

***THE QUALITY CONTROL USING SEVEN TOOLS METHOD FOR DEFECT PRODUCT  
ON SCANNER PRODUCTION***

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***ABSTRACT***

The aim of this research is to analyze the achievement quality standards that have been set and reduce waste due to product defects in scanner production at PT. Epson Batam using seven tools method. This research using a quantitative and descriptive method. Quantitative method using check sheet, stratification, histogram, pareto diagram, scatter diagram and while descriptive method using fishbone analysis. Data was collected by observation and documentation techniques. The results of the study stated that the improvements implemented to reduce product defects that occur from several factors, namely materials and work methods, it is necessary to do an effective division of work time so defect product do not occur due to pursuing production targets and material factors that must be checked before the goods/products enter the market.

**Key words:** *Seven Tools; Check Sheet; Stratification; Pareto Diagram; Scatter Diagram.*

## INTRODUCTION

The main goal of every company, especially industrial or manufacturing companies is to satisfy the quality of customer service and product quality. Many products are produced in various types, quality standards and forms, all of which are carried out to meet customer needs and attract customer interest. Therefore, companies must be able to innovate products with the best specifications to satisfy customers. This requires the company to be able to re-arrange its strategy to increase competitiveness in terms of product quality. To produce quality products, companies must maintain and improve quality control processes. It is very important to determine the quality standards that a product must meet to avoid deviations in the production process (Shafira et.al,2022).

In the production process, the possibility of problems in the form of defective products cannot be separated. Often, the occurrence of defective products is caused by human error factors, machines or even materials. In order to get the highest quality products, staff and quality control must be coordinated. The company will be able to continue to retain customers with the best products. Product quality is very important in the standard production process. If the product produced in the production process is defect, it will cause losses for the company, so the ultimate goal of quality control is to reduce product defects (Afif & Rismawati, 2019).

The company's efforts to satisfy customers, sometimes still encounter obstacles, for example because of some products on the market are sometimes defect, especially for the production of Veronica scanner models. This rejection is still considered low, but can be minimized by reducing the amount of finished product that has been thrown away because it cannot be repaired or recycled. Wrong experiences and complaints from companies, especially those related to raw materials, where mistakes are often made during the cutting process, resulting in raw materials not going to the next stage and piling up in the warehouse (Hermawan & Kusuma, 2017).

The basic qualities that can help companies solve problems and continuously improve their processes are the goals of one of the testing tools, namely the seven tools. The seven tools were first introduced by Dr. Kaoru Ishikawa in 1968, through the publication of a book entitled "Gemba no QC Shuho" which discusses quality management through Japanese company techniques and practices. In this book the seven quality control tools are proposed for the first time. Seven tools brought by Dr. Ishikawa consists of Check sheets, Stratification, Histograms, Pareto charts, Cause and-effect diagrams, Scatter diagrams, and Control charts (Neyestani, 2017).

The problems faced by the company are related to the products produced by the company, and have actually have been around for a long time. In the production process, there are problems such as unstable machines and manpower, resulting in defective products such as missing, scratch, and broken. Through quality control, company can reduce product defects and provide the best quality products. Based on the background stated above, the problem that can be identified is the needed of evaluation and analysis of control over product defects in scanner production as an effort to improve PT Epson Batam (PTEB). To avoid widespread problems, the problem boundaries are set as follows 1) this research is focused only on the Veronica type scanner production process, 2) this study uses defect data in 2019 and 2020, 3) the quality control analysis in this study will only discuss six of the seven tools consisting of a check sheet, stratification, histogram, pareto diagram, scatter diagram, and fishbone (cause-effect diagram). The purpose of this study is to provide input for evaluation and analysis of control over product defects in scanner production as an effort to improve PTEB. To help the company to achieve the quality standards that have been set and reduce waste due to product defects and to find out the type of defect from the scanner production with the Veronica model at PTEB.

In the current era of globalization and free competition, it is very necessary for companies to be able to compete in an uncertain economic environment. Companies must determine the right direction and policies to maintain the

company's economic stability. More and more competition, among companies encourage each company to be more efficient and quality standards in various fields. Only companies with high competitiveness can survive, one of which is by prioritizing quality improvement (Ginting et al., 2020).

