flow of materials from raw materials to finished products.



Picture 2. Material Flow Diagram PT. Electronic

The following is the production process of PT. Electronics through several steps, including the following:

1. *Warehouse*

Warehouse is a warehouse or warehousing. Warehouse as a place to store goods such as raw materials, semi-finished materials or finished products. Warehouse is also useful for providing information about the status, availability and condition of goods. The functions of the Warehouse are as follows :

- As a place to store and maintain items safely and organically.
- Warehouses play a role in receiving incoming goods from suppliers or manufacturers.
- The warehouse is responsible for keeping the goods in good condition and ready to be shipped or used.

The following is the method of processing materials in the warehouse at PT. Electronics: materials in the warehouse at PT. Electronics are applied by the method, namely FIFO. The following is the definition of FIFO :

- FIFO (*First In First Out*)

FIFO (*First in First Out*) is one of the methods of inventory management by using goods in the warehouse that are adjusted to the time of entry. This method is also said to be the first item that enters must also be the first to be issued or sold. So, the inventory recorded in the report will be similar to the stock in the warehouse.

2. *Assembling*

Assembly is the process of arranging individual components into a complete and functional product. This process typically involves the use of specialized tools and techniques to ensure that all components are installed correctly and according to the specified specifications. In the context of manufacturing, assembly can refer to different types of products.

3. *Printing Inspection*

Printing inspection refers to the process of inspecting and assessing the quality and accuracy of printed materials. This involves examining various aspects of the printout, such as text, images, colors, registration, and overall print quality. Printing inspection is essential in industries such as publishing, packaging, labeling, and commercial printing to ensure that printed products meet the desired standards and specifications.

4. *Final Inspection*

This final inspection is the most sensitive part but is the most important part because where all processes will be carried out 100% of the checking process, where once a week there is a pretest by the trainer in

one day of production there will be one product that is NG deliberately, if the final inspection does not find an NG product at the time of the test then he must retrain, every 3 months or if the stop line is in the final inspection will be in the capability where there are several leaders who supervise and must check one NG product and the Final Inspection must find 5 NG from several NG that have been deliberate on the product. The purpose of the final inspection is to ensure that the product meets the required quality standards and specifications, as well as to identify and address any defects or problems before they get to the end user.

5. *Safety Inspection*

Safety inspection refers to the actions and practices that are implemented to ensure that a product is safe for its intended use, minimizes potential risks, and does not harm consumers or users. Product safety is an important aspect of manufacturing, distribution, and consumption, which aims to protect individuals from harm, injury, or health risks associated with products.

6. *Quality Control*

Quality control is a production process that can determine whether the product we make is in accordance with company standards or not, this quality control can judge a product if a product is NG then the product we produce can be pending where this process is a very critical process and requires precision and mastering the entire product so as to facilitate the process of checking production goods, if the product is Ok, it will be continued in the next section.

7. *Finish Good*

Finish good is a place to store a product that has been processed through the production process, the method that is often used in finish good is FIFO where the product first enters, then the product must be the first to come out to avoid product products that are easily expired. In the process of work, Finish good does not only function as a warehouse for storing finished goods. Another function of the finished good is the final place to inspect production goods before being sent to customers, this is done to prevent errors that lead to customer complaints. Errors in shipping goods, errors in the delivery of types of goods that do not meet customer requests, and other mistakes need to be avoided so that product quality is maintained.

Standardization in Stage Housing Left

Standardization is the process of setting and setting consistent standards for a specific product or product category. This standard can cover various aspects, such as technical specifications, dimensions, quality, raw materials, production processes, safety, and security. The main purpose of product standardization is to ensure that the products produced meet the expected level of quality, are easily interchangeable, and are safe for consumers to use. The

following is the standardization in the left housing stage on printer products at PT. Electronic.

Tabel 2. Standardization in Stage Housing Left

No	Kind	Standardization
1.	*Short Mold*	Ensure the part has a perfect shape and does not melt.
2.	*Dirty*	Ensures parts are clean and free from dirt or dust.
3.	*Loose*	Make sure the screws at the time of installing the part will not come loose or loose.
4.	*Scratch*	Make sure the part is not scratched or scuffed due to friction with other objects or due to other causes.
5.	*Bending*	Ensure that the condition of the part is not bent when installed or used.
6.	*Broken*	Make sure the part is not broken.

DISCUSSION

The part defects that occurred in the prnter of the cahill model in the stage housing left in June are presented in the following table:

Table 3. June 2023 Part Defect Data

No	Tanggal	Produksi/hari	Scratch	Loose	Broken	Dirty	Short Mold	Bending
1	01 Juni 2023	210	8	4	5	2	4	3
2	2 Juni 2023	200	5	2	0	4	0	0
3	3 Juni 2023	205	6	3	1	2	2	1
4	4 Juni 2023	199	5	0	2	1	3	0
5	5 Juni 2023	202	4	2	4	2	1	3
6	6 Juni 2023	189	3	1	2	0	3	1
7	7 Juni 2023	190	6	3	4	2	2	0
8	8 Juni 2023	187	4	2	3	0	2	1
9	9 Juni 2023	192	3	0	1	2	4	2
10	10 Juni 2023	195	2	4	2	1	3	0
11	11 Juni 2023	190	3	2	2	0	2	2
12	12 Juni 2023	198	3	1	1	4	0	1
13	13 Juni 2023	194	0	5	1	3	0	2
14	14 Juni 2023	200	0	0	2	4	10	0
15	15 Juni 2023	192	4	3	4	2	3	1
16	16 Juni 2023	200	6	2	0	1	3	2
17	17 Juni 2023	199	0	4	3	0	4	0
18	18 Juni 2023	205	5	3	2	1	0	2
19	19 Juni 2023	202	7	2	2	0	0	3
20	20 Juni 2023	189	4	0	5	2	1	2
21	21 Juni 2023	193	3	1	0	10	0	1
22	22 Juni 2023	198	5	2	1	3	5	0
23	23 Juni 2023	195	9	0	0	2	3	1
24	24 Juni 2023	189	0	3	4	0	2	3
25	25 Juni 2023	201	5	0	2	1	3	5
26	26 Juni 2023	190	2	2	1	4	2	0
27	27 Juni 2023	187	4	1	0	0	3	4
28	28 Juni 2023	193	7	2	3	2	4	0
29	29 Juni 2023	188	6	0	1	1	2	0
30	30 Juni 2023	200	3	1	2	1	0	0
Total			122	55	60	57	71	40

