International Journal of Engineering Inventions
e-ISSN: 2278-7461, p-ISSN: 2319-6491
Volume 12, Issue 9 [September. 2023] PP: 213-220

Quality Control of HD 785 Dump Truck Fuel Tank Production Using PDCA Method at PT. ABC

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ABSTRACT: *PT. ABC is a company engaged in manufacturing services with one of the products it produces, namely the HD 785 dump truck fuel tank. This study focused on the fuel tank because this fuel tank is a product that often experiences rejection. A product is said to be of high quality if the product produced meets the standards in accordance with consumer wishes. However, defective product data showed that defective products in the fuel tank as a whole reached 27 products. In this study, the method used in quality control is Plan-Do-Check-Action (PDCA) which is used to find the root cause of the defect and provide recommendations for proposed improvements. The results of processing and data analysis show that the type of defect that occurs in fuel tank products is a defective 2 NPT thread. The dominant cause of the defect is the factor of using less thread slope degrees and the absence of tools in checking thread functions. From these problems, it was obtained in order to minimize the occurrence of defective products at PT.ABC, namely by making checking tools and changing the degree of thread taper from 1.3 degrees to 1.783 degrees and making standardization in the form of SOP and WS written on the production and quality sections in areas that are easily accessible to workers or operators.*

Date of Submission: 18-09-2023 Date of acceptance: 03-10-2023

I. INTRODUCTION

In research [1-3] states that local products still have the opportunity to develop into global products that can flood other countries' local markets, as long as the requirements demanded by the market are met. Quality products and services are products and services that are in accordance with what consumers want. Therefore the company as a producer, needs to know its consumers or customers and know its needs and wants [4-7]. In other words, the company needs to listen to the voice of consumers (Customer Voice) in making policies about product quality. With a policy on product quality can reduce defective products in the production process. In research [12] states that defective products are products resulting from production processes that do not meet quality standards, but after repairing are economically more profitable than direct sales. To avoid the occurrence of defective products due to the manufacturing process. Companies can only prevent defects with the role of quality control. The goal of quality control is to produce a uniform product by identifying the causative factors of product defects and reducing quality control costs [8, 11].

PT. ABC is a company that has the opportunity to develop into a global product that can flood other countries' local markets. Product production process at PT. ABC occurs defective products that result in consumer complaints about the required product quality. As a result of the quality not in accordance with the standards, the company experiences waste to repair defective products. Of the total defective product data produced at PT. ABC is focused on the fuel tank production process. Based on data from June-August 2022, there were 51 products rejected by PT. XXX. Of the 51 defective products rejected, the most rejected were HD-785 dump truck fuel tank products, as many as 27 units of rejected products (figure 1). Due to the large number of rejected products in the fuel tank production process, it is necessary to conduct an analysis to determine the cause of the large number of rejected products using the PDCA method.