Quality is the state of the product, service, workforce, process and environment that the customer expects. The quality of the business world can be used as a powerful tool to maintain a company's business. Therefore, quality can be used to win the competition. Through technological advances, consumers can face more alternative products, different prices and suppliers (Idris et al., 2016).

Quality consists of a number of product features, both directly and which are characterized by attractive features that satisfy customer needs so as to provide satisfaction in using the product. Understanding of quality is also obtained from two aspects, namely producers and consumers. Producers determine quality requirements or specifications, while consumers determine needs (Suryoputro et al., 2017).

Quality control is a series of 37 activities carried out according to the plan, and if there are deviations, they can be corrected immediately so that something is achieved. Produce quality products that can compete in the market and can be accepted by the community. There are more tools to achieve operative quality management targets, and the most frequent method of measuring and assessing process capability is through the capability index (Prabaswari & Susilo, 2020).

Quality control can usually be defined as a system that maintains quality and corrective action is required through feedback on product/service properties, as well as strengthening those attributes from the set standards. This general area can be divided into three main sub-areas: Off-line Quality Control, Statistical Process Control, and Acceptable Sampling Planning (Haryanto, 2019). Quality control generally consists of four steps, namely:

a. Standard setting is the setting of cost quality standards, performance quality

standards, safety quality standards, and product quality standards.

- b. Conformity assessment can compare problems with manufactured products and services for which standards have been set.
- c. Acting as necessary, can correct problems and causes that affect customer satisfaction through factors such as marketing, design, production, engineering and maintenance.
- d. Plan improvements and develop ongoing efforts to raise cost, performance and safety standards.

Seven Tools is a simple solution for statistical tools. These tools were developed in Japan or introduced to Japan by excellent teachers like Deming and Juran. According to Kaoru Ishikawa, you can use these 7 tools to solve 95% of problems. These tools were the basis for reviving the amazing Japanese industry after World War II (Wicaksono, 2018).

Basic statistical tools are essential to reach the top of the feature, so the default statistical tools are very important. The concept behind the seven tools comes from Kaoru Ishikawa, who argues that these core tools can solve 95% of 11 quality problems. The key to successful problem solving is being able to identify problems, use the right tools, and provide solutions to others (Jayakumar et al., 2017).

Seven tools is an enhanced data processing tool will help you quality and seven tools to determine the consolidation communication with tools by mapping structural problems. There are several points from the seven tools, namely: pareto chart, histogram, fishbone, scatter diagram, check sheet, and stratification (Suryoputro et al., 2017).

Statistical quality control uses SPC (Statistical Process Control) and SQC (Statistical Quality Control), or seven basic statistical tools that can be used as tools for quality control, including:

a. Check Sheet

Check sheets are useful to simplify the process of data collection and analysis. Because making this table is the first step taken to analyze quality control statistically (Prabaswari & Susilo, 2020). Check sheet is a form that records certain events at the time of data collection. This is a simple form that you

can use to collect your organization's data and turn it into useful information. This type of data collection can be used to ensure that the project is expected to confirm some defects. Check sheets can be entered directly into the histogram to provide information collected (Wicaksono, 2018).

**Table 1 Check Sheet**

Type of Defect	Count	Score
Dirty		12
Broken stitching		42
Inconsistent margin		15
Wrinkle		30
Long thread		10
Padding shape		8
Off center		18
Stitch per inch		24
Others		22
<b>Total Defects:</b>		<b>181</b>

Source: Prabaswari & Susilo (2020)

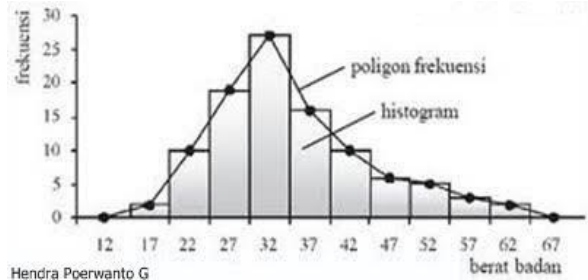
**b. Stratification**

According to Machfud & Atika (2020), stratification is a technique for grouping data into certain categories, so that the data can describe the problem clearly so that conclusions can be drawn more easily. Configured categories include data related to the human resources involved, environment, raw materials, machines used in the process, etc. In quality control, stratification aims to:

- 1) Find the root cause of quality easily.
- 2) Facilitate drawing conclusions in the use of control charts.
- 3) Examine the problems faced thoroughly.