From the collection of a number of data above, the following is an explanation of the application of the seven tools method for processing and analyzing the causes of part defect problems in cahill model printer products on the left housing stage at PT. The electronics are as follows:

Check Sheet

The inspection using the check sheet observation sheet aims to provide information in the form of product data containing the observation time and the number of part defects.

The following table is a check sheet on part defects recorded by production operators on June 1, 2023.

Table 4. Check Sheet

Nama Line	R42	Tahun = 2023	*Check Sheet Part*
Stage	*Housing Left*	Tanggal = 01 Juni 2023	

No	Nama *Part*	*Shift*	Jenis NG					
			Scratch	*Loose*	*Broken*	*Dirty*	*Short Mold*	*Bending*
1	*Housing Left*	1	3	0	1	1	3	1
2	*Cover Paper support RASF*	1	1	3	0	1	0	2
3	*Cover Tank*	1	2	0	3	0	1	0
4	*RASF Full*	1	0	1	1	0	0	0
5	*RASF Home*	1	2	0	0	0	0	0
Jumlah			8	4	5	2	4	3

Control Chart

A control chart is a tool in the form of a graph and is used to monitor/monitor the stability of a process and study process changes over time. This control chart has an Upper Line for the Upper Control Limit, a Lower Line for the Lower Control limit and a Middle Line for the Average.

a) Calculating the *Central Line* (CL)

$$CL = \frac{\sum cacat}{\sum_{Jumlah\ Produksi}} \quad \textbf{(4.1)}$$

b) Calculating the *Lower Control Line* (LCL)

$$LCL = \bar{P} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}} \quad \textbf{(4.2)}$$

c) Calculating the *Upper Control Line* (UCL)

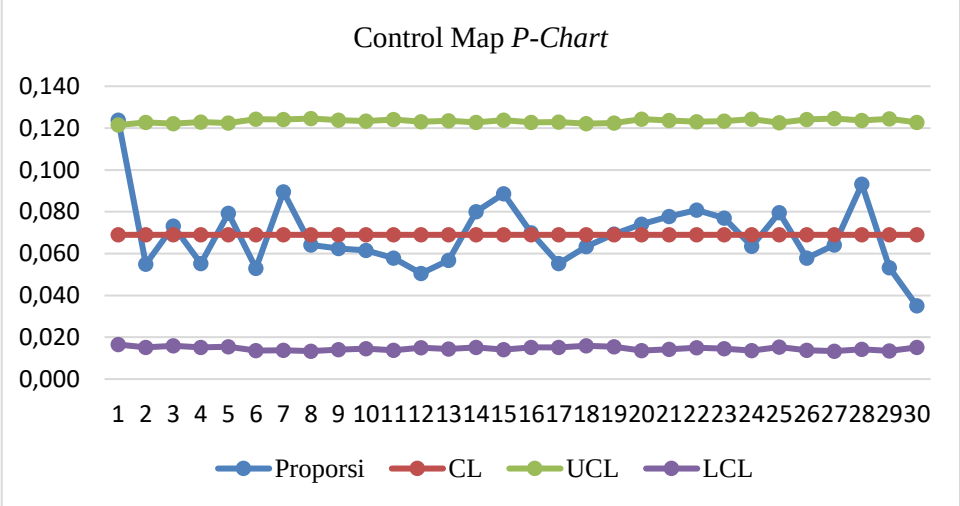
$$UCL = \bar{p} + 3\sqrt{\frac{\bar{p}(1-p)}{n}} \quad \textbf{(4.3)}$$

The following is the process of change from time to time, can be seen in table 4. below.

Table 5. Control Chart Calculation

No	Produksi/hari	Jumlah Cacat	Proporsi	CL	UCL	LCL
1	210	26	0.124	0.069	0.121	0.017
2	200	11	0.055	0.069	0.123	0.015
3	205	15	0.073	0.069	0.122	0.016
4	199	11	0.055	0.069	0.123	0.015
5	202	16	0.079	0.069	0.122	0.015
6	189	10	0.053	0.069	0.124	0.014
7	190	17	0.089	0.069	0.124	0.014
8	187	12	0.064	0.069	0.125	0.013
9	192	12	0.063	0.069	0.124	0.014
10	195	12	0.062	0.069	0.123	0.015
11	190	11	0.058	0.069	0.124	0.014
12	198	10	0.051	0.069	0.123	0.015
13	194	11	0.057	0.069	0.124	0.014
14	200	16	0.080	0.069	0.123	0.015
15	192	17	0.089	0.069	0.124	0.014
16	200	14	0.070	0.069	0.123	0.015
17	199	11	0.055	0.069	0.123	0.015
18	205	13	0.063	0.069	0.122	0.016
19	202	14	0.069	0.069	0.122	0.015
20	189	14	0.074	0.069	0.124	0.014
21	193	15	0.078	0.069	0.124	0.014
22	198	16	0.081	0.069	0.123	0.015
23	195	15	0.077	0.069	0.123	0.015
24	189	12	0.063	0.069	0.124	0.014
25	201	16	0.080	0.069	0.123	0.015
26	190	11	0.058	0.069	0.124	0.014
27	187	12	0.064	0.069	0.125	0.013
28	193	18	0.093	0.069	0.124	0.014
29	188	10	0.053	0.069	0.124	0.014
30	200	7	0.035	0.069	0.123	0.015
$\sum$	5872	405				
$\bar{P}$	0.069					
$1-\bar{P}$	0.003					

