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Quality Control Analysis with Statistical Process Control (SPC) and Failure Mode Effect Analysis (FMEA) Methods on Battery Products at PT. Selatan Jadi Jaya

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A B S T R A C T

PT. Selatan Jadi Jaya is a company that produces lead acid batteries for Automotive Car Batteries. During production, problems often arise, namely the high level of product defects. These defects more often appear in the burning process, including Melted Tin defects, Burnt Connector defects, Bent Plate defects, and Torn Separator defects. The purpose of this study is to determine the percentage of defects that occur most often and the factors that cause defects and provide suggestions for improving the quality of battery batteries. Based on the above problems, quality control analysis can use methods, namely the Statistical Process Control (SPC) method and improvement efforts using Failure Mode and Effect Analysis (FMEA). Based on the results of research on Statistical Process Control that the dominant defect is Burnt Connector with a percentage of (33%), then followed by Plate Bent by (26%), then Melted Tin by (24%), and Torn Separator by (17%). Based on the results of the Failure Mode and Effect Analysis research, it is known that the highest RPN value is 200 on the tin melt defect with the cause of failure due to errors when workers set the fire too large. The recommendation for improvement for this problem is to adjust the size of the fire in accordance with the procedures set before welding.

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1. INTRODUCTION

Nowadays, every company involved in the manufacturing industry is faced with increasingly fierce competition with increasingly rapid changes.The increasing demand for automotive components caused by the growth of the automotive industry can be an opportunity for component manufacturers to increase production and attract more customers (Sumasto et al., 2023). Not only that, companies must also be able to take the right steps and prepare strategies to win the competition, one of which is improving the quality of a product. Quality control is an important thing that must be done by companies to reduce defective products. Without product quality control, it will cause big losses for the company, because deviations are unknown so improvements cannot be made and ultimately deviations will occur continuously. PT. Selatan Jadi Jaya is one of the companies engaged in the manufacturing industry. The company is a manufacturer of lead acid batteries for four-wheeled vehicles. In the production process PT. Selatan Jadi Jaya always tries to provide quality battery products and the best prices to give to its consumers. But over time, market demand and competition will increase, the company will be required to compete and must have a competitive advantage, by producing quality products. However, during production problems often arise namely the high level of product defects. These defects more often appear at the beginning of the assembly process, namely the burning process. In the burning process that takes place there are several defects encountered such as in the battery component found defects namely Melted Tin, Burnt Connector, Bent Plate, and Torn Separator. From the burning process of battery battery production observed, it is known that the total amount of AMB type production in November 2022 - April 2023 was 16,291 units, while the total defect was 995 units with a percentage of 6% defect from the company's standard limit set at 1%. This causes losses for the company, so the company must spend more time and money to eliminate the defect.

Based on the above problems, the purpose of this study is to analyze the factors that cause defects in products. In addition, this study also aims to provide suggestions for improvements to the quality of battery products. It is hoped that the results of this study will be able to help the company to solve problems regarding defects in battery products at PT. Selatan Jadi Jaya. Therefore, in accordance with the discussion above, the researchers applied the Statistical Process Control (SPC) method to determine the factors causing product defects and the Failure Mode and Effect Analysis (FMEA) method to provide suggestions for improvements to the quality control of battery production at PT. Selatan Jadi Jaya (Novianti & Rochmoeljati, 2023).

2. LITERATURE REVIEW

According to Afandi et al. (2022), Quality is a description of the characteristics of a product whose attributes can describe the ability to meet customer needs, the need for compatibility between the company and consumer desires in creating a product, so that it can create a special impression for consumers. Meanwhile, according to Sunardi & Suprianto (2020) Quality is a general characteristic or attribute of a product or service that aims to meet customer needs and expectations. The customers or consumers in question are not customers or consumers who try once and never return, but customers or consumers who buy repeatedly. The role of quality is very important for companies because the products they sell must have high quality assurance so as not to lose customers. Conversely, if the company does not pay attention to the quality of the products it produces, it will result in the product being less attractive to customers in the market. Defective products are products that are not optimal in the production process or do not meet the company's quality standards. Defective products can be repaired economically at a certain additional cost, which will result in the company bearing greater costs and losses due to uncontrolled defective products (Andespa, 2020).