**c. Histogram**

A histogram is a tool that helps to detect inconsistencies, and a histogram is a method of summarizing data to analyze it, which provides graphical data on how often items are seen in progress. A histogram is a graphical representation (bar graph) that draws the frequency with which other values occur in a given variable. Histograms are used to determine the current situation, define variables and propose the central trend of the variables. The histogram that has been developed for the responses must be developed to evaluate the data generated during the selected frequency (Wicaksono, 2018).



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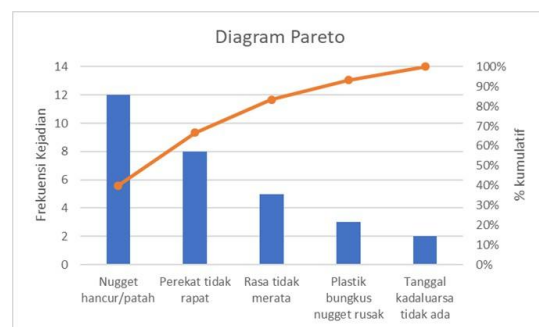
Source: Wicaksono (2018)

**Figure 1 Histogram**

**d. Pareto chart**

Pareto charts are used for categorizing problems according to their causes and symptoms. The Pareto chart is also called the 80/20 rule, and is used to determine the relative importance of the differences between data sets and to display them graphically, i.e. to separate out some of the vital causes (20%) that account for the dominant part of the quality loss (80%). The principle of the 80/20 rule is that 80% of problems come from 20% of problems. The Pareto diagram states that a small amount of damage causes most of the effect (Wicaksono, 2018).

The benefits of a Pareto diagram are to show the main problem, show how each problem compares to the whole, show the level of improvement after corrective action in a limited area, show a comparison of each problem before and after (Haryanto, 2019).



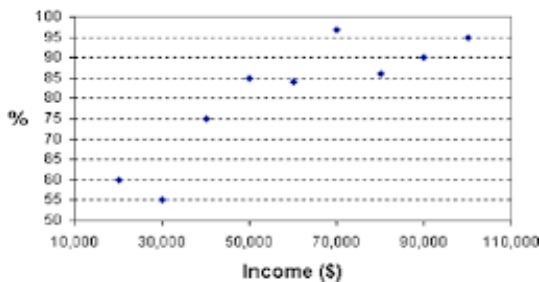
Source: Haryanto (2019)

**Figure 2 Pareto Chart**

**e. Scatter Diagram**

Scatter diagrams are useful tools that show the relationship between variables and whether the relationship is positive or negative. Scatter diagrams are used to investigate and measure possible relationships between observed changes in two different sets of variables. In other words, it can be used to show how strong the relationship between two variables is.

A scatter diagram is a graph in which one variable is compared with another to determine if there is a correlation between two variables. This graph is used to plot the distribution of two-dimensional information. The purpose of a scatter diagram is to display a variable while changing different variables. This graph is used to test the theory that relates the two variables. The slope of the graph shows the type of relationship that (Wicaksono, 2018).

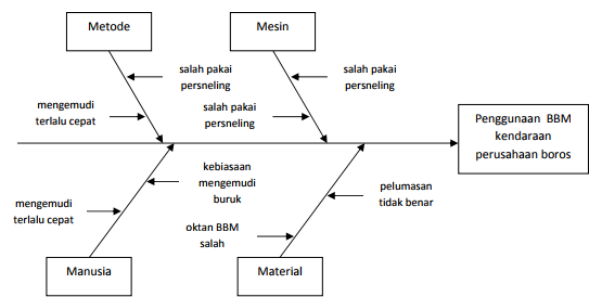


Source: Wicaksono (2018)

**Figure 3 Scatter Diagram**

f. Fishbone

Fishbone diagrams are also known as cause-and-effect diagrams. This diagram shows the lines and symbols that show the causal relationship in the problem. According to Ginting et al. (2020), a cause-and-effect diagram is a diagram that shows the causality and nature of the root causes of the current problem, including manpower (labor), machine (machine), method (work method), material (raw materials), motivation (motivation), money (finance). Fishbone diagrams have benefits for solving problems. The benefits of fishbone diagrams include: 1) the use of actual conditions for the purpose of improving the quality of a product or service; 2) circumstances that cause non-conformance of products or services and customer complaints can be reduced and eliminated; 3) able to standardize existing and planned operations; and 4) can provide education and training on corrective action and staff regarding decision-making activities.