From the results of the calculation above, the following control map is obtained:



Picture 3. Control Chart

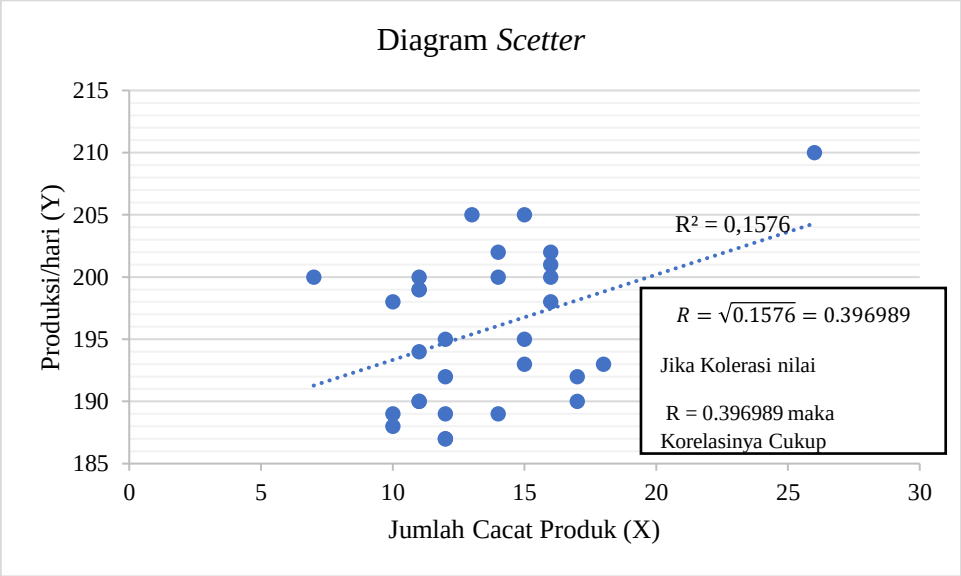
The control map graph above the proportion of damage that crosses the boundary line, the control map shows that the product is still experiencing irregularities. There is 1 point that comes out, namely on the 1st. This shows that

the variation produced in the production process is in an unstable condition (Out Of Control) or uncontrollable. Therefore, there needs to be an improvement in quality control on the stage housing left at PT. Electronic.

Scatter Diagram

A scatter diagram or pancast diagram is a graphic drawing consisting of a set of points from the values of a pair of variables (variable X and variable Y). It is used to see the extent to which product defects affect production results. To make it easier to interpret the strength of the relationship between the two variables, Saworno in the book "Quantitative and Qualitative Research Methods" provides the following criteria (Sarwono: 2006)

- 0 : There is no correlation between the two variables
- > 0 – 0.25 : Correlation is very weak
- > 0.25 – 0.5 : Sufficient correlation
- > 0.5 – 0.75 : Strong correlation
- > 0.75 – 0.99 : Correlation is very strong
- 1 : Perfect correlation



Picture 4. Scatter Diagram

From the form of the graph produced, the chart scetter diagram is stated to have a sufficient relationship or correlation, meaning that there has been a positive relationship, namely the higher the number of production part defects, the higher the number of production defects. If you want to reduce product quality damage, one of the actions that must be taken is to reduce the level of product defect influence.

Histogram

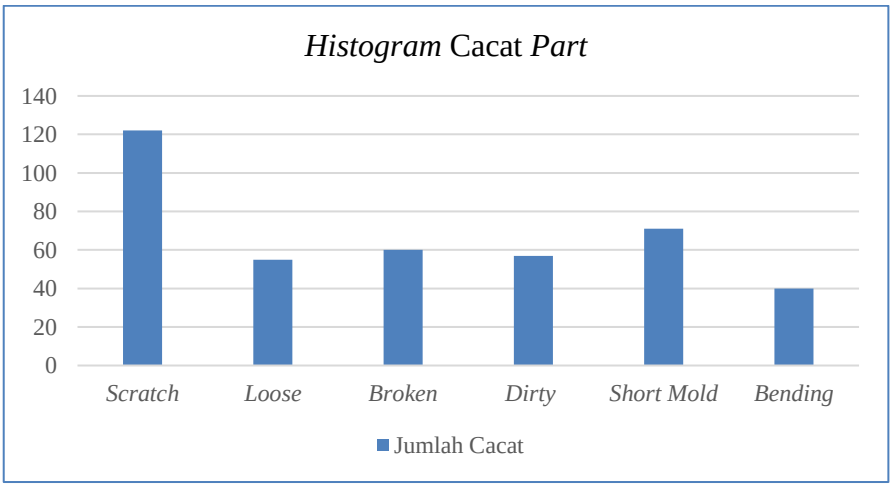
A histogram is a bar chart that depicts the many factors that affect a product.