According to Haddad (2021), Statistical Process Control is a quality control method based on statistical methods used to monitor processes to ensure that they work in a stable and efficient manner to produce the appropriate percentage of products/services while reducing waste. Everyone in the organization should be trained to use these tools so that each "employee" can contribute to improving the quality of his or her work. Often, technicians are the main focus of SPC training, with an emphasis on more technical tools such as control charts. Other basic tools are simpler, such as flowcharts, cause and effect diagrams, check sheets, and pareto diagrams (Oakland et al., 2018). The first objective of the Statistical Process Control method is to monitor the consistency of the processes used in manufacturing products designed with the aim of obtaining a controlled process (Susanti, et al., 2023)

Failure Mode and Effect Analysis (FMEA) is a technique that can be used to find and eliminate defects or failures in products during the production process. FMEA can determine the consequences of failure at each stage of the process, then determine preventive and corrective actions that need to be taken to ensure that the product produced in the next production process will meet customer desires (Kalid, 2022). FMEA supports improving the quality of production results and performance in identifying and eliminating risks (Hutabarat et al., 2020). Three variables are used in FMEA process analysis to determine the problem. Namely the level of disability (severity), frequency (incident), and level of detection (detection) (Kalid, 2022). FMEA is considered effective if it is able to identify corrective activities to anticipate failures in reaching out to customers and can ensure that the expected results have the highest possible quality and reliability (Elvina et al., 2022).

According to Ratri et al. (2018), the steps in carrying out the FMEA process are as follows: (1) Define labels for each process or system, (2) Make an explanation of the process function, (3) Identify the types of defects that occur, (4) Identifying the consequences of defects that occur, (5) Determining the severity value, (6) Identifying the cause of defects, (7) Determine the occurance value, (8) Identifying the controls in place, (9) Determining detection, (10) Calculating Risk Priority Number (RPN).

- **Severity**

The first step in analyzing risk is severity, which calculates how much impact or violence an event has on the end result of a process..

Table 1. Severity value

Scale	Severity	Criteria
10	Very dangerous	Hazard, damage endangers people and systems without warning
9	Danger	Hazard, malfunction endangers people and system with warning
7-8	Serious	Damage affects total system operation
6	Moderate	Damage affects system work 50%
4-5	Minor	Damage affects system operation 25%
3	Slight	Malfunction affects working system 10%
2	Very Slight	Damage is negligible
1	None	Damage has no effect

(Source: Aprianto, 2019)

- **Occurance**

After determining the severity value, then determine the occurance value. Occurance itself is the possibility that the cause of the failure will occur and produce a failure during the production period of the product.

Table 2. Occurance value

Scale	Occurance	Criteria
10	Almost Certain	Damage occurs continuously
9	Very High	Damage occurs frequently
7-8	High	Damage is relatively frequent
5-6	Moderate	Damage sometimes occurs
3-4	Low	Damage is slight
2	Very Low	Damage rarely occurs
1	None	Damage never occurs

(Source: Aprianto, 2019)

- **Detection**

After the occurance value is obtained, then determine the detection value. Detection helps prevent failures in the production process and reduce the failure rate in the production process.

Table 3. Detection value

Scale	Detection	Criteria
10	Almost Impossible	Damage cannot be detected
9	Very Remote	Damage is very difficult to detect
8	Remote	Damage is relatively difficult to detect
7	Very Low	Damage is very unlikely to be detected
6	Low	Damage is less likely to be detected
5	Moderate	Possible damage detected
4	Moderate High	Damage likely to be detected
3	High	Damage is relatively easy to detect
2	Very High	Damage is very easy to occur
1	Almost Certain	Damage is certain to occur

(Source: Aprianto, 2019)

- **Risk Priority Number**

RPN is an assessment that aims to rank the object damage that occurs. The value of RPN is obtained from the results of multiplying Severity, Occurrence, and Detection. Here is the equation for obtaining the RPN value.

$$RPN = S \times O \times D$$

Description :
S = Severity
O = Occurance

D = Detection
Through this RPN value, it can provide data and information in the form of work accident failures that receive priority handling (Aprianto, 2019).