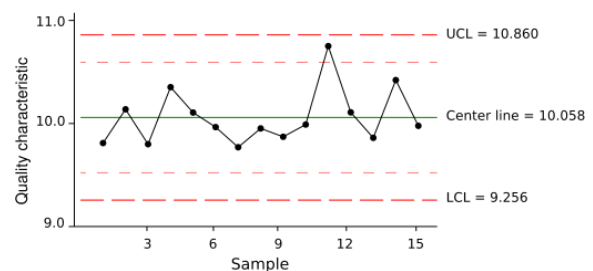
Source: Idris et al. (2016)

**Figure 4 Fishbone**

g. Control Chart

The control chart is a tool in the form of a process control chart to determine the upper control limit and lower control limit for process performance. In product quality control, quality control charts are often used. With a control chart or chart it can be seen immediately whether the quality of the processed goods is under or out of control. Control chart or control chart is a comparison chart of the data performance process (test results/observation of product properties), to calculate control limits which are described as boundary lines on the map. The main purpose of a control chart is to determine whether there is unavoidable uniformity in the process. There are 6 types of control charts, namely:

- 1) X-Chart, is a chart used for average prices, and this chart is the most frequently used.
- 2) R-Chart, used on the side.
- 3) X-Chart, intended to show the magnitude of variation in each sub-group.
- 4) P-Chart, is used to show the defect value (percent defects).
- 5) Pn-Chart, used to control the number of defects with a fixed size sample value.
- 6) C-Chart, is used to show the number of times the actual defect value (not in percent) per piece or per unit (Suryoputro et al., 2017).



Source: Suryoputro et al. (2017)

**Figure 5 Control Chart**

There have been many previous studies conducted in the use of the seven tools method. Several studies will be summarized to support this research.

Arizal (2019), conducted a study entitled "Oil Product Defects at PT NOK Indonesia" from the results of data processing research using check sheets, and the conclusions that can be drawn in this study are the average defects caused by Spring material during the month April 2018 to March 2019 with a total of 1,712 defects from a total production of 166,416 products at a rate of 1.0290%. When compared with the company's defect tolerance limit (by 0.5%) it seems that it exceeds the tolerance limit so improvements are needed. The use of the p control chart in product quality control can determine that there are seven periods for defective products that are outside the proper control limits, and this is as shown in the control chart given in April 2018, May 2018, July 2018, October 2018, January 2019, February 2019 and March 2019.

Wicaksono (2018), who conducted a study entitled "Quality Control of Nursing Dress Products to Minimize the Number of Defective Products with the Seven Tools Method" which concluded that defects often occur in hacinco products in CV. Laras Mitra Sejati has 65.65% excess or irregular thread, 32.06% screen printing and less elegant ink, and 2.29% irregular trouser pockets. From the data obtained, it can be concluded that the most common defects are excessive or untidy threads. By using 5W + 1H to analyze seven tools controlled by control charts, Pareto diagrams and fishbone diagrams, it is concluded that the main factors for product defects are human factors, machines, raw materials and work methods obtained. One of the maintenance programs carried out to reduce product defects is the repair of frequently used machines and equipment, followed by inspection and maintenance, to the factors that cause these defects. As for the human factor and work methods, the working hours should be distributed efficiently and not accumulate in the end. To reduce the raw material defect factor, the company must frequently check incoming goods and

immediately file a complaint with the supplier if unsuitable raw materials are found. The quality improvement plan should review the percentage of defects in each production at all times.

Machfud & Atika (2020), conducted a study entitled "Implementation of the Six Sigma Method to Minimize the Risk of Product Rejection." The conclusion that can be drawn in this study is that the production process at Company X has a risk of causing defects in the product so it needs to be reduced. In the production process, there are 13 risk events and 11 risk factors identified based on expert observation and discussion. The sigma value of the product line at Company X is 3.20. This value indicates that a production process has a higher chance of causing product defects compared to a production process which has a value of 6 sigma. The results of the FMEA-HOR modeling show that there are 5 priority risk factors that must be addressed and 9 risk factors that are the most effective and feasible. Mitigation measures implemented from within in order to improve the production process and reduce the rate of defective products.