Based on table 5. The part defect data above is obtained as follows:

Tabel 5. Histogram

Types of Defects	Number of Defects	Defect Percentage	Cumulative Presentation
Scratch	122	30.12%	30.12%
Loose	55	13.58%	43.70%
Broken	60	14.81%	58.52%
Dirty	57	14.07%	72.59%
Short Mold	71	17.53%	90.12%
Bending	40	9.88%	100%
Total	**405**	**100%**	

From the percentage results in table 5. The following is a histogram diagram of the total part defect data in June 2023 at PT. Electronic.



Picture 5. Histogram

Based on the histogram diagram above, it can be seen that defects caused by scratch 30.12%, loose 13.58%, broken 14.81%, dirty 14.07%, short mold 17.53%, and part defects in the left bending stage housing by 9.88%.

Stratifikasi

Stratification (Run chart) is in charge of the problem of being a group or group of the same type of details or smaller things being the single elements of the problem. To make it easier to digest, classify/group the types of problems into small components, stratification needs to be carried out.

From the calculation of each type of defect, the number of defects is 405pcs. After knowing the number of defective presentations, it can be classified again according to the most dominant defect. The following is a priority table by

the most dominant defects.Tabel berikut merupakan hasil *stratifikasi* dari data total cacat *part* pada bulan Juni- 2023 di PT. Elektronik.

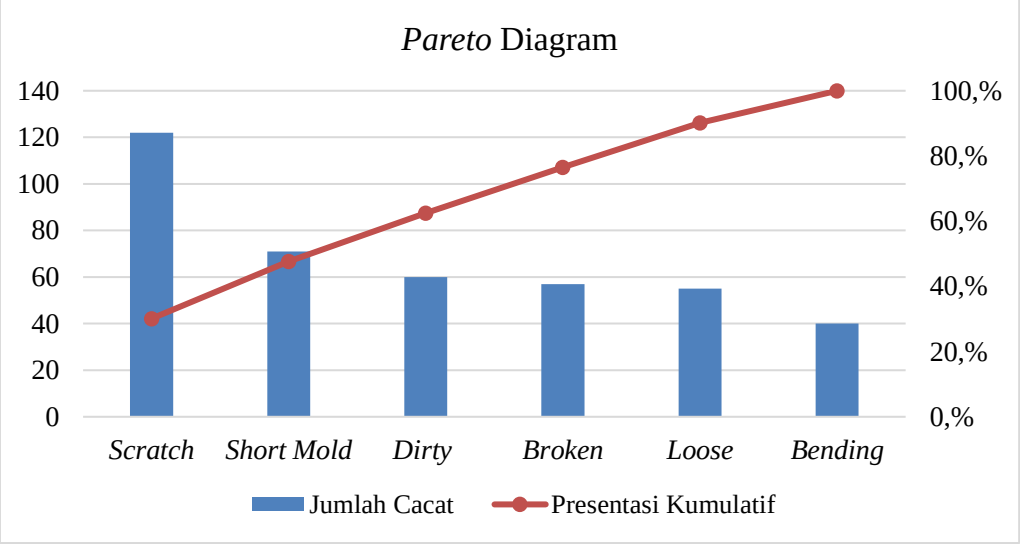
Tabel 6. Stratifikasi

Types of Defects	Number of Defects	Defect Percentage	Cumulative Presentation	Priority
Scratch	122	30.12%	30.12%	1
Short Mold	71	17.53%	47.65%	2
Dirty	60	14.81%	62.47%	3
Broken	57	14.07%	76.54%	4
Loose	55	13.58%	90.12%	5
Bending	40	9.88%	100%	6
Total	405	100%		

Pareto Analysis

A pareto chart is a diagram used to identify, sort, and work to permanently exclude defective or not good products. With this diagram, it can be known which types of defects are most dominant in production during June 2023.

Based on diagram 7. Above it can be concluded that the largest or most dominant part defect is the scratch part defect. Then a pareto diagram can be made based on the type of defect as follows.



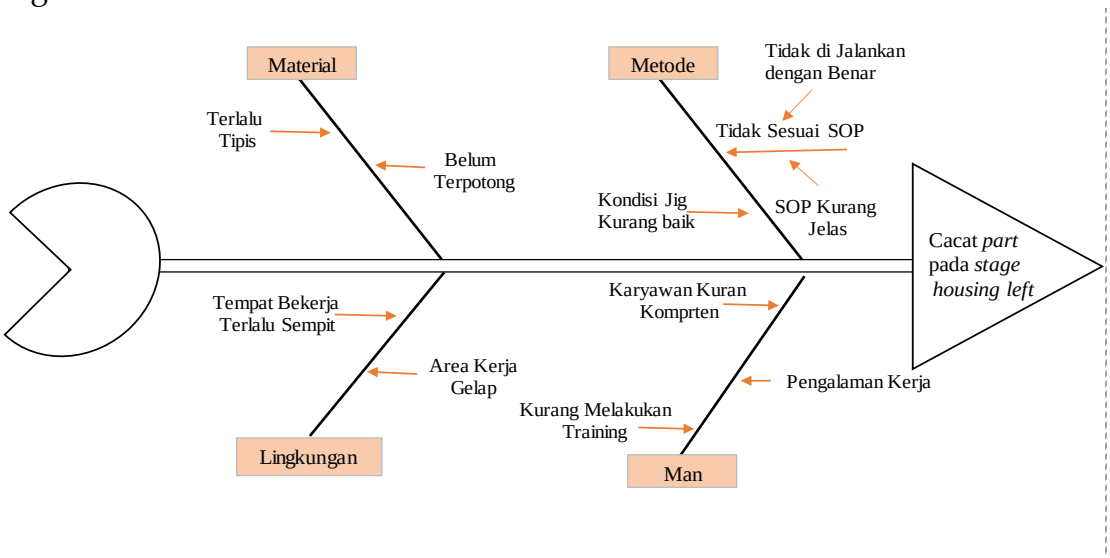
Picture 6. Pareto Analysis

Fishbone

Fishbone diagrams are often called Ishikawa diagrams or cause and effect diagrams. A fishbone diagram is a tool for identifying the various potential causes of a single effect or problem, and analyzing the problem.

