



Legano Product Quality Control Using DMAIC and FTA for Quality Improvement Efforts at PT Fitria Jaya Lestari

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Abstract

Quality control at PT. Fitria Jaya Lestari's inadequate supply caused problems for the company. This problem is characterized by a fairly high defect rate in Legano products, reaching 11.28%. This problem arises due to the absence of effective quality control methods at PT. Fitria Jaya Lestari. To analyze this problem, the DMAIC method is used in conjunction with Fault Tree Analysis (FTA). The purpose of this study is to identify the causes of the high level of defects and provide suggestions for improvement to overcome the problem of defects in Legano products. The method applied in this study is DMAIC with Fault Tree Analysis to find out the cause of the high level of defects and propose improvements for defect problems in Legano products. The results of the analysis showed a DPMO value of 28,443.58 or the possibility of defects as many as 28,443 in a 12-month period, with the causes of defects including Humans, namely the lack of job training for employees and the low quality of human resource graduates, Machinery, which is too high a temperature, Materials, which are raw materials made from rubber waste, and Methods, namely the absence of guidelines for cutting. Given these results, there are several suggestions for improvement such as holding job training for employees, recruiting a workforce with good quality graduates, replacing raw materials from rubber waste to rubber seeds, and making work instructions and jig parts as cutting guides.

Keywords: Quality Control, Defect, DMAIC, Fault Tree Analysis

Introduction

The manufacturing industry is a company that processes raw materials or materials as inputs to produce semi-finished products or finished products. To ensure the development of the manufacturing industry, quality control is very necessary, because this activity is important for the company. The quality control activities carried out will supervise the goods and services obtained according to the predetermined plan and existing errors can be minimized (Ilham, 2012). PT. Fitria Jaya Lestari is a company operating in the rubber industry sector. PT Fitria Jaya Lestari is a company that produces rubber metal components for motorcycles and also for other industrial needs. The products produced by this company include Legano, Flange, Fuel Filler, Damper, and Packing Separator. In 2023, it appears that Legano products have a fairly high defect rate when compared to total production. This is due to the lack of effective quality control implemented by PT. Fitria Jaya Lestari.

PT. Fitria Jaya Lestari faces problems in quality control, namely the high number of defects or NG (No Good) in the production process of Legano products, so that the percentage of defects or NG in Legano products reaches 11.28%, and the company is looking for reasons for NG products and trying to find solutions to reduce the NG rate. Therefore, the company tries to reduce defects or NG by 3%, and the author tries to solve this problem using quality control methods such as DMAIC with a tool approach, namely FTA (Fault Tree Analysis), which is a method used to analyze the failure of a system with an analysis that starts from the system level (top) and continues down (Priyanta, et al, 2016).

1. Define
Define is the first step in determining the process to be evaluated, which is determined at this stage.
2. Measure
Measure is a term that refers to the measurement of a problem that has been described at the definition level. Measure is carried out by collecting and assessing the ongoing process based on the data obtained.
3. Analyze
When applying Six Sigma to improve the performance of business systems and processes, the goal to be achieved is to create systems and business processes that have stability and the ability to meet zero defect standards, or zero failure rates. To achieve these standards, in the analysis stage, it is necessary to conduct a search that can identify variations in systems and processes that have the potential to cause defects.
4. Improve
In this phase, a solution selection is made and the most effective solution is determined to achieve the best performance. The solution created can be through design (or redesign) and the implementation of new processes.
5. Control
The control stage is carried out after the solution that has been determined is implemented, with the aim of overseeing the process that has been improved in performance.
6. 5W + 1H (What, Why, Where, When, Who and How)
5W + 1H is a concept that is often used in journalism, problem analysis, research, and various other fields to ensure that the information obtained or presented is complete and structured.

Method

A method to continuously improve performance at the level or operation of a process, from each functional area in an organization, by utilizing existing resources and capital, and control by examining outputs, comparing them with standards, and analyzing existing differences, as well as making decisions to adjust those processes to meet the standards set to improve quality. And there are 5 (five) stages in the DMAIC (Define, Measure, Analyze, Improve, Control) process.