In research (Ningrum, 2019) and (Elyas et al., 2020) on quality control, it appears that only statistical process control methods are used. So it is not known which defect factors need to be prioritized for improvement. then this is the reason for the need for the failure mode and effect analysis method to determine some of the most dominant defect factors with the RPN formula and make proposals for improvements to the quality of battery products.

3. RESEARCH METHOD

In this research, the Statistical Quality Control method and Failure Mode and Effect Analysis are used. The research steps for solving the problem can be seen below in Figure 1. Figure 1 is the stages of research that must be carried out in a research process to achieve predetermined goals. In the first stage, namely making observations of existing problems in order to determine the formulation of problems and research objectives, after that identifying dependent variables and independent variables. Then collect research data which includes total production data, data on the number of product defects, and data on the types of defects obtained either in the form of interviews or secondary data from the company. Next, process the data with the SPC method with statistical quality control tools such as Check Sheet, Histogram, Pareto Diagram, Control Map, and Fishbone Diagram and then make improvement proposals with FMEA analysis based on the calculation of RPN value.

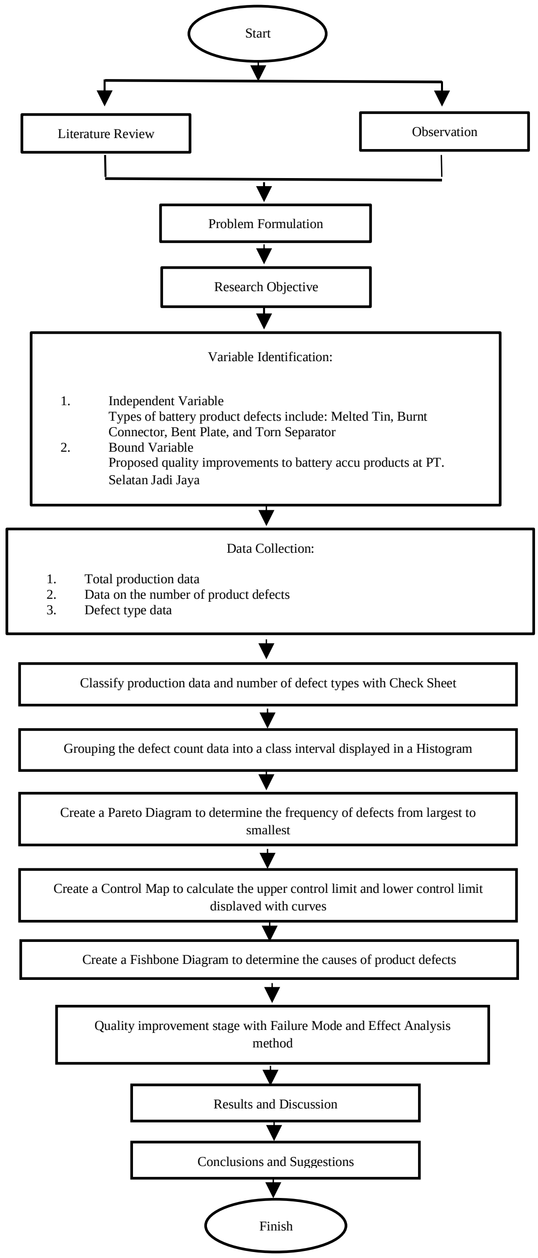

Figure 1. Research stages

4. RESULT AND DISCUSSION

The data is processed using the Statistical Process Control method and improvement recommendations with Failure Mode and Effect Analysis method. Here are the results.

A. Check Sheet

The first step in data processing is to analyse quality control by making a table (Check Sheet) of the number of damaged or defective products. Making this table (Check Sheet) aims to simplify the data collection and analysis process. The following check sheet is made based on Table 4.

Table 4. Check sheet

No	Series	Defect Type				Total (Unit)
		Melted Tin	Burnt Connector	Bent Plate	Torn Separator	
1	NS60S/ 12	11	21	11	20	63
2	NS40Z/ 10	35	56	28	23	142
3	NS40/ 9	45	75	62	25	207
4	NS40ZL / 10	38	46	42	30	156
5	NS60L/ 12	11	46	30	31	118
6	N50/ 9	98	85	90	36	309
	Total	**238**	**329**	**263**	**165**	**995**

(Source: Company's data)

In Table 6 the check sheet data used is the battery production data of PT. Selatan Jadi Jaya for the last 6 months. The check sheet table can record the types of defects that are often encountered during battery production, such as melted tin, burnt connector, bent plate and torn separator.