The factors that cause defects in the left housing product, namely man, method, engine and environment will be described in the following fishbone

diagram.



Picture 7. Fishbone

Repair Plan

The main purpose of this stage of the 5W+1H method problem analysis process is to provide recommendations for improvement proposals to the company, especially those related to the problems identified in the fishbone above and factors such as the 5M factor that require improvement. Proposed corrective actions for part defects can be seen in the table below:

Tabel 7. Causes of Human Factor Part Defects

Factor	Kind	5W+1H	Description
Man (Manusia)	Main Purpose	Apa (*What*)	Incompetent employees
	Reasons for Usability	Mengapa (*Why*)	1. Lack of work experience 2. Employees take part in training only at the beginning
	Location	Dimana (*Where*)	Held at PT. Electronics In the production room
	When	Kapan (*When*)	When the Production Process is not operating or not running
	Human	Siapa (*Who*)	All operators working
	Method	Bagaimana (*How*)	Conduct training at least once every 2 months.

Tabel 8. Causes of Material Factor Part Defects

Factor	Kind	5W+1H	Description
Material	Main Purpose	Apa (*What*)	1. Raw materials are too thin 2. The material is not in a perfectly cut condition
	Reasons for Usability	Mengapa (*Why*)	Parts from the Vendor are not in good condition
	Location	Dimana (*Where*)	Work Area
	When	Kapan (*When*)	Parts from the Vendor are not in good condition
	Who	Siapa (*Who*)	Vendors
	Method	Bagaimana (*How*)	Conduct periodic checks on materials

Tabel 9. Causes of Defects in Environmental Factors

Factor	Kind	5W+1H	Deskripsi
Environmental	Main Purpose	Apa (*What*)	1. 1. Lighting is not up to standard 2. Narrow Workspace
	Reasons for Usability	Mengapa (*Why*)	1. Installation is not clearly visible 2. Difficulties when installing parts
	Location	Dimana (*Where*)	Work Area
	When	Kapan (*When*)	During the production process and not taking place.
	Who	Siapa (*Who*)	Leadership and all production operators
	Method	Bagaimana (*How*)	*1.* Checking the Lights 2. Lamp replacement on stage housing left 3. Widening of the workspace.

After several improvement measures were taken in production activities. The results of the repair were re-checked, by comparing the data on part defects that occurred before the repair in June 2023 and the data after the implementation of the repair in July 2023. The following is an analysis using seven tools after repairs:

Part defects that occurred in the prnter of the cahill model in the stage housing left in June are presented in the following table:

Table 10. July 2023 Part Defect Data

No	Tanggal	Produksi/hari	Scratch	Loose	Broken	Dirty	Short Mold	Bending
1	01 Juli 2023	210	4	2	0	2	3	0
2	2 Juli 2023	200	2	2	2	4	0	0
3	3 Juli 2023	203	2	0	3	0	2	3
4	4 Juli 2023	199	2	0	0	0	4	3
5	5 Juli 2023	202	0	0	3	2	0	3
6	6 Juli 2023	189	0	2	1	0	0	1
7	7 Juli 2023	190	2	0	1	2	0	0
8	8 Juli 2023	187	0	1	0	0	1	1
9	9 Juli 2023	191	0	2	0	1	2	2
10	10 Juli 2023	195	0	0	0	1	2	0
11	11 Juli 2023	190	3	0	0	0	0	0
12	12 Juli 2023	196	1	0	2	0	0	1
13	13 Juli 2023	194	0	2	1	0	1	1
14	14 Juli 2023	200	0	0	0	2	1	0
15	15 Juli 2023	192	3	0	1	3	0	0
16	16 Juli 2023	200	0	2	0	1	1	0
17	17 Juli 2023	198	1	0	0	0	0	0
18	18 Juli 2023	203	0	0	0	1	2	2
19	19 Juli 2023	202	0	0	1	0	0	3
20	20 Juli 2023	190	4	2	1	2	0	0
21	21 Juli 2023	193	1	1	0	0	0	0
22	22 Juli 2023	197	1	0	0	1	2	0
23	23 Juli 2023	193	0	0	2	0	1	0
24	24 Juli 2023	189	0	0	1	0	0	2
25	25 Juli 2023	200	3	1	0	0	0	0
26	26 Juli 2023	190	0	2	1	0	0	0
27	27 Juli 2023	187	1	0	0	0	0	0
28	28 Juli 2023	191	1	0	0	0	0	0
29	29 Juli 2023	188	0	0	0	0	0	0
30	30 Juli 2023	200	0	0	0	0	0	0
Total			31	19	20	22	22	22

Check Sheet After Repair

The following is a check sheet on part defects recorded by the production operator on June 1, 2023.