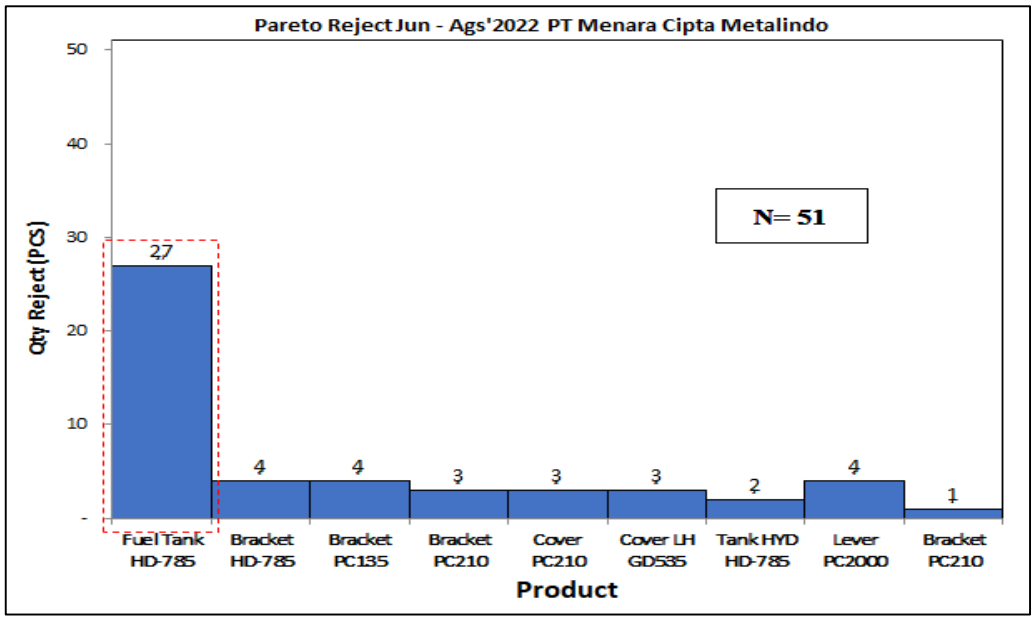


Figure 1. Number of rejected products at PT. ABC for the period June to August 2022 (Source: Data from PT. ABC, 2022)

The PDCA (Plan-Do-Check-Action) method is one method to improve quality which can be a systematic method and aims to facilitate repair operations. When performing operations, the QCC spins the Deming wheel (PDCA cycle) and performs eight troubleshooting steps supported by seven assistive devices [9–14]. From this discussion, the purpose of this study can be formulated is to improve product quality by applying the PDCA method so that it can overcome and reduce the number of defects that arise, by finding solutions in the form of tools or Standard Operating Procedures (SOPs) in the production process and explaining to companies the importance of applying PDCA principles for quality improvement and control.

II. STUDIES OF METHOD

This case study research was conducted with Steps as shown in figure 2 and can be explained as follows:

2.1 Early Identification

Research conducted at PT. ABC is motivated by problems that arise in the field. This initial identification stage is a stage to get to know the picture of the problems that exist in PT. ABC appropriately and correctly with the conditions of the existing environment. After this stage is carried out, then the problem is formulated which is then poured into the main thoughts of writing this research report.

2.2 Problem Formulation

From the observations, a problem formulation was found, namely: How to overcome and reduce the number of defects that arise in the HD-785 dump truck fuel tank by applying the Plan-Do-Check-Action method to quality improvement at PT. ABC?

2.3 Purpose and benefits of research

In research conducted at PT. ABC objectives and benefits of research is carried out so that the research carried out has a clear purpose and provides benefits for authors, readers and companies.

2.4 Data collection

Data collection is carried out at PT. ABC to support this research in three ways, namely by collecting data primary, secondary, and literature studies. Primary data collection includes interviews, and direct field observations. Data collection uses secondary data as well as those obtained from the company. Literature study is the collection of data by reading and studying documents, literature, and books related to the object of research to obtain theories or concepts. The use of literature includes books, journals, undergraduate assignment reports, and internet sites. The scope of the literature studied is about the PDCA method, quality control tools, and the eight-step Quality Control Circle (QCC).

2.5 Improvement with PDCA method

In processing this data, using the Plan-Do-Check-Action (PDCA) method in which there are eight steps of continuous improvement systems and seven quality control tools.

