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Optimizing the Use of Sealant Material Type 5977 for Car Engine Production at PT X Using the PDCA (Plan, Do, Check, Action) Method

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ABSTRACT: Business development in the world causes companies to be able to compete, especially in the field of automotive manufacturing so that companies must have a strategy. This study aims to identify, analyze, and evaluate the use of sealant type 5977 in automotive manufacturing companies to optimize the use of sealant material type 5977 at PT X to remain competitive in local and global markets. This research uses the Deming Cycle Method or PDCA Cycle and the tools used in this research are Checksheets obtained from data for the last 3 months. From the results of this study it can be seen that by optimizing the use of sealant type 5977 for engine production, the results are very good, for 3 months no defects were found or defects that could affect the quality of the engines produced and with the application of cost reduction it is good for the company to reduce its production costs. Based on these results the company can still compete competitively in local and global markets with more efficient costs, the costs incurred before the improvement of Rp 199,000 or 100 engine units to Rp 39,000 or 20 engine units in one month, which saves Rp 160,000 every month or Rp 1,920,000 per year.

KEYWORDS: Sealant type 5977, Deming cycle, PDCA cycle, cost reduction.

1. INTRODUCTION

PT X is a foreign capital company from South Korea, which is engaged in automotive manufacturing. Which sells products in the form of small 4-wheeled vehicles (cars). Established in 2019, this modern factory is located on a site of 8.35 million square feet (77.6 hectares) in Kota Deltamas, Bekasi. And started its first production in 2021 with an annual capacity of 150,000 units and eventually 250,000 units annually when it reaches its maximum capacity.

Business development in the world has led to more and more companies competing in the business world. This causes each company to compete with each other to survive in the business world. In accordance with Michael Porter's classic theory, there are five types of competitive pressures that exist in business competition, namely the competition of competitors, the threat of new competitors, the threat of substitute goods, customer bargaining power, and supplier bargaining power.

To overcome these five competitive pressures, companies can use five types of competitive strategies, namely cost leadership, product differentiation, innovation, growth, and alliance. One of the most effective ways to survive in a competitive market is to use a cost reduction strategy. To be able to run a cost reduction strategy, a company must be able to meet the requirements in two areas, namely: resources and organization. This strategy is only possible if there are several advantages in the field of company resources, namely: strong capital, skilled in process engineering, strict supervision, easy to produce, and low distribution and promotion costs. While from the organizational field, the company must have: good management capabilities in terms of control and cost reduction. [1]

Cost Reduction is defined as an effort to manage activities related to the production process that can reduce production costs by eliminating costs that should not need to occur.

Therefore, for manufacturing companies, production costs are an important factor in the success or failure of the company in financial terms. This production cost is a large cost item compared to other cost items. So the main objective in controlling production costs is to be able to use economic resources to produce effectively, so that there is no waste of costs in production.

The concept of cost reduction is very appropriate in line with increasing competition and the level of supply that far exceeds the level of demand, so market forces have a greater influence on the price level. For this reason, cost reduction is needed to be able to achieve company goals in the context of cost reduction, which will ultimately have an impact on competitive price levels. As one of the innovation management, the implementation of cost reduction in a company must also pay attention to matters related to the successful implementation of the innovation. When cost reduction begins to be taken and implemented by the organization's business operations in other business environments, it can be assumed that something new about the approach can be learned by paying attention to what is happening with other business contexts. [2]

Cost reduction is a common strategy adopted by various organizations to increase their profitability, cope with economic fluctuations, and improve their competitiveness in the global market. Therefore, understanding effective and innovative strategies for cost reduction has become crucial for the long-term sustainability and growth of the company. [3]

This research aims to identify, analyze, and evaluate the use of sealant type 5977 in manufacturing companies in the automotive sector so that optimization of the use of sealant material type 5977 at PT X can be done. Thus, this research is expected to provide practical guidance and in-depth understanding for business practitioners, managers, and decision makers in developing effective and sustainable cost reduction strategies to support overall company growth.

2. METHODS

This research was conducted at PT.X to solve the existing problems. The analysis method used is the Deming cycle or PDCA Cycle and the tools used in this research are Checksheet. Data is obtained from checksheets for the last 3 months. The steps in this research are presented in a flow that can be seen in Figure 1.