Table 11. Check Sheet After Repair

Nama Line	R42	Tahun = 2023	*Check Sheet Part*
Stage	*Housing Left*	Tanggal = 01 Juli 2023	

No	Nama *Part*	*Shift*	Jenis NG					
			Scratch	*Loose*	*Broken*	*Dirty*	*Short Mold*	*Bending*
1	*Housing Left*	1	2	0	0	2	0	0
2	*Cover Paper support RASF*	1	0	2	0	0	0	0
3	*Cover Tank*	1	0	0	0	0	0	0
4	*RASF Full*	1	1	0	0	0	2	0
5	*RASF Home*	1	1	0	0	0	1	0
Jumlah			4	2	0	2	3	0

Control Chart After Repair

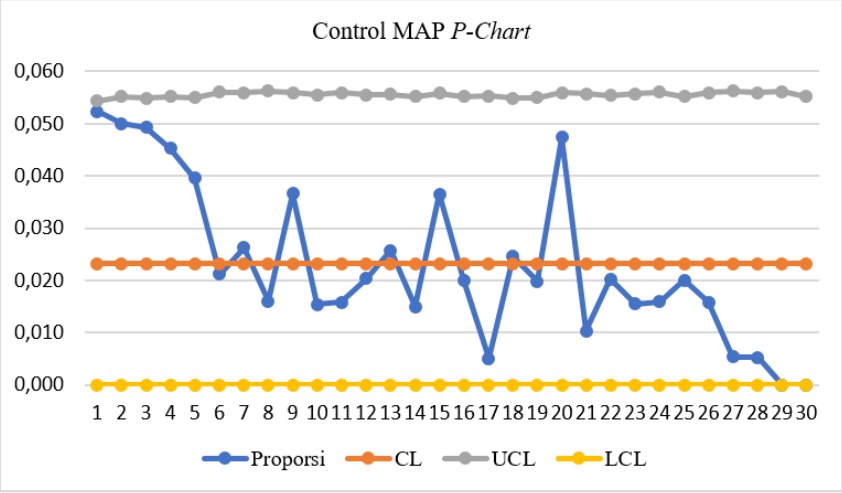
The following is the process of changes from time to time, which can be seen in table 12 below.

Table 12. Control Chart Calculation After Improvement

No	Produksi/hari	Jumlah Cacat	Proporsi	CL	UCL	LCL
1	210	11	0.052	0.023	0.054	0.000
2	200	10	0.050	0.023	0.055	0.000
3	203	10	0.049	0.023	0.055	0.000
4	199	9	0.045	0.023	0.055	0.000
5	202	8	0.040	0.023	0.055	0.000
6	189	4	0.021	0.023	0.056	0.000
7	190	5	0.026	0.023	0.056	0.000
8	187	3	0.016	0.023	0.056	0.000
9	191	7	0.037	0.023	0.056	0.000
10	195	3	0.015	0.023	0.056	0.000
11	190	3	0.016	0.023	0.056	0.000
12	196	4	0.020	0.023	0.055	0.000
13	194	5	0.026	0.023	0.056	0.000
14	200	3	0.015	0.023	0.055	0.000
15	192	7	0.036	0.023	0.056	0.000
16	200	4	0.020	0.023	0.055	0.000
17	198	1	0.005	0.023	0.055	0.000
18	203	5	0.025	0.023	0.055	0.000
19	202	4	0.020	0.023	0.055	0.000
20	190	9	0.047	0.023	0.056	0.000
21	193	2	0.010	0.023	0.056	0.000
22	197	4	0.020	0.023	0.055	0.000
23	193	3	0.016	0.023	0.056	0.000
24	189	3	0.016	0.023	0.056	0.000
25	200	4	0.020	0.023	0.055	0.000
26	190	3	0.016	0.023	0.056	0.000
27	187	1	0.005	0.023	0.056	0.000
28	191	1	0.005	0.023	0.056	0.000
29	188	0	0.000	0.023	0.056	0.000
30	200	0	0.000	0.023	0.055	0.000
$\sum$	5859	136				
$\bar{P}$	0.023					
$1-\bar{P}$	0.002					

Because what is stated in the value of proportion or percentrase is always positive, it should not be negative so that the LCL value is 0.

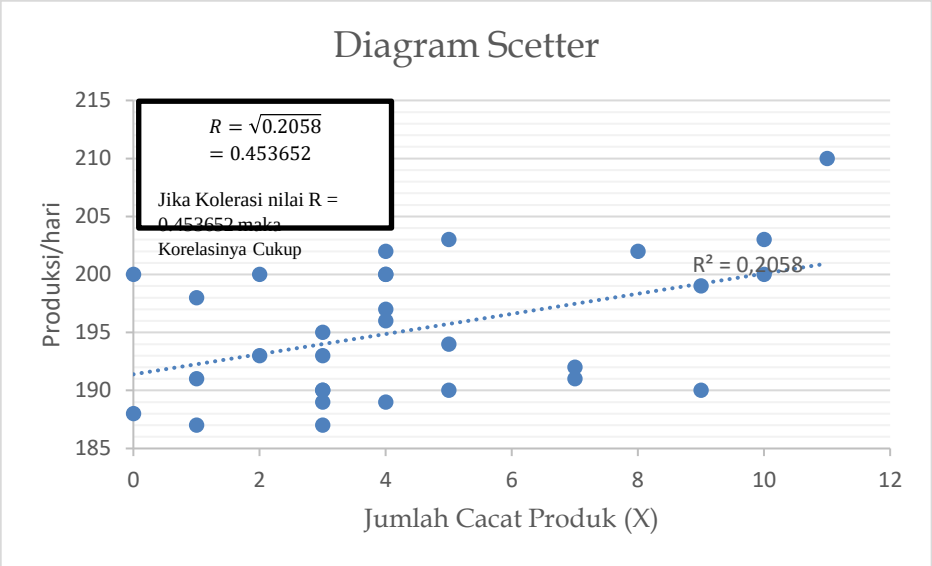
From the results of the calculation above, the following control map is obtained:



Picture 8. Control Chart After Repair

Scatter Diagram After Repair

From the data above, a scatter diagram can be described as follows:



Picture 9. Scatter Diagram After Repair

From the form of the graph produced, the chart scetter diagram is stated to have a sufficient relationship or correlation, meaning that there has been a positive relationship, namely the higher the number of production part defects, the higher the number of production defects.