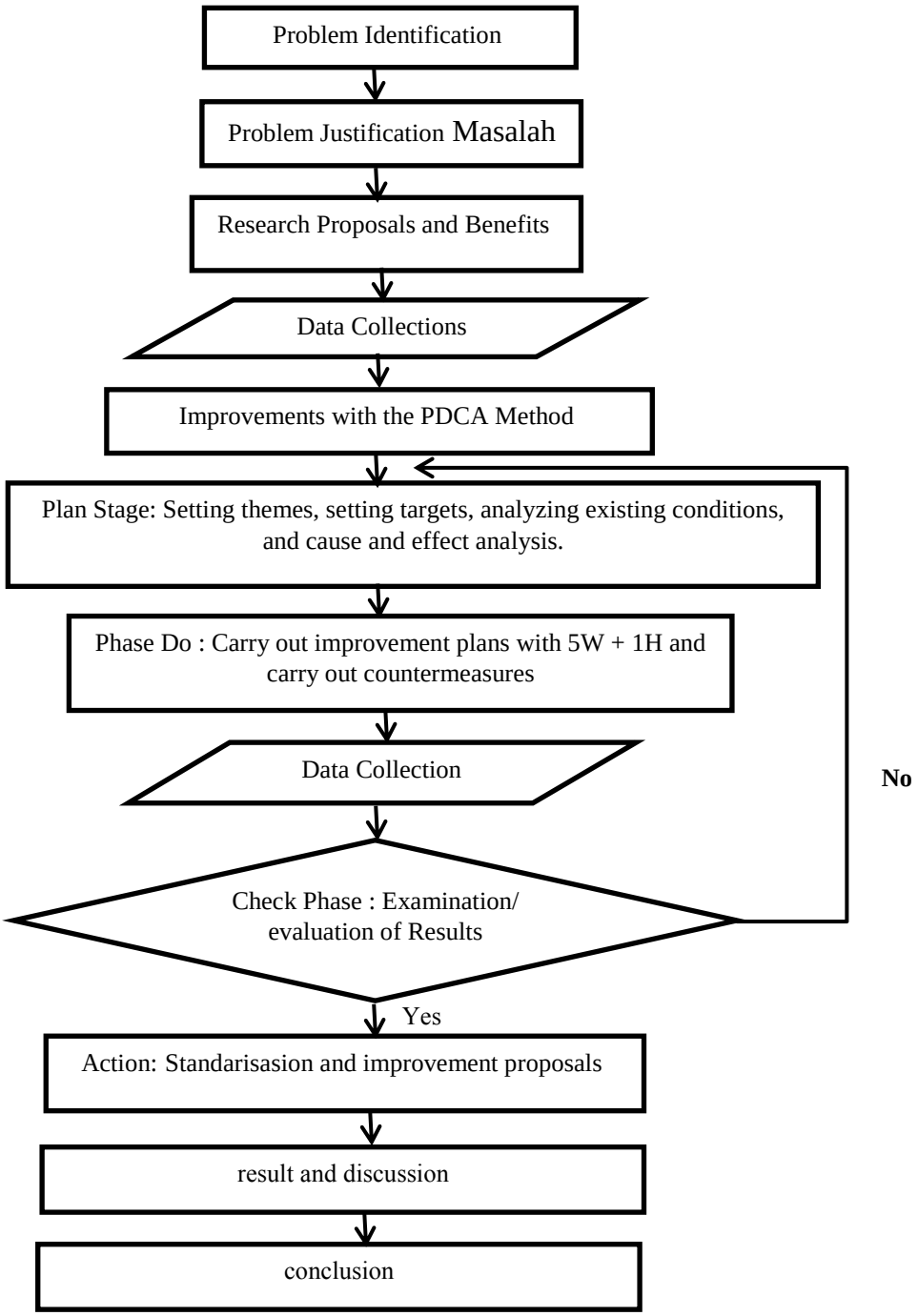


Figure 2. Research Flow chart

2.6 Results and Discussion

After data collection and processing then l data analysis. By explaining the results of research conducted before and after the improvement, which will then be known how big the results of the improvement are by evaluating.

2.7 Conclusion

From the results of the data obtained that have been processed then draw conclusions from the improvements that have been made, so that the results before and after the improvement can be known. And provide suggestions for further research and improvement.

III. RESULTS AND DISCUSSION

The results of quality improvement with the PDCA method can be described starting from Plan, Do, check, and Action as follows:

3.1 Plan

The following are the results and discussions in the steps of the plan stage (planning), namely determining the theme, setting targets, analyzing existing conditions, and analyzing cause and effect.

Define a theme

Themes are events or problems that need to be addressed by QCC taken from problems that develop in the work environment. The following data is collected from the results of research obtained from the results of shipping data and defective product data at PT. ABC for fuel tank products. Based on the details of shipping data and defective product data from June to August 2022 in Figure 3, the focus of the data is 2 defective NPTs, because these problems are the most often rejected.