Prabaswari & Susilo (2020), conducted a research entitled "Analysis of Quality Control of Chippendale Furniture Products using the Seven Tools Approach at PT. Bothwell" Based on the analysis of product defects, the highest score was the type of uneven paint defects with as many as 7 products. Followed by a five-part gross defect type, three broken/cracked parts. In this type, uneven coating defects are caused by tools that are not rearranged, lack of lighting around the spray room, lack of operator accuracy in spraying, and the absence of written SOP for the use of tools and spraying. In this type of defect, cracks are caused by lack of light during deceleration. This results in employees being less careful in assigning each part or contact with the product. Next is the transportation of goods without standard operating procedures and the types of raw materials used in production. About the kinds of dirty defects caused by different environmental conditions due to the residue from the polishing process. Then the lack of vacuum cleaners and SOP when transporting goods.

Further research by (Idris et al., 2016). The title is "Tempe Quality Control with Seven Tools". The methodology used in this study is seven tools, using product results check sheets, flow charts, histograms, Pareto charts, control charts, scatter diagrams, and fishbone diagrams for quality control accounts. The results were analyzed using control charts for 20 observations, the mean value was 3, the upper control limit value (UCL) was 5.6 and the lower control limit value (LCL) was 0.32, and there was no difference in the out of control process. All operations are still under control.

Haryanto (2019), conducted a study entitled "Analysis of Quality Control of Boss Rotor Products on the CNC Lathe Machine Process with the Seven Tools Method" from the results of research on defective products of the boss rotor type K41A using the seven tools method, it can be concluded that: According to production data boss rotor type K41A obtained from January 2016 to December 2016 reached 95,600 pcs. From the results of processing Pareto graph data, there are 4 types of defects that appear more or more in the production process, the type of underfilling defect is up to 34.2%, which is 860 pcs, porosity with the number of defective products reaching 15.7% to 394 pcs, dented with the number of defective products decreased 15.6% to 392 pcs, and defective products due to machine settings which reached 12.7% to 318 pcs using seven tools and fishbone diagrams, it was found that the most common causes of defects were in existing products.

Suryoputro et al. (2017), conducted a study entitled "Quality Control System using a Simple Implementation of Seven Batik Textile Making Tools" from the results of research on gray warp xyz fabric there are several types of defects that occur, namely: non woven, warp double, loose warp dropping, double weft, blank warp, loose warp, ugly edge, thick weft, and rust. Of the various types of defects classified by the company, the most common defect was warp defect doubling the percentage value of 44%. Based on the fishbone diagram analysis, it can be seen that there are many factors that cause the types of defects that multiply warp materials, humans, machines, and the management environment.

Therefore, it is necessary to improve and evaluate the company. Efforts that need to be made by the company to reduce defects in the type of gray xyz fabric are: 1) in terms of materials, the company should be more strict and pay more attention to the selection of the quality of textile raw materials; 2) in the case of humans or workers in the company, they must provide guidance or training for them to improve performance and further improve strict regulation and supervision so that workers can work well; 3) regarding the work of the machine that must be done, it is by increasing the maintenance and cleaning of the machine on a regular basis; 4) in terms of how to operate, the elements of the company are more compliant and comply with the standard operating procedures that have been implemented; 5) with regard to measurement, the company should pay more attention to the measurement of test equipment in order to meet the standards applicable in the company in order to produce the required quality output; 6) with regard to the environment, the company should increase the implementation of the 5S work culture which includes everything about the company's environmental conditions.

Ginting et al. (2020), conducted a study entitled "Quality Control of Crude Palm Oil Products using Seven Tools." Based on the analysis of the discussion that has been carried out, it can be concluded that the defects in CPO are high FFA content, high impurities and water content because the dominant defect that occurs in CPO is high FFA content and high impurities are identified using the Pareto 80/20 principle, the cumulative ratio of the two defects is 74.7%. The results of the scatter diagram analysis show that high levels of FFA and high impurities have a strong positive effect on the number of defects. Thus, an analysis of the causes of defects was carried out using a fishbone diagram and it was found that the main causes of defects were high levels of FFA in terms of materials (e.g. low quality raw materials), humans (e.g.: operators who were less careful in sorting fruit) and machines (such as machine age). ). The dominant cause of the high level of impurity defects also consists of

3 factors, namely human, machine and material.