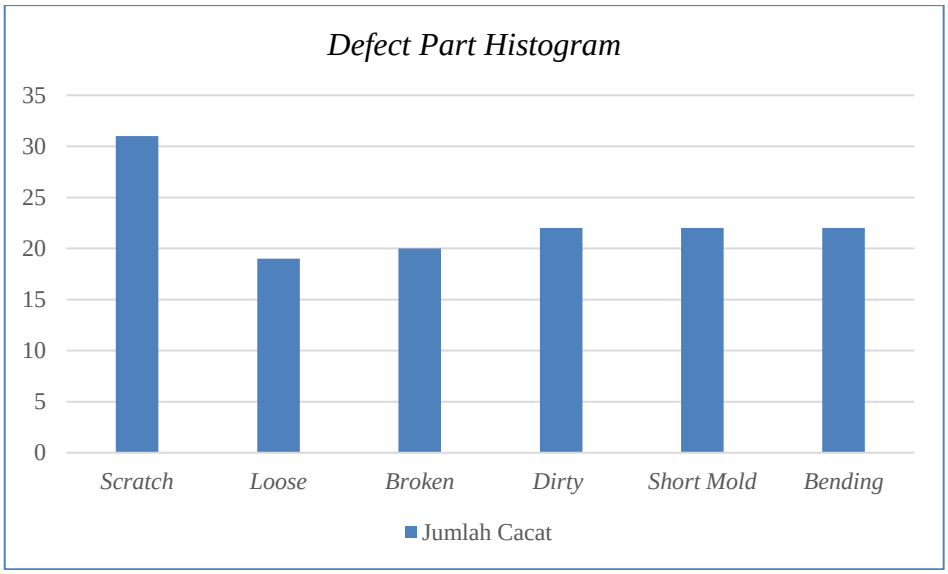
Histogram After Improvement

Based on table 5 of the Part defect data above, the histogram percentages are obtained as follows:

Tabel 13. Histogram After Repair

Types of Defects	Number of Defects	Defect Percentage	Cumulative Percentage
Scratch	31	22.79%	22.79%
Loose	19	13.97%	36.76%
Broken	20	14.71%	51.47%
Dirty	22	16.18%	67.65%
Short Mold	22	16.18%	83.82%
Bending	22	16.18%	100%
Total	136	100%	

From the percentage results in table 5, the following is a histogram of the total part defect data in June 2023 at PT. Electronic.



Picture 10. Histogram After Repair

Stratifikasi After Repair

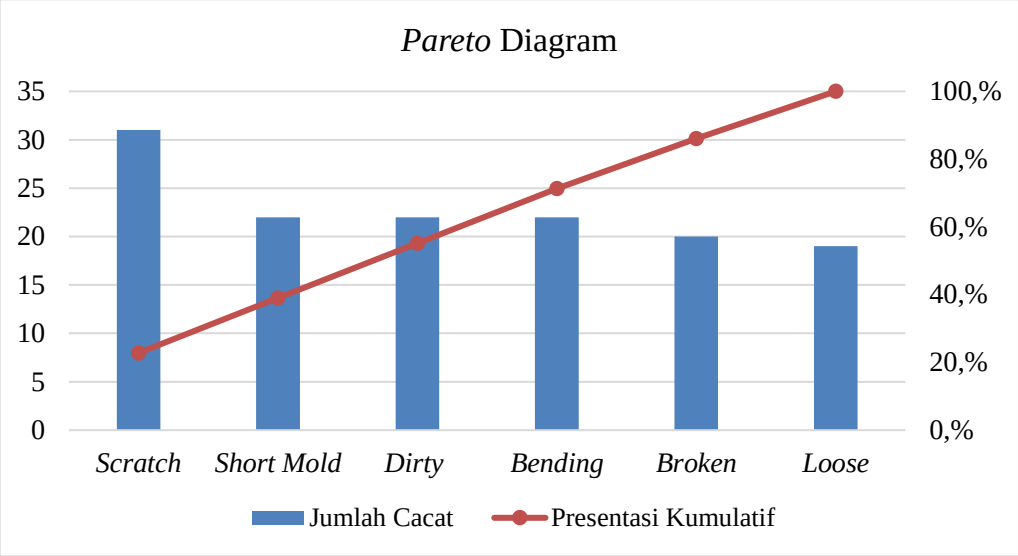
The following table is the result of stratification of the total part defect data in July 2023 at PT. Electronic.