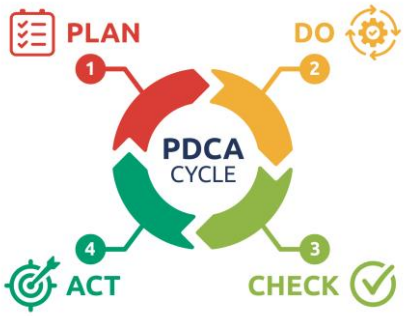

Figure 1: Flow of the PDCA cycle

The PDCA cycle, also known as the Deming cycle, is an improvement cycle that is a continuous quality improvement management that emphasizes profit [4].

A. Shewhart. In the 1950s Japan gave the name Deming cycle. The PDCA cycle consists of 4 basic stages: plan, do, check and action. The PDCA cycle is used as a tool to test and make changes to improve systems, processes and product performance in the future. The PDCA cycle is an iterative problem-solving method that can be applied in statistical and continuous quality control or called kaizen improvement [5]. Kaizen improvement is the attention to make improvements on small things in every production process [6].

The PDCA cycle can be used as a tool to identify, analyze, and evaluate the use of sealant type 5977. In this study, the activities carried out at each stage of the PDCA cycle are as follows:

Plan: At this stage, an understanding of the problems that occur in the process in the production line will be carried out or improvement, namely the use of sealant type 5977.

Figure 2. Problems that occur

Do: At this stage, the sealant machine is implemented by eliminating the drain process when changing the sealant bucket.

Check: At this stage, the results of the sealant machine process are checked against the engine material.

Action: At this stage, if the results of the improvement do not affect the quality, it will be used as a continuous improvement and change the standard operating procedure related to the sealant bucket change.

Checksheet: Checksheet is a simple designed sheet containing a list of things needed for the purpose of recording data so that data collection can be done easily, systematically, and regularly when the data appears at the scene. Data in Checksheet both in the form of quantitative and qualitative data can be analyzed quickly [7]. The check sheet is used as sealant usage data before and after improvement.

3. RESULTS AND DISCUSSION

The focus of this research was conducted at a four-wheeled vehicle automotive manufacturing company, precisely in the engine production department. The research was conducted because the use of sealant type 5977 was less than optimal which must be optimized. All problems that occur need to be addressed and followed up to get good results and can be useful for companies in particular to increase their profitability, overcome economic fluctuations, and increase their competitiveness in the global market.

Analyze the cost of 5977 type sealant material before improvement:

Table 1

Description	Cost or Price
Sealant tipe 5977 (20kg)	Rp 3.980.000
Usage per engine unit (10gr)	Rp 1.990
Residual weight of drain nozzle A (± 800 gr)	Rp 159.200
Residual weight of drain nozzle B (± 200 gr)	Rp 39.800

It can be seen in table 1 that the amount of sealant material costs, the cost of each engine unit and the costs wasted every time the sealant bucket is changed. From the table above, it can be seen that there is a waste of costs in sealant replacement activities that can be optimized for production needs to meet company targets.

The following is an estimate of the number of units for production with conditions before improvement, with a bucket capacity of 20kg and minus 1kg for sealant replacement activities, the following data is obtained:

Table 2

Description	Quantity	10gr /unit
Maximum capacity	20.000gr	2.000
Ready Capacity	19.000gr	1.900
Residual weight of drain nozzle A & B	800gr	80
	200gr	20

From the collection of a number of data in tables 1 and 2, it looks not optimal because the wasted sealant could have been used for the production process on the line with a loss of around Rp. 199,000 or 100 engine units in one month, so improvements will be made by optimizing the use of sealants using the Deming cycle method or PDCA cycle.

A. Plan

The first step is to determine the theme of improvement that can be seen from the problems that occur, namely the inefficient sealant replacement process by draining each nozzle.

The following is data from the process of changing the 5977 type sealant bucket before improvement or efficiency for the January-March 2023 period.

Table 3

Sealant changeover checksheet (before efficiency)		
Date	**Residual weight of drain (gram)**	
	Nozzle A	**Nozzle B**
January 2023	822 gr	190 gr
February 2023	854 gr	202 gr
March 2023	812 gr	196 gr

Figure 3. Process drain nozzle A

Figure 4. Process drain nozzle B

From the data in table 3, it can be seen that the drain process at nozzle A consumes quite a lot of sealant compared to nozzle B, therefore the theme of improvement to be carried out in this study is to optimize the use of sealant by eliminating the drain process at Nozzle A.