## METHODOLOGY

The object of research is the topic that will be studied to obtain data in a more focused manner. According to (Suprianto, 2016), explaining the idea that the object of research is a scientific goal to obtain data with certain goals and uses about something that is objective, valid and reliable about something (certain variables). The object of research is the document/data related to quality control of defective products, the data is more focused on the scanner production process at PTEB. The data used by the author while completing this report is the data in the form of primary data and secondary data. Primary data is data obtained directly through the results of observations. Meanwhile, secondary data in the form of company documents. Secondary data obtained is data from documents used as supporting materials for writing and research results. Data collection is the process of procuring data for research purposes. The data collection method used is the method of observation and documentation.

Observation is a data technique that is carried out in a way that you want to research. Through this method, the authors make observations to review and observe the process in controlling product quality defects in the scanner production process at PTEB. Data engineering with easy documentation. The author uses the documentation method to obtain documents related to quality control of defective products in the scanner production process at PTEB. The data analysis method is a stage of the research process where the collected data is processed to answer existing problems. During the research process, the authors used data analysis methods with descriptive analysis methods. Descriptive analysis method, according to Jayakumar et al. (2017) is a research conducted to determine the value of independent variables, either one or more independent variables without making comparisons or linkages with other variables.

## RESULT AND DISCUSSION

The first step in quality control is to make a check sheet. By using a well-organized and standardized check sheet, we can reduce the differences in how to get to each group. Check sheet is a tool that is often used in the industry to collect the following information as a leading decision using the data collected in the manufacturing process. Check Sheet is a data collection and analysis tool that is presented in the form of a table containing data on the number of defective goods produced. The function of the cheek sheet is to simplify the process of collecting and analyzing data. When creating a cheek sheet, we can decide which events or problems to study and we can decide when and how long the data will be retrieved (Sander et al., 2018).

**Table 2 Check Sheet**

No	Month	CR TPU Can't Initial	Lamp Test 2 Abnormal	Lamp Test 3 Max	Main Color Slip	Lamp Test 4 PDIFF	Total Defect/Month
1	Jan-19	1	1	6	0	0	8
2	Feb-19	0	1	9	1	0	11
3	Mar-19	0	1	12	0	0	13
4	Apr-19	0	3	10	0	0	13
5	Mei-19	1	2	6	0	0	9
6	Jun-19	0	3	0	0	0	3
7	Jul-19	1	4	4	0	0	9
8	Agu-19	0	6	2	0	0	8
9	Sep-19	0	5	4	0	0	9
10	Okt-19	0	3	3	0	0	6
11	Nov-19	0	2	4	0	0	6
12	Des-19	0	3	3	1	0	7
13	Jan-20	0	1	0	1	0	2
14	Feb-20	0	3	0	0	0	3
15	Mar-20	0	3	3	0	0	6
16	Apr-20	0	2	0	0	0	2
17	Mei-20	0	1	6	0	1	8
18	Jun-20	0	2	2	4	0	8
19	Jul-20	0	2	4	0	1	7
20	Agu-20	0	4	3	0	1	8
21	Sep-20	0	2	4	0	0	6
22	Okt-20	1	3	2	1	2	9
23	Nov-20	0	3	4	3	0	10
24	Des-20	0	1	7	1	1	10
Total		4	61	98	12	6	181

Source: Data Analyzed (2022)

To the 181 defects/24 months = 7.5 defect units per month, so from the check sheet table above it can be concluded that there are 14 months where the total defect is above the weighted average. The 14 months of 2019 occur in January, February, March, April, May, July, August, September and 2020 will occur in May, June, August, October, November and December.

Secondly, stratification analysis is a quality assurance tool used to sort data and objects into separate and distinct groups. Segmenting data using stratification can help identify and reveal patterns that might not be visible when combined. In this table, the function of stratification can make it easier to

draw conclusions, as well as help make Pareto diagrams and histograms. The following stratification types of scanner manufacturing defects include:

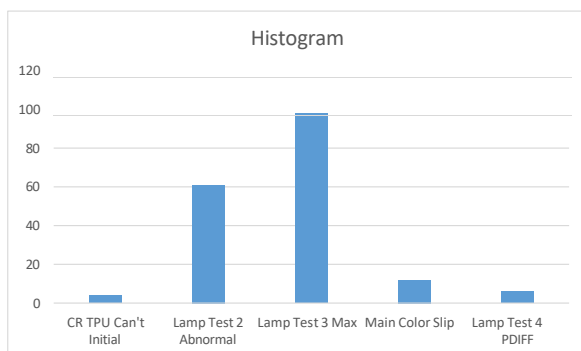
**Table 3 Stratification**

No	Type of Defect	Total Defect/Year
1	CR TPU Can't Initial	4
2	Lamp Test 2 Abnormal	61
3	Lamp Test 3 Max	98
4	Main Color Slip	12
5	Lamp Test 4 PDIFF	6
<b>Total Defect</b>		<b>181</b>