Tabel 14. Stratifikasi After Repair

Jenis Cacat	Jumlah Cacat	Presentase Cacat	Presentasi Kumulatif	Prioritas
Scratch	31	22.79%	22.79%	1
Short Mold	22	16.18%	38.97%	2
Dirty	22	16.18%	55.15%	3
Bending	22	16.18%	71.32%	4
Broken	20	14.71%	86.03%	5
Loose	19	13.97%	100%	6
Total	136	100%		

Pareto Analysis After Repairs

Based on the diagram 14 above, it can be concluded that the largest or most dominant part defect is the scratch part defect. Then a pareto diagram can be made based on the type of defect as follows. Based on the diagram 4.16 above, it can be concluded that the largest or most dominant part defect is the scratch part defect. Then a pareto diagram can be made based on the type of defect as follows.



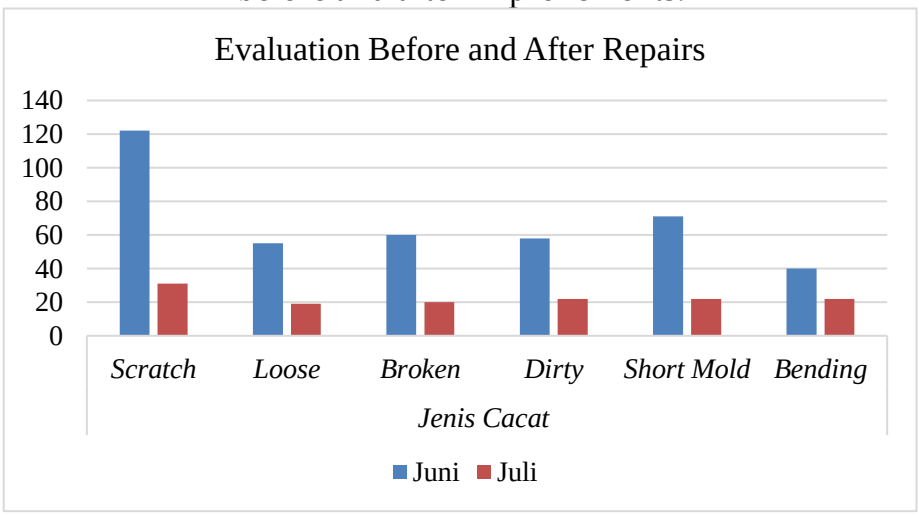
Picture 11. Pareto Analysis After Repairs

The analysis uses the seven tools method on part defects in the left housing stage in July 2023. After making bailouts, it has been carried out. The following is the percentage decrease from June before the improvement to July after the improvement.

Table 15. Product Part Defect Data for June 2023 - July 2023

No	Bulan	Jumlah Produksi	Jenis Cacat						Jumlah	Presentase %
			Scratch	*Loose*	*Broken*	*Dirty*	*Short Mold*	*Bending*		
1	Juni	5872	122	55	60	57	71	40	405	6.9%
2	Juli	5859	31	19	20	22	22	22	136	2.3%

From the table above, the defect of the part in the left stage housing. After the improvement was made, it decreased. The following is a chart of evaluation before and after improvements:



Picture 12. Diagram of Part Defect Reduction After Repairs

From the above data, it can be concluded that the data on part defects in the left housing stage at PT. Electronic. After making repairs in July 2023. There was a decrease of 4.6% from before the improvement. The percentage of part defects has decreased from the standard set by the company, the standard set by

the company is 5% while the part defect that occurred in the left stage housing in July was 2.3%. This condition shows that the quality problems that occur at PT. Electronics have been minimized. The next step that must be taken is to maintain the quality control results that have been achieved to prevent the recurrence of the same problem and further minimize the level of product defects in the next production activities by setting standards for the company after making repairs.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the analysis and discussion of Based on the results of the analysis of part defects that occur in the left housing stage at PT. Electronic, then the following conclusions can be drawn:

1. The most dominant type of part defect occurs in the left housing stage at PT. Electronics, namely part defects of 30.12%.
2. Based on the analysis using fishbone diagrams, it was concluded that the factors causing part defects in the left housing stage at PT. Electronics, namely:
   a. Man / Human Factor

      Employees are not competent, This is due to the lack of employee awareness about the impact of making mistakes in the occurrence of part defects, lack of work experience of operators in the scope of production, employees are only given training on the work process in the left housing stage when joining PT. Electronic.
   b. Methode Factor
      - Working not in accordance with the Standard Operating Procedures (SOP).
      - The condition of the Jig is not good.
      - Employees Do Not Understand SOPs, This is because there is no socialization to employees about the renewal of SOPs.
   c. Material Factor
      - The material of the parts used is too thin.
      - Parts that have not been completely cut.
   d. Environmental factor
      - Environmental Factors of Too Narrow Work Area
      - Dark Work Area
3. The relationship between part defects and production results. Based on the scatter chart, the correlation number between the variables of the total smallpox part is 0.396989. It is concluded that there has been a positive relationship. This value means that the relationship between the two variables Total defect part (X) is related to the production yield (Y) with the degree of correlation is sufficient.
4. How to minimize part defects to reduce part defects in the stage housing left of PT. Electronics:
   - Conduct training at least once every 2 months.
   - Traing employees so that each employee understands every SOP that exists.

- Swap jigs, if you feel that the condition of the jig is not in good condition.
- Conduct periodic checks on materials.
- Check the lights.
- Lamp replacement on stage housing left.
- Widening of the workspace.

ADVANCED RESEARCH

Based on the research that has been conducted, the researcher gives the following suggestions:

1. The company must provide training and information on the factors that cause part defects and provide special trainings so that employees are more thorough and skilled in carrying out the tasks or work carried out can run in accordance with the work procedures in the company.
2. Maintain the quality control results that have been achieved to prevent the recurrence of the same problem and further minimize the level of product defects in subsequent production activities by setting standards for the company after making repairs.

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