B. Histogram

Histograms are useful for seeing the types of defects that are most experienced. The following histogram is made based on Figure 2.

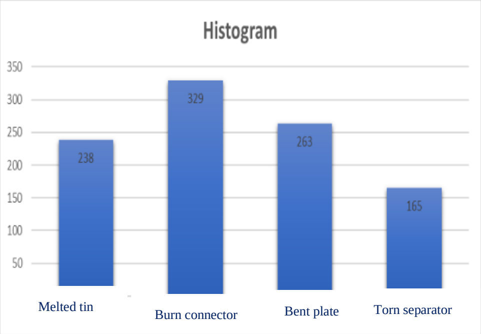

Figure 2. Histogram
(Source: processed data)

Based on Figure 2, it is known that the sequence of intervals of each type of defect that occurs most frequently includes burnt connector defects as many as 329 units, then bent plate defects as many as 263 units, then tin melt defects as many as 238 and torn separator defects as many as 165 units.

C. Pareto Chart

Pareto chart which aims as an interpretation tool to determine the frequency of errors from the largest to the smallest, then calculates the percentage of errors and the cumulative percentage of each error, can be seen in Table 5.

Table 5. Percentage of defects

Defect	Number of Defects	Percentage	Cumulative Percentage
Burnt Connector	329	33%	33%
Bent Plate	263	26%	59%
Melted Tin	238	24%	83%
Torn Separator	165	17%	100%
Total	**995**		

(Source: processed data)

The pareto diagram of defects in battery products is shown in Figure 3.

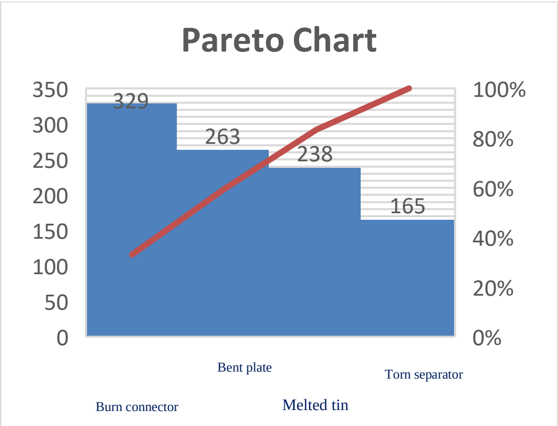

Figure 3. Pareto Chart
(Source: processed data)

D. Control Chart

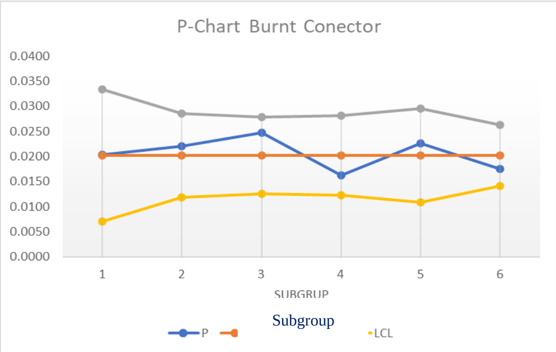

Figure 4. P-chart burnt conector defect
(Source: processed data)

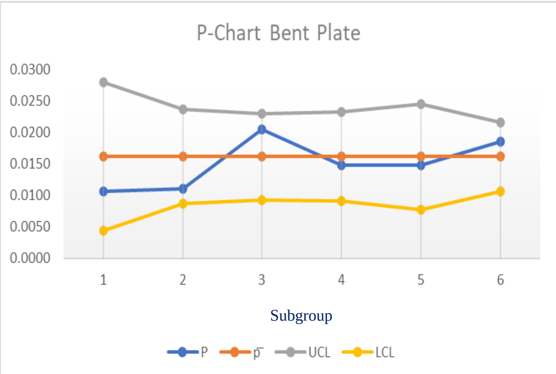

Figure 5. P-chart bent plate defect
(Source: processed data)