Results and Discussion

Table 1. Data on the Number of Production and Number of Legano Product Defects in 2023

Era	Production Quantity (pcs)	Defect (pcs)	Percentage
January 2023	16390	1867	11,39%
February 2023	16330	1832	11,22%
March 2023	16390	1875	11,44%
April 2023	16350	1879	11,49%
May 2023	16380	1856	11,33%
June 2023	16380	1863	11,37%
July 2023	16345	1855	11,35%
August 2023	16400	1886	11,50%
September 2023	16355	1875	11,46%
October 2023	16370	1874	11,45%
November 2023	16370	1863	11,38%
December 2023	16390	1826	11,14%
TOTAL	196450	22151	11,28%

Source: PT. Fitria Jaya Lestari (2023)

Production Data and Defect Data

In the Legano production process, namely from January to December 2023 with a total production of 196,450 pcs and a total of 22,151 pcs defects with a defect percentage of 11.28%. Production Data and Defect Data can be seen in table 1.

a) Define Stage

Define is the first level at the DMAIC level. At the define stage, the source of the problem that occurred was identified and improvements were needed to improve the quality of the rubber profile.

b) Diagram SIPOC

The following is a diagram of SIPOC (Supplier - Input – Process – Output -Customers) on the Legano process at PT. Fitria Jaya Lestari.

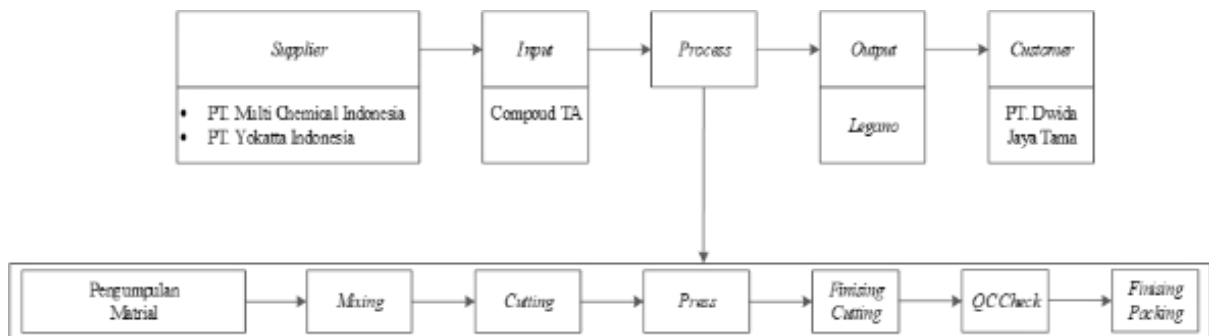


Figure 1. SIPOC Diagram of Legano Process

c) Critical To Quality Identification (CTQ)

In order to identify the needs that are the main concern of consumers, CTQ tools are a factor in a process that has a direct impact on the creation of the required quality. According to observations at the extrusion plant, there are four types of defects in the production process, namely: Scrap.

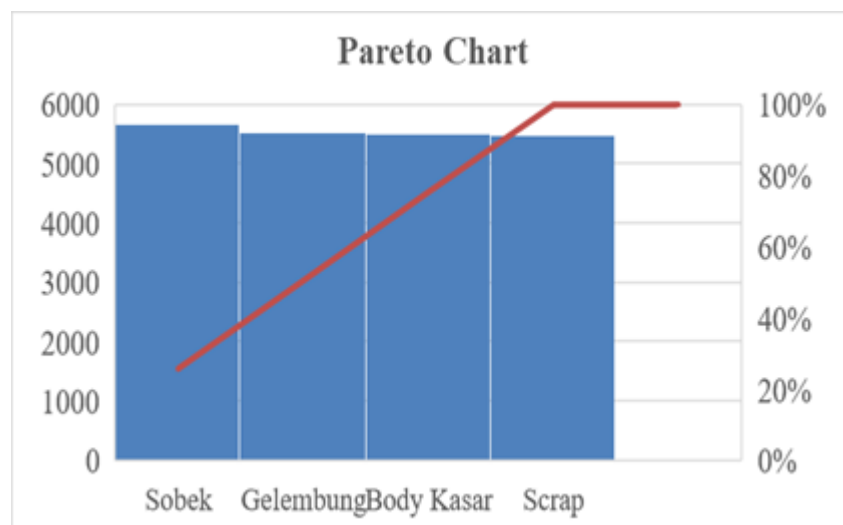


Figure 2. Pareto Chart Types of Defects in Legano Products

Based on the results of the pareto chart above, it can be seen that the percentage of defects in Legano products can be seen. From the results of the pareto chart, it can be concluded that the type of torn defect has the highest percentage of 25.53%, followed by bubbles at 24.91%, rough body at 24.84% and scrap at 24.71%. Therefore, the type of defect that has the highest percentage will be solved first.