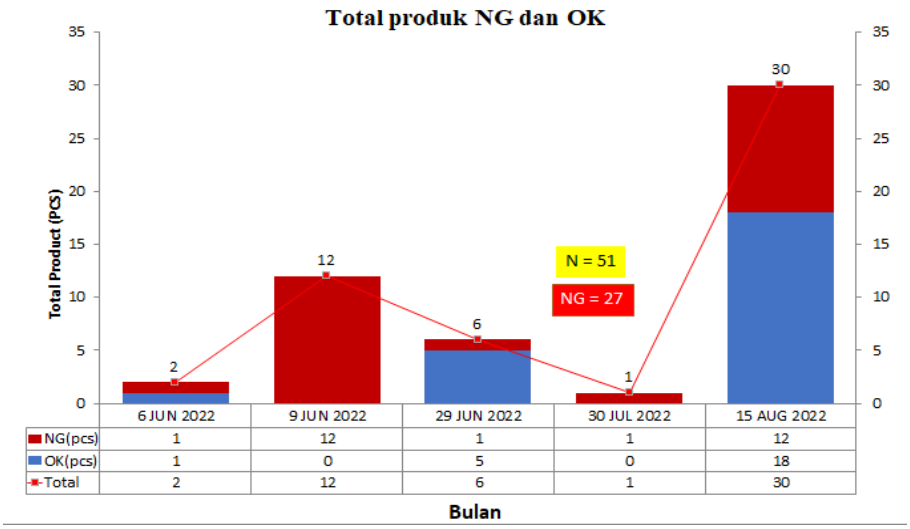


Figure 3. NG and OK product charts (Source: Data PT. ABC, 2022)

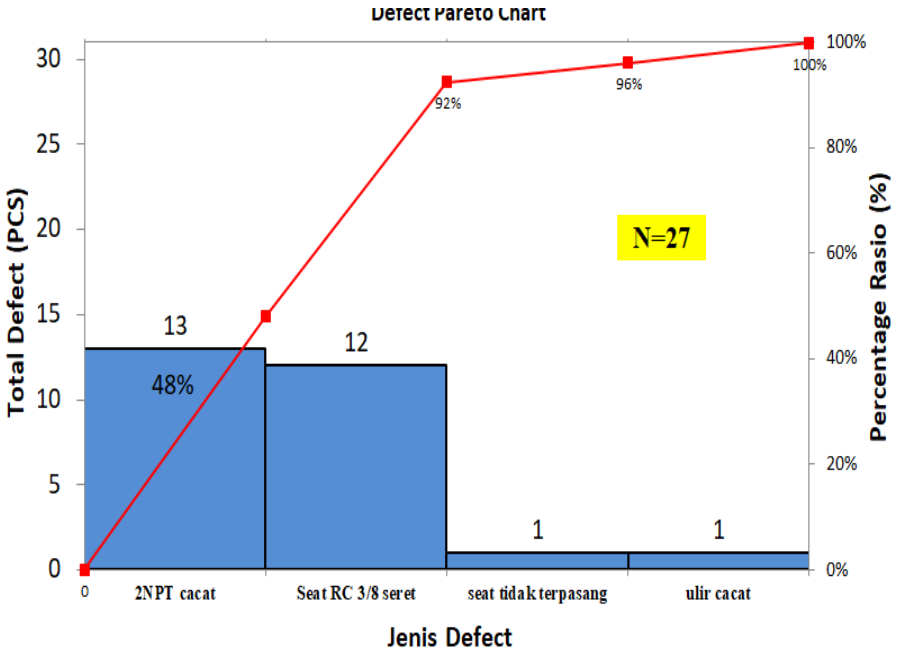


Figure 4. Defect graph of fuel tank products (Source: Data PT. ABC, 2022

Set targets

The improvement target using the SMART method, reducing the number of defects in the fuel number product with problem 2 NPT defects from the number of defects by 48% to 0.5% or the target of reducing defects by 47.5% as shown in figure 5.