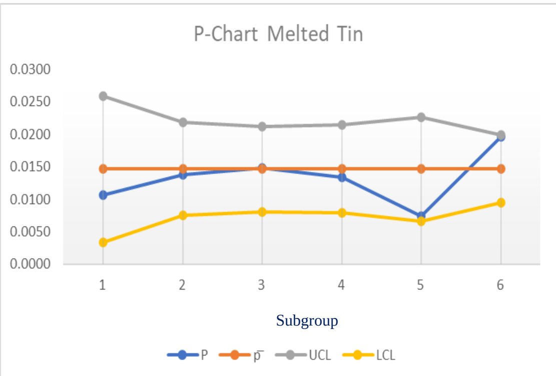

Figure 6. P-chart melted tin defect
(Source: processed data)

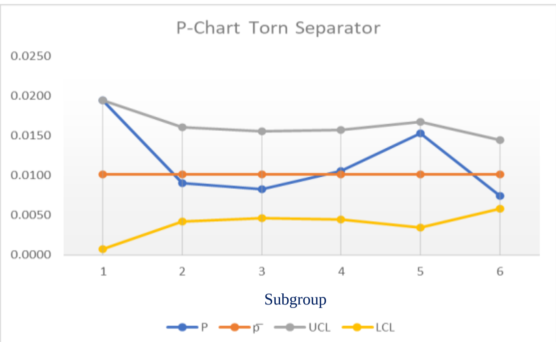

Figure 7. P-Chart torn separator defect
(Source: processed data)

From the data processing above, it can be seen that the data is still within the upper control limit and lower control limit, so it can be concluded that the percentage of defective products in battery products that occur is still within the control limit (nothing is out of control).

E. Cause and Effect

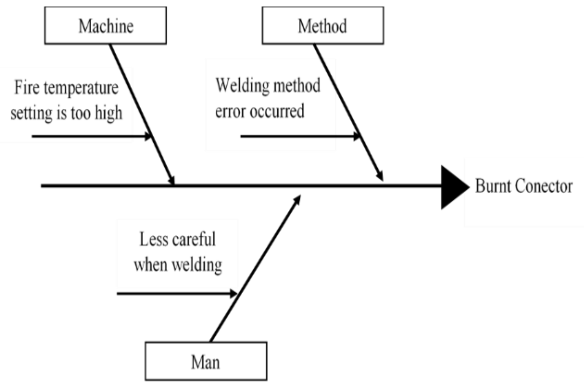

Figure 8. Cause and effect diagram burnt conector
(Source: processed data)

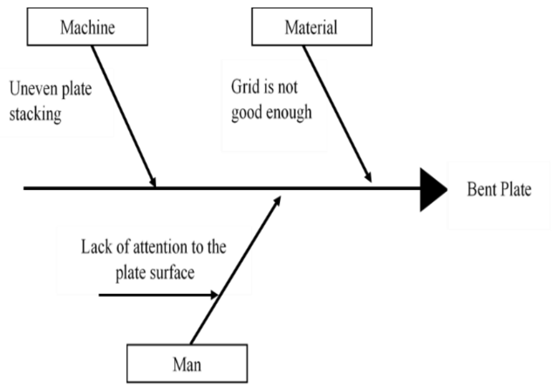

Figure 9. Cause and effect diagram bent plate
(Source: processed data)

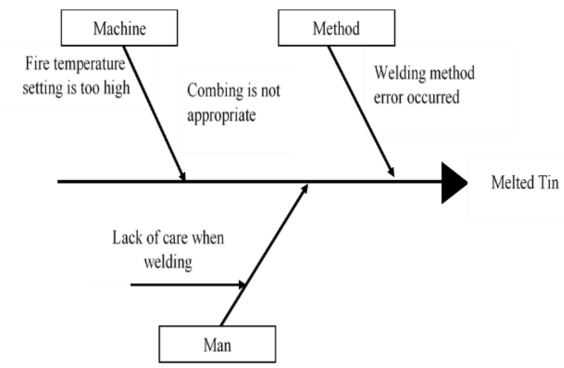

Figure 10. Cause and effect diagram melted tin
(Source: processed data)