Measure Stage

The measure stage is the second stage of the DMAIC concept, this stage measures the problems that have been defined, the measure stage is carried out by looking for Defect Per Unit (DPU), Defect Per Opportunities (DPO), Defect Per Million Opportunities (DPMO) and Sigma Level that has been achieved during production. The following is the formula of Defect Per Unit (DPU), Defect Per Opportunities (DPO), Defect Per Million Opportunities (DPMO) and Sigma Level.

Table 2. Sigma Defect Legano Products in 2023

Era	Production Quantity (pcs)	Defect/NG (pcs)	DPU	DPO	DPMO	Sigma Value
January 2023	16390	1867	0.113910921	0.028477730	28477.73	3.404
February 2023	16330	1832	0.112186160	0.028046540	28046.54	3.410
March 2023	16390	1875	0.114399024	0.028599756	28599.76	3.402
April 2023	16350	1879	0.114923547	0.028730887	28730.89	3.400
May 2023	16380	1856	0.113308913	0.028327228	28327.23	3.406
June 2023	16380	1863	0.113736264	0.028434066	28434.07	3.404
July 2023	16345	1855	0.113490364	0.028372591	28372.59	3.405
August 2023	16400	1886	0.115000000	0.028750000	28750.00	3.399
September 2023	16355	1875	0.114643840	0.028660960	28660.96	3.401
October 2023	16370	1874	0.114477703	0.028619426	28619.43	3.401
November 2023	16370	1863	0.113805742	0.028451436	28451.44	3.404
December 2023	16390	1826	0.111409396	0.027852349	27852.35	3.413
Total	196450	22151				
Average	16371		0.113774323	0.028443581	28443.58	3.404

Based on the results of the calculation of DPU, DPO, DPMO and Sigma Defect from table 5 for 12 periods from January to December 2023 in the Legano production process at PT. Fitria Jaya Lestari, obtained an average DPMO result of 28443.58 so that a Sigma Defect value

of 3.404 was obtained. In the results of the calculation, it can be seen that in one million products produced, there are 28,443 possible defects during a 12-month period.

Analyze Stage

In the defect weighting assessment, discussions, interviews and observations are carried out with office holders or superiors of related departments:

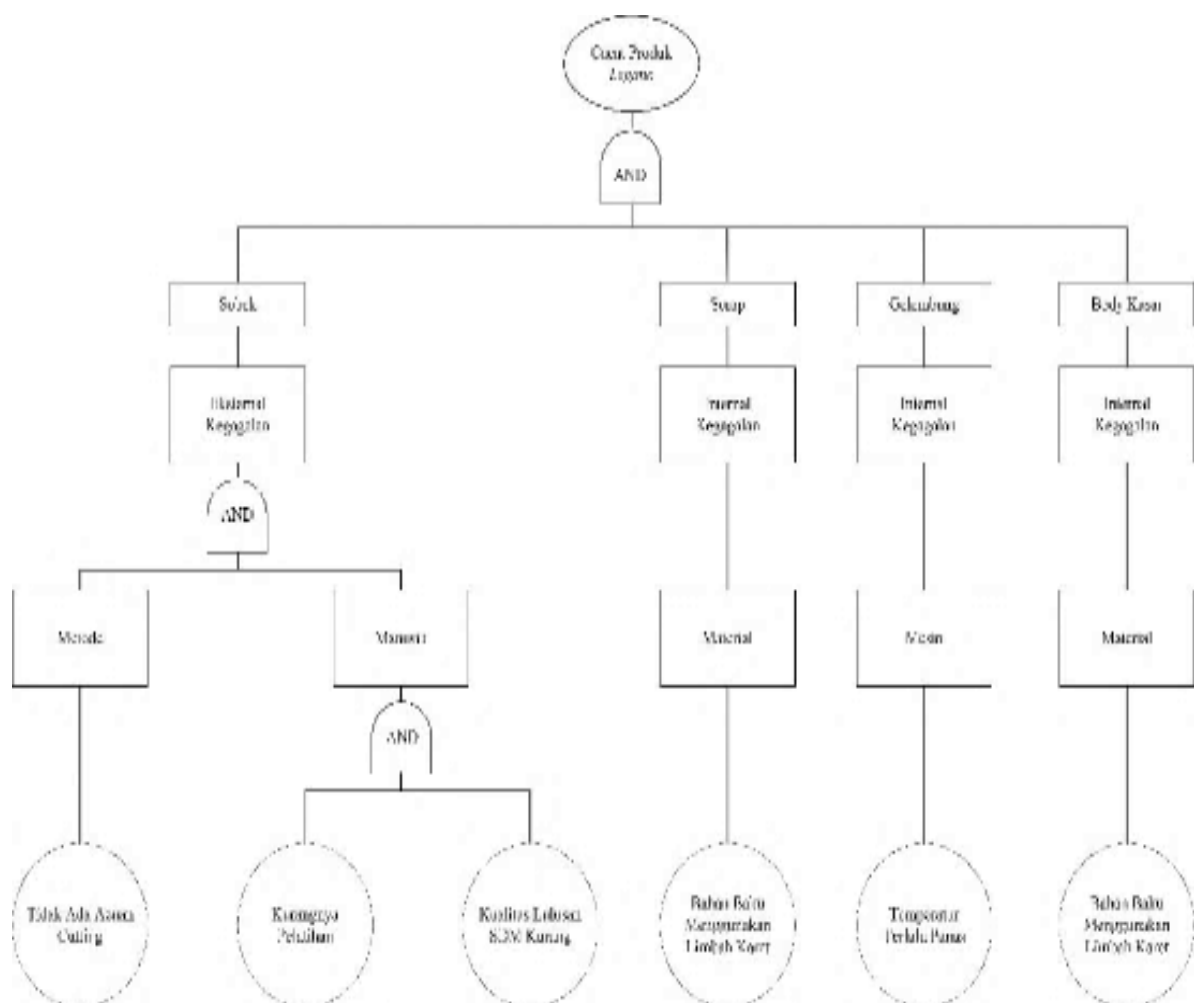


Figure 3. Legano Product Defect FTA

Table 3. 5W+1H Tear Product Defects

<i>What (What)</i>	<i>Why</i>	<i>Where</i>	<i>When</i>	<i>Who</i>	<i>How (How)</i>
Torn products	Absence of cutting reference	Finishing Area or 2nd process	In December 2023, a proposed improvement was made	Finishing operators	With the proposal to improve the creation of WI (<i>work inrruction</i>) With the proposal to improve the manufacture of <i>jig parts</i> for cutting reference
	Lack of training	Finishing Area or 2nd process	In December 2023, a proposed improvement was made	Finishing operators	Lack of training, therefore with the proposal of <i>employee training to skill up</i>
	The quality of HR graduates is lacking	Finishing Area or 2nd process	In December 2023, a proposed improvement was made	Finishing operators	With the proposal to improve the recruitment of human resources with adequate graduates

Improve Stage

In addition to using a Fault Tree Analysis (FTA) diagram, the way that can be done is to develop a plan for improvement and quality improvement activities using the 5W+1H method. Plan improvement activities on human, machine, method, material and environmental factors. Below is a table of the repair process using the 5W+1H method which is a continuation of the development of the Fault Tree Analysis (FTA) diagram to find defect repairs in Legano products that have been discussed with office holders or superiors of related departments

Based on table 3 above, there are several improvement proposals to overcome the type of tear defect such as making work instructions for use and jig parts for cutting references, jig parts are tools that function to direct a cutting tool in a position that is in accordance with the product work, then equipped with work instructions which are documentation about the steps to do the job properly. In addition, a proposal was made to hold training for employees to increase their skills and use qualifications in the recruitment of employees with adequate graduates with the aim that employees can understand the correct and appropriate work procedures to anticipate the occurrence of products with a high level of defects.

Conclusion

Based on the causative factors that cause the occurrence of Legano defect products using the Fault Tree Analysis (FTA) method by identifying factors that have possible causes to cause legano defect problems. Among them are the Man factor (lack of job training in the workforce and lack of quality of human resource graduates), Machinery (temperature is too hot), Materials (raw materials using rubber waste), methods (no cutting references).

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