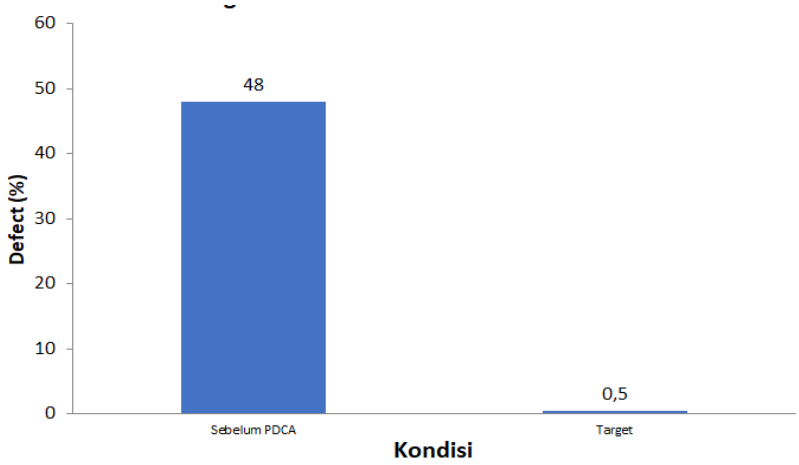
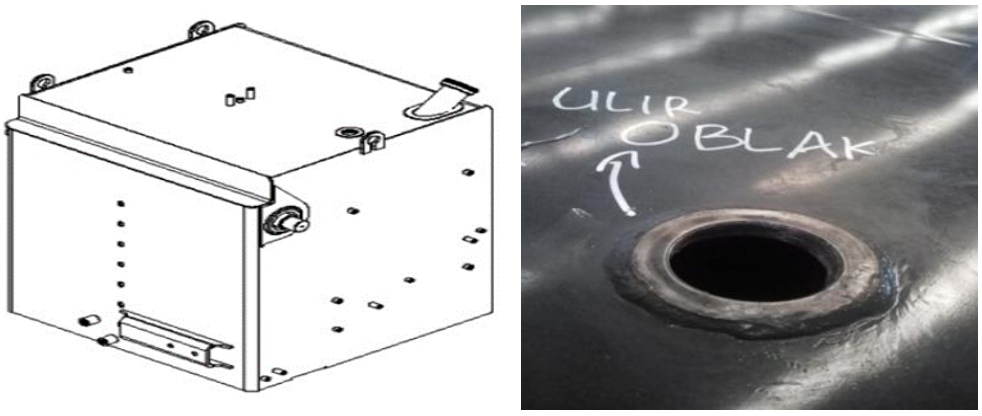


Figure 5. The graph sets defect reduction targets

Analysis of existing conditions

Conduct direct field reviews by paying attention to the 4M + 1E factor (Machine, Material, Method, Man, Environment). Looking for the 4M+1E relationship in the Analyze existing conditions step.



Causal analysis

Fishbone diagram to get the most dominant cause in a problem can be seen in figure 5 and continued using 5 Why analysis to find the root cause of the problem in table 1.

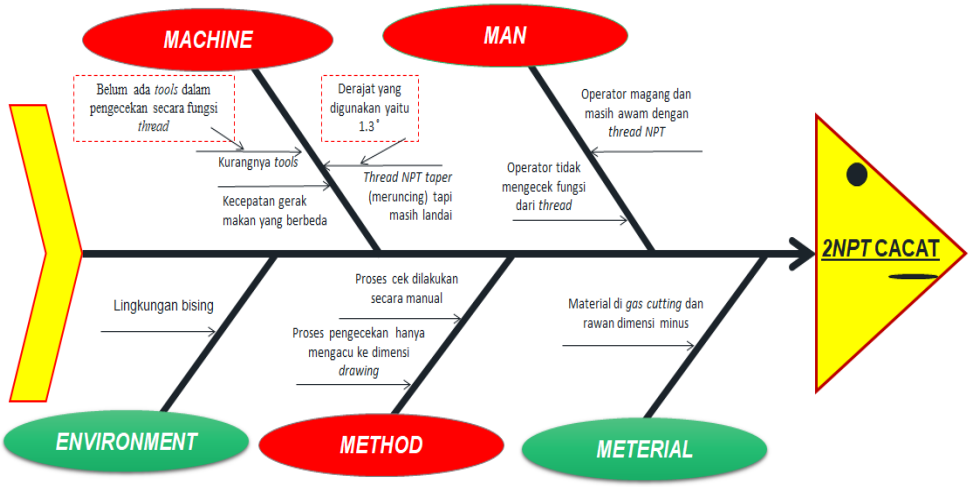


Figure 6. Analysis of fish bone diagram problems

Table 1. 5-WHY problem analysis

Factor	Why-1	Why-2	Why-3	Why-4	Why-5
Man	The operator did not check in its entirety.	Does not check functionally on the thread.	There are no tools in checking thread functions.		
Method	The checking process is done manually using a caliper.	Checking on the function on the thread is not performed.	There are no tools in checking thread functions.		
Machine	Lack of tools	There are no tools for checking thread functions.			
	NPT thread taper (tapered) but still sloping.	The use of less degree of inclination.	The operator miscalculated in the planning of the taper thread.		

3.2 Do (Penanggulangan)

Rencana penanggulangan

Sebelum melakukan penanggulangan terlebih dahulu dibuat renana penanggulangannya. Maka dibuat rencana penanggulangan dengan metode 5W + 1H seperti pada tabel 2.