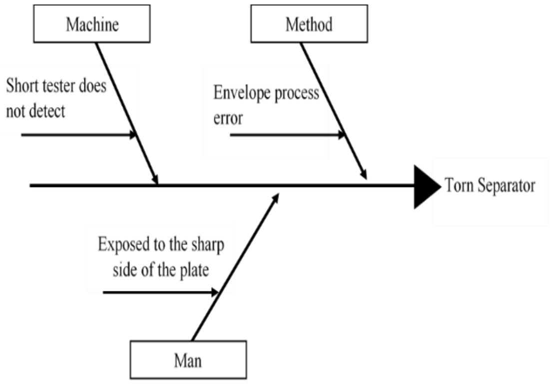

Figure 11. Cause and effect diagram torn separator (Source: processed data)

From the cause and effect diagram above is the root cause of each type of defect in the battery products studied, namely there are tin melt defects, bent plate defects, burnt connector defects, and torn separator defects. The cause and effect diagram data is obtained through several sources, namely by making direct observations to the company during the production process and identifying the factors that are the root causes of product defects. In addition to direct observation, data is obtained from inspection reports or product failure data that provide information about the problems that occur. as well as conducting interviews with field heads or employees, to gain insights and perspectives from them. In the cause and effect diagram, several factors causing defects in battery products can be identified. For Connector Burning defects, the cause of the problem is from the machine side due to setting the fire temperature when welding too high, in terms of methods due to errors in welding methods, and from the human side due to less thoroughness when welding connector parts. For Plate Bent defects, the cause of the problem is from the machine due to uneven plate stacking, in terms of material because the grid that was initially printed does not match the specified shape, in terms of humans because workers pay less attention to the surface of the plate. For Melted Tin, the cause of the problem is from the machine because it occurs due to the setting of the fire that is too large to exceed the standard limit, from the method because there is an error in the welding method, and from the human aspect because the worker is not careful in welding (burning cell). For the Torn Separator defect, the cause of the problem is human because the worker is too hard when inserting the plate into the separator, in terms of methods because there is an error in the envelope process, and in terms of machinery because the short tester does not detect it, causing an error in the separator.

F. Failure Mode And Effect Analysis (FMEA)

At this stage, the failure mode and effect analysis method is an improvement strategy stage when the SPC tool is a fishbone diagram which identifies potential problem areas that are prioritized for improvement which will be used as a reference in this method.

Table 6. FMEA battery accu

Potential Failure Mode	Potential Effect of Failure	S	Potential Cause	O	Current Control	D	RPN
Burnt Conector	Will cause cracks in the connection area causing the battery to not work.	7	Flame setting is too large	5	Adjusting to the standard	5	175
			Welding method error	5	Conduct method training	5	175
			Not careful enough when welding	6	Conduct briefings for workers to be more thorough	2	84
Bent Plate	Will cause a short circuit (short inter cell)	8	Uneven plate stacking	4	Briefing workers during the plate stacking process	5	160
			Grid is not good	5	Re-sorting the grid that does not meet the criteria	3	120
			Less attention to plate surface	6	Rechecking the cell	4	192
Melted Tin	Will cause a short circuit (short inter cell) if the molten tin	8	Fire setting is too big	5	Adjusting to the standard	5	200
			Combing is not appropriate	3	Replace appropriate combing	6	144

	hits part of the plate and separator.		Lack of caution when welding	6	Conduct briefing to workers	3	144
			Welding method error occurred	4	Conduct method training	5	160
Torn Separator	Will cause a short circuit (short inter cell)	8	Short tester does not detect	3	Calibrated the short tester	6	144
			Envelope process error	3	Conducted briefing to be more thorough when finishing the envelope.	4	96
			Exposed to the sharp side of the plate	4	Rechecked the side of the plate	3	96

(Source: result focus group discussion with experts)

Based on the results of the calculation of the RPN (Risk Priority Number) value, it can be seen that process failures cause defects. The causes of defects (potential causes) are then sorted from the highest to the lowest RPN value and then given recommendations for improving each cause. The order of improvement recommendations based on RPN can be seen in Table 7.