Source: Data Analyzed (2022)

PTEB which produced scanners during the 2019-2020 research period, concluded that the production data for the CR TPU Can't Initial defect type was 4 units, for the Lamp Test 2 Abnormal type, there were 61 units, the Lamp Test 3 Max type as many as 98 units, the type Lamp Test 3 Max as many as 98 units. There are 12 units of Main Color Slip, and 6 units of Lamp Test 4 PDIFF with defects.

Thirdly, a histogram is a graphical display to visually show the distribution of data or the number of times different values occur in a data set. The benefit of using histograms is to manage and provide information about differences in processes and assist management in making decisions for continuous process improvement. Histogram is a display of frequency distribution using an image in the form of a vertical bar chart.



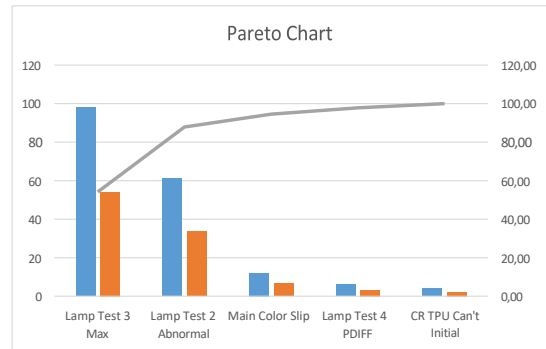
Source: Data Analyzed (2022)

**Figure 6 Histogram**

The following is a histogram diagram for product defect data in scanner production in 2019-2020. There is the highest defect in the lamp test 3 max, which almost reaches 100

defect units and the lowest defect in the CR TPU can't initial with defects below 10 units.

Next, a pareto chart is a bar chart that depicts problems in order of number of repetitions. The first sequence will start from problems with higher frequencies to problems with lower frequencies. Pareto diagrams are very useful in identifying and defining priority problems to be solved.

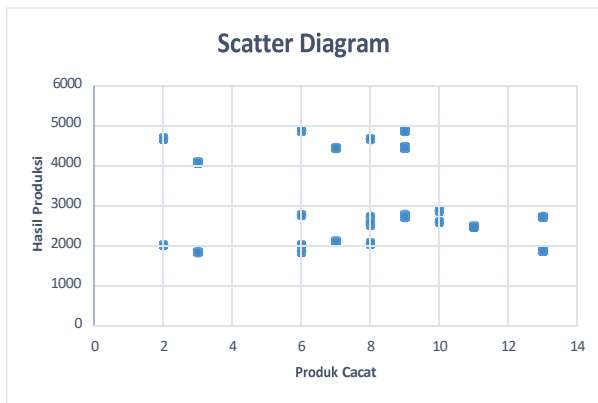


Source: Data Analyzed (2022)

**Figure 7 Pareto Chart**

Based on observations from January 2019 to December 2020 that product defects in scanner production are shown on the Pareto diagram, the highest frequency of defects is in the Lamp Test 3 Max type and the lowest frequency is the CR TPU Can't Initial type.

Next, Scatter Diagram that tests the strength of a positive relationship, whether there is a relationship between a negative relationship, and tests the intensity of the relationship between two scattered variables, and determines the type of relationship between the two variables. A scatter diagram is a set of graphical representations of variables consisting of a set of points for the values of a pair of variables (Variables X and Y). From the number of defective product units and the number of production units registered as X (defective products) and Y (production results) in 2019-2020, the data in the scatter diagram below is shown as follows:



Source: Data Analyzed (2022)

**Figure 8 Scatter Diagram**

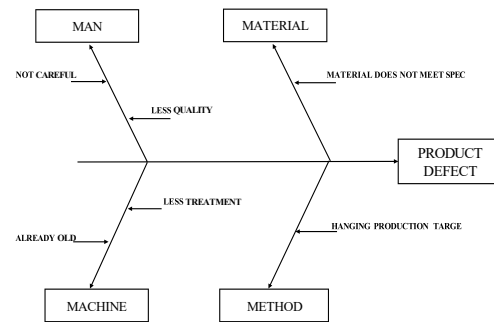
From the resulting graph, it is stated that the scatter diagram above has a positive correlation, which means that the higher the defective product, the greater the level of damage. So if you want to reduce the level of product damage, one of the actions that must be taken is to reduce the level of product defects.