Table 2. Rencana penanggulangan masalah

Masalah	*Why*	*How*	*Who*	*When*	*Where*
***2NPT* Cacat**	Belum adanya *tools* dalam pengecekan fungsi ulir 2 NPT.	Membuat *tools* untuk pengecekan ulir 2 NPT.	Akbar dan PT. MCM	Oktober-2022	PT. Menara Cipta Metalindo
	Operator salah perhitungan dalam perencanaan ulir *taper*.	Mengubah derajat *taper* menjadi 1,7 derajat.	Akbar dan PT. MCM	Oktober-2022	PT. Menara Cipta Metalindo

The result obtained in the countermeasure is to make a thread checking tool for thread type 2 NPT and change the degree of thread slope to 1.783 degrees.

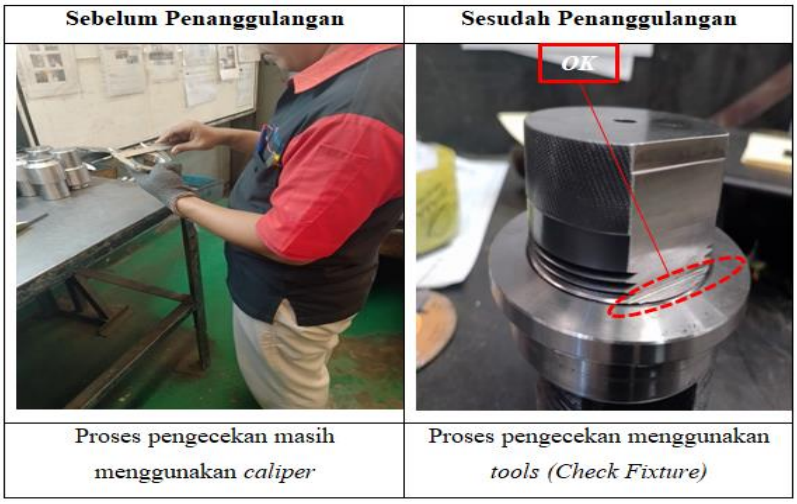


Figure 7. Evaluation of countermeasures before and after improvement

3.3 Check (Evaluation of results)

After the repair has been carried out for 2 months, the comparison of the percentage of defects due to 2 NPTs before PDCA with after after PDCA can be seen in figure 8.

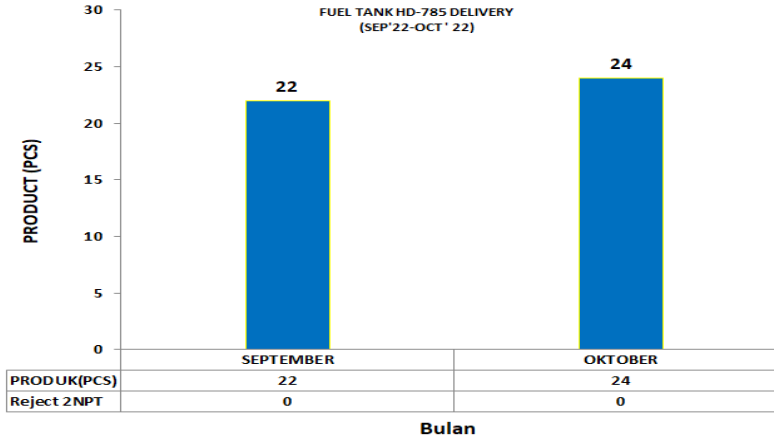


Figure 8. Delivery chart of HD-785 fuel tank in September and October.

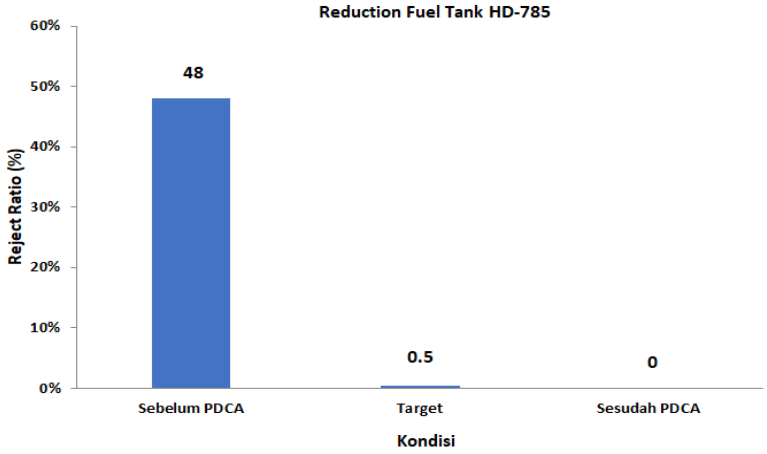


Figure 9. Graph of the result of the decrease in reject after countermeasures.