Table 7. Recommendations for improvement based on RPN ranking

Priority	Potential Failure Mode	Potential Cause	RPN	Recommendation
1	Melted Tin	Setting the fire too large	200	• Checking the size of the flame before welding
2	Plate bent	Lack of attention to the plate surface	192	• Conduct intensive supervision and reprimand when workers are working not according to the SOP
3	Burnt Conector	Flame setting is too large	175	• Checking the size of the fire before welding
4	Burnt Conector	Welding method error	175	• Provide training to workers to make them more skilled and also provide direction to workers before the production process runs.
5	Plate bent	Uneven plate stacking	160	• Repeatedly checking the stack on the machine
6	Melted Tin	Error in welding method	160	• Provide training to workers to make them more skilled and also provide direction to workers before the production process runs.
7	Melted Tin	Combing is not appropriate	144	• Conduct routine inspection and replacement of combing
8	Melted Tin	Lack of caution when welding	144	• Conduct intensive supervision and reprimand when workers are working not according to SOP
9	Separator torn	Short tester does not detect	144	• Calibrate the short tester before the production process.
10	Plate bent	Grid is not good	120	• Performing a detailed check of the grid before processing to the next stage.
11	Torn separator	Envelope process error	96	• Conducting briefing to workers so that during the envelope process it will not happen again.

12	Torn separator	Exposed to the sharp side of the plate	96	• Rechecking the grid side • Replace another grid if the grid is found not to meet the criteria
13	Burnt Conector	Not careful enough when welding	84	• Conducting intensive supervision and reprimands when workers are working not in accordance with the SOP

(Source: FGD with experts)

Based on the FMEA results, the highest RPN value is 200 in the type of tin melt defect with the cause of failure due to errors when workers set the fire too large. tin melt can occur if workers do not follow the procedure so that during the burning cell process, part of the tin melts out of the strap. This value is the most critical failure mode and must be prioritized for corrective action as soon as possible.

Based on observations and interviews at the company, the factors that cause battery defects are caused by less than optimal results in terms of humans, machines, materials and methods during the production process on the production floor. Therefore, with this research, companies need to increase supervision of workers, machines used, methods, and materials or raw materials during the production process to minimize battery product defects.

From the results of previous research, it shows that there are slight differences in data processing. In several previous studies, only statistical process control methods were used to analyze product quality control. Therefore, in this research a method was added failure mode and effects analysis. The purpose of this method is to identify and understand potential failures and causes in a particular system or process.

5. CONCLUSION

Based on the research that has been carried out at PT. Selatan Jadi Jaya, the following conclusions can be drawn. Analysis of product defect factors based on the results of the pareto diagram can be seen that the dominant defect in welding quality is Connector Burning with a percentage of (33%), followed by Plate Bent by (26%), then Melted Tin by (24%), and Torn Separator by (17%). The factors causing the Connector Burning defect are in terms of the machine setting the fire too large, in terms of humans not being careful when welding the strap, and in terms of work methods there is an error in the welding method where the welding intensity of the connector is too long. Proposed product quality improvements based on the results of RPN calculations for battery FMEA obtained several risks that have the highest priority level for improvement to minimize the possibility of errors. The calculation of the highest RPN value is 200 with a severity value of 8, an occurance value of 5 and a detection value of 5 in the type of tin melt defect with the cause of failure due to errors in adjusting the fire temperature that is not in accordance with operational standards. The recommendation for improvement for this problem is to adjust the size of the fire in accordance with established procedures before welding. For further research, it is hoped that data processing regarding quality control can use other tools such as the new seven tools to get the best solution.

REFERENCES

Afandi, M. F., Andesta, D., & Negoro, Y. P. (2022). Upaya Perbaikan Kualitas pada Proses Pengemasan Kedelai di PT Sari Agrotama Persada Gresik Menggunakan Metode Failure Mode and Effect Analysis. *Jurnal Serambi Engineering*, *7*(3). https://doi.org/10.32672/jse.v7i3.4652

Andespa, I. (2020). Analisis Pengendalian Mutu Dengan Menggunakan Statistical Quality Control (SQC) Pada PT. Pratama Abadi Industri (Jx) *Sukabumi*. *E-Jurnal Ekon. dan Bisnis Univ. Udayana*, *9*(2), 129-160. https://doi.org/10.24843/EEB.2020.v09.i02.p02

Aprianto, H. A., Nusyirwan, N., & Prasetya, S. (2019). Analisis Kegagalan Gas Cooler pada Sistem Gas Compressor Menggunakan Metode FMEA. *In Seminar Nasional Teknik Mesin*. 9(1), 1216-1223. https://prosidingold.pnj.ac.id/index.php/sntm/article/view/2197/1252

Elvina, T., & Dwicahyani, A. R. (2022, March). Pengendalian Kualitas Menggunakan Metode Lean Six Sigma Dan Fmea Untuk Mengurangi Produk Cacat Panci Anodize PT. Abc. *In Prosiding SENASTITAN: Seminar Nasional Teknologi Industri Berkelanjutan*, 2, 294-304 http://ejurnal.itats.ac.id/senastitan/article/view/2672.