Fishbone diagram which is one way to analyze the cause of a problem or condition. This diagram is often called a cause-and-effect diagram. The main function of a fishbone/cause-and-effect diagram is to identify and manage the potential causes of a particular effect and then isolate the root causes. Fishbone diagrams can help identify root causes of problems and help generate ideas for problem solutions.

**Table 4 Observed Factors and Problems That Occur**

No	Observed factors	Problem
1	Man	a. Less thorough b. Don't care about quality
2	Method	Pursuing production targets
3	Machine	a. is old b. Less maintenance
4	Material	Material not according to spec

Source: Data Analyzed (2022)

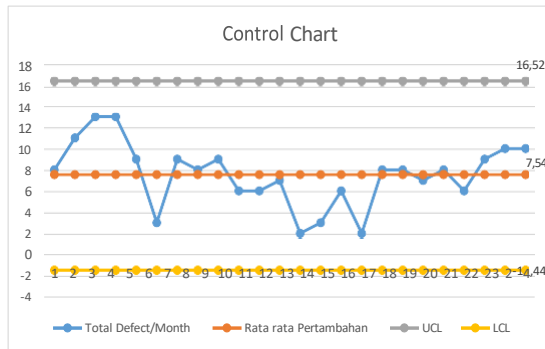


Source: Data Analyzed (2022)

**Figure 9 Fishbone**

By making improvements to the factors that cause defects, it is an improvement plan that is implemented to reduce product defects, the material must be checked before the goods enter production. For frequently used machines and equipment, inspection and maintenance are carried out. To reduce defects in human factors and work methods, it is necessary to implement an effective division of work time so that product defects do not occur due to pursuing production targets.

Control chart or commonly called a control chart is a tool in the form of a process control diagram to determine the upper control limits and lower control limits of process performance. Control chart is one of the tools for statistical process control (SPC). Control charts are used to measure process performance and successive variability or time. A control chart is used to analyze the output in a process. Control chart analysis performed can be visualized graphically to monitor and evaluate whether the activity/process is under statistical quality control or not so as to solve problems and produce quality improvements. A control chart is a graph or map with boundaries and these lines are called control lines. There are three kinds of control lines, namely: upper control limit, center line and lower control limit. The control lines are written as UCL,  $\bar{x}$ , and LCL in the same order.



Source: Data Analyzed (2022)

**Figure 9 Control Chart**

From the results of the analysis using a control chart for 181 total defects, the median value is 7.54, the upper control limit value (UCL) is 16.52 and the lower control limit value (LCL) is 1.44, and there is no difference in the process that is not controlled (out of control). All operations are still under control.

## CONCLUSION

The scanner product quality control system at PTEB consists of analysis and evaluation using check sheets, stratification, histograms, Pareto diagrams, scatter diagrams and fishbones on raw materials for Veronica type scanner products. Based on the results of research on defect products in scanner production using the seven tools method, it can be concluded that: Based on data from scanner production results obtained from January 2019 to December 2020 it reached 70691 units. From the results of data processing from the graph diagram, it produces the following calculations: lamp test 3 max by 54.14% as many as 98 units, Lamp Test 2 Abnormal by 33.70% by 61 units, Main Color Slip by 6.63% by 12 units, Lamp Test 4 PDIFF is 3.31% with 6 units, CR TPU Can't Initial is 2.21% with 4 units. By using the seven tools, especially the fishbone diagram, finally the cause of the defect that most often occurs in humans and machines is the lack of thoroughness and checking on the product.

From the discussion and conclusions obtained in this study, the authors formulate several suggestions for material quality control for PT Epson Batam for Veronica type scanner products as follows: 1) the quality department must be more active in providing education

about the limits of product defects; 2) hoping that by always emphasizing on employees to carry out routine inspections and maintenance of machines, because the most influential factor in product damage in the production process is the machine factor; and 3) the engineering department must make improvements to all production processes that are still not perfect.

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