3.4 Action (Standardization and next plan)

Standardization is needed to prevent the recurrence of the same problem in the future and to create Standard Operating Procedures (SOP) for checking tools and Working Standard (WS) for manufacturing boss parts, as well as planning the next problem theme by lowering the reject ratio on HD-785 fuel tank products with RC 3/8 drag seat defect problems with supporting data as shown in figure 3.

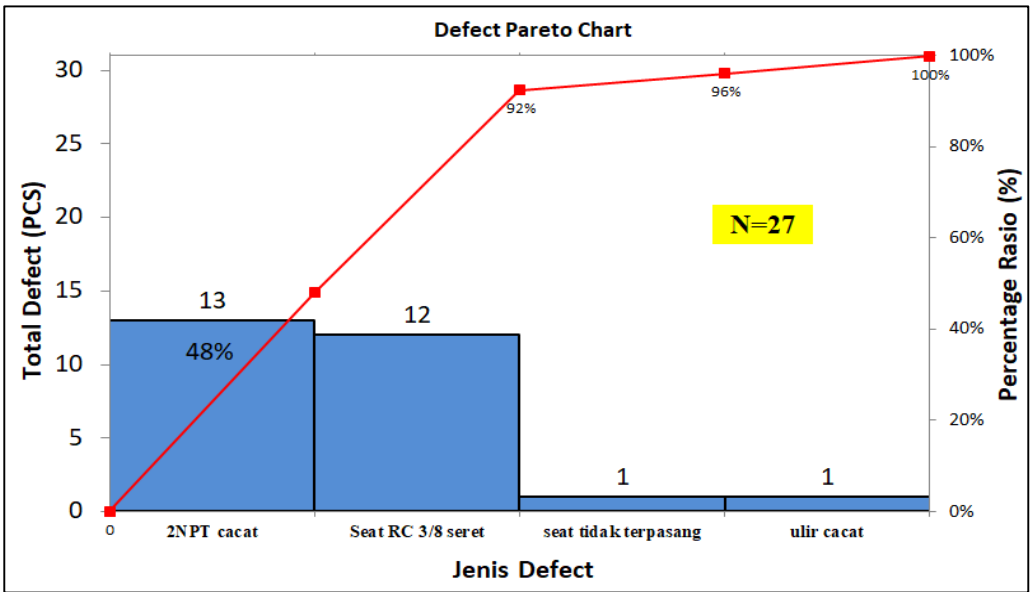


Figure 10. Defect graph of fuel tank products (Source: Data PT. ABC, 2022)

IV. CONCLUSION

Based on the results of data processing and analysis that has been carried out, the following conclusions can be drawn:

1. Based on the results of data processing using the PDCA (Plan, Do, Check, Action) method, it can be concluded that the most dominant main factor or cause is the factor of using less thread slope degrees and the absence of tools in checking thread functions, which are the main factors causing the occurrence of 2 NPT defects because they are directly involved in the process of making threads on boss parts and the checking process, Therefore, this factor must be corrected immediately. From these problems, it is obtained in order to minimize the occurrence of defective products at PT. ABC is by making a checking tool and changing the degree of thread taper from 1.3 degrees to 1.783 degrees and making standards in the form of SOP and WS written on the production and quality section in areas that are easily accessible to workers or operators.
2. Based on the results of improvements that have been made at PT. ABC by applying the PDCA (Plan, Do, Check, Action) method can reduce the reject ratio due to defects in the HD-785 dump truck fuel tank product for defective 2 NPT thread problems, the reject ratio has decreased from 13 reject products to 0 reject or reject products decreased by 48% so that it can be said that the quality improvement activity on the HD 785 dump tuck fuel tank was successful.

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