B. Do

In the second stage of the PDCA cycle is to implement the sealant machine by eliminating the Nozzle A drain process when changing the sealant bucket.

The following is the standard operating procedure for changing the sealant bucket when it runs out:

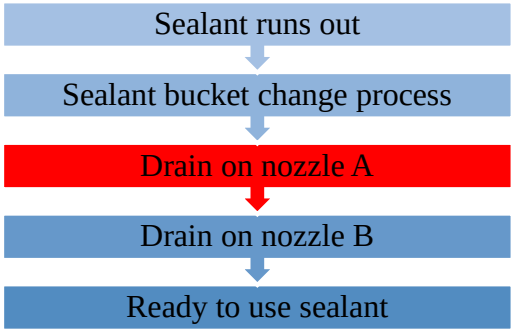

Figure 5. Changeover process before improvement

After the improvement, the standard operating procedure for the sealant replacement process changed to the following:

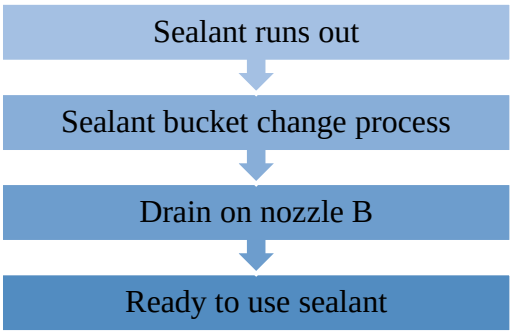

Figure 6. Changeover process after improvement

C. Check

Checking or scrutinizing refers to determining whether the implementation is on track, in accordance with the plan and monitoring the progress of planned improvements. Comparing the quality of production results with predetermined standards, before and after improvement [8].

After making improvements by eliminating the drain process at nozzle A to optimize the use of sealants, the data obtained on the sealant replacement process is as follows:

Table 4

Sealant changeover checksheet (before efficiency)		
Date	**Residual weight of drain (gram)**	
	Nozzle A	**Nozzle B**
April 2023	-	211 gr
Mei 2023	-	199 gr
Juni 2023	-	208 gr

Material cost analysis of sealant type 5977 after improvement:

Table 5

Description	**Cost or Price**
Sealant tipe 5977 (20kg)	Rp 3.980.000
Usage per engine unit (10gr)	Rp 1.990
Residual weight of drain nozzle B (± 200 gr)	Rp 39.800

The following is the estimated number of units for production after improvement:

Table 6

Description	**Quantity**	**10gr /unit**
Maximum capacity	20.000gr	2.000
Ready Capacity	19.800gr	1.980
Residual weight of drain nozzle B	200gr	20

After making improvements to the sealant change process, the data from tables 5 and 6 shows that the wasted costs are less, to Rp 39,000 or 20 engine units in one month.

The results of these improvements do not affect the quality of the engine production process in the line.

Figure 6. Sealant results after improvement

D. Action

Standardization is the final stage of this research intended to create standard procedures so that the same problems will not recur or can be minimized. In this stage, the next project plan is usually also raised [9].

The standardization carried out is as follows.

1. Revise the SOP for the work steps performed by the operator during sealant change by eliminating the drain process at nozzle A [10].
2. Ensure the results of the sealant process on the machine do not affect the quality of the engine in production by supervising and checking after the sealant change and always warning the importance of quality to employees periodically.
3. Perform the same improvement on other sealant machines.

4. CONCLUSION

Based on the results of improvements made by eliminating the drain nozzle A process during sealant replacement, using the PDCA cycle to optimize the use of sealant type 5977 in manufacturing companies in the automotive field, it can be concluded as follows:

1. The application of the PDCA cycle shows more efficient results when compared to the conditions before the improvement, and is also a good alternative for companies to reduce their production costs, where with the application of cost reduction, the costs incurred before the improvement amounted to Rp 199,000 or 100 machine units to Rp 39,000 or 20 machine units in one month, resulting in savings of Rp 160,000 every month or Rp 1,920,000 per year.
2. The improvements made do not cause a decrease in the quality of the machines in production.
3. As a way to maintain production quality, always supervise and check after sealant replacement and always warn the importance of quality to employees regularly.

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