Elyas, R., & Handayani, W. (2020). Statistical Process Control (SPC) Untuk Pengendalian Kualitas Produk Mebel Di UD. Ihtiar Jaya. *Bisma: Jurnal Manajemen*, *6*(1), 50-58. https://ejournal.undiksha.ac.id/index.php/BISMA-JM/article/view/24415

Haddad, T. (2021). Quality Assessment of Concrete Production Using Statistical Process Control (SPC) Techniques. *Proceedings on Engineering*, *3*(2), 233-240. https://pesjournal.net/journal/v3-n2/11.pdf

Hutabarat, Rosiana, Tan Hauw Sen Rimo, Meilani, and Aditya Andika. (2020). "Improving Delivery Performance by Using Simulation, FMEA, and FTA." *IOP Conference Series: Earth and Environmental Science*, *426*(1). https://doi:10.1088/1755-1315/426/1/012125.

Kalid, S. I. (2022). Pengendalian Kualitas Cacat Produk Tas Kulit Dengan Metode Failure Mode And Effect Analysis (FMEA) Dan Fault Tree Analysis (FTA) Di PT Mandiri Jogja Internasional. *Jurnal Cakrawala Ilmiah*, *1*(6), 1307-1320. https://www.bajangjournal.com/index.php/JCI/article/view/1131

Ningrum, H. F. (2019). Analisis Pengendalian Kualitas Produk Menggunakan Metode Statistical Process Control (SPC) Pada PT Difa Kreasi. *Jurnal Bisnisman: Riset Bisnis dan Manajemen*, *1*(2), 61-75. https://doi.org/10.52005/bisnisman.v1i2.14

Novianti, F., & Rochmoeljati, R. (2023). Quality Control of Edamame Products Using Statistical Quality Control (SQC) and Failure Mode Effect Analysis (FMEA) Methods in PT. XYZ. *IJIEM - Indonesian Journal of Industrial Engineering and Management*, *4*(2), 221-230. https://doi.org/10.22441/ijiem.v4i2.20550

Oakland, J., & Oakland, R. J. (2018). Statistical process control. Routledge.

Ratri, E. M., & Singgih, M. (2018). Peningkatan Kualitas Produk Roti Manis pada PT Indoroti Prima Cemerlang Jember Berdasarkan Metode Statistical Process Control (SPC) dan Failure Mode and Effect Analysis (FMEA). *E-Journal Ekonomi Bisnis Dan Akuntansi*, *5*(2), 200-207. https://doi.org/10.19184/ejeba.v5i2.8686

Sumasto, F., Maharani, C. P., Purwojatmiko, B. H., Imansuri, F., & Aisyah, S. (2023). PDCA Method Implementation to Reduce the Potential Product Defects in the Automotive Components Industry. *Indonesian Journal of Industrial Engineering & Management*, *4*(2), 87-98. https://dx.doi.org/10.22441/ijiem.v4i2.19527

Sunardi, A. T. P., & Suprianto, E. (2020). Pengendalian Kualitas Produk Pada Proses Produksi Rib A320 Di Sheet Metal Forming Shop. *Jurnal Industri Elektro dan Penerbangan*, *5*(2). 6-15. https://jurnal.unnur.ac.id/index.php/indept/article/view/154

Susanti, R., Ramadhan, D. S., Arwi, P. P., & Siregar, M. (2023). Analisis Oil Losses Pada Stasiun Perebusan Produksi Crude Palm Oil (CPO) Menggunakan Metode Statistical Process Control (SPC). *Jurnal Teknologi dan Manajemen Industri Terapan*, *2*(2), 98-110. https://jurnal-tmit.com/index.php/home/article/view/67