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Original Research Article

Quality Cost Control Analysis to Degrade Defective Products and Their Impact on Company Performance (Case Study at Pt. Tirta Investama – Subang Factory)

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Abstract

PT. Tirta Investama – Subang Factory is an industrial company engaged in bottled drinking water, background of this research is significant increase in product returns of 5 gallons over five years (in 2016 - 2020) from AQUA Group. Purpose of this study was to analyze the cost of quality due to defective products and their impact on the company's performance. This study uses the quantitative destructive method with the seven tools analysis method. The results showed that the increase in conversion costs / industrial costs, especially quality costs, has an impact on the company's performance must be improved.

Keywords: Tirta Investama, Subang Factory, Control Analysis.

1. INTRODUCTION

In general, the main goal of profit oriented companies is to produce maximum profits that are expected to continue to increase every period to keep the company sustainable, but the ever-changing consumer demands require the company to be more flexible in meeting consumer demands which in this case is directly related to how well the quality of products received by consumers.

Various types of bottled water brands on the market encourage companies to compete for potential customers through various strategic strategies, such as changing design, color, packaging, promotion and price. Therefore, effort made by the company in order to compete is to improve the quality of its production so that consumers can be interested in buying the products. Increased quality will reduce the occurrence of damaged products so that it will increase profits. One way to improve quality is to reduce / lower the level of disability and increase the level of quality.

PT. Tirta investama has constraints in external quality costs, namely return of special products of 5 gallons, in 2016 - 2020 aqua group experienced a significant increase, following customer return product data in 2016 to 2020:

Previous research has examined quality costs, namely Setiabudi et al. (2020), Puspasari et al. (2019), Sudibyo et al. (2019) and Rufaidah et al. (2018) concluded that the cause of defective products was due to engine performance factors (incomplete documents), method factors, capital factors, raw material/material factors, environmental factors, weather factors and labor factors, machine performance factors when taking measurements are not checked again sustainably, labor factors due to lack of focus, lack of thoroughness and haste in doing work.

Rufaidah et al. (2018) Quality improvement in proposed chocolate coffee products using PDCA and 5S cycles that solve problems by determining problem priorities based on causal diagrams. In PDCA and 5S resistance, namely by conducting training to improve the operator's ability and skil, machine tools are always maintained so that damage can be minimized.

Costaa et al. (2019) three factors that cause excessive insertion power, one of which is the wear of engine components. A series of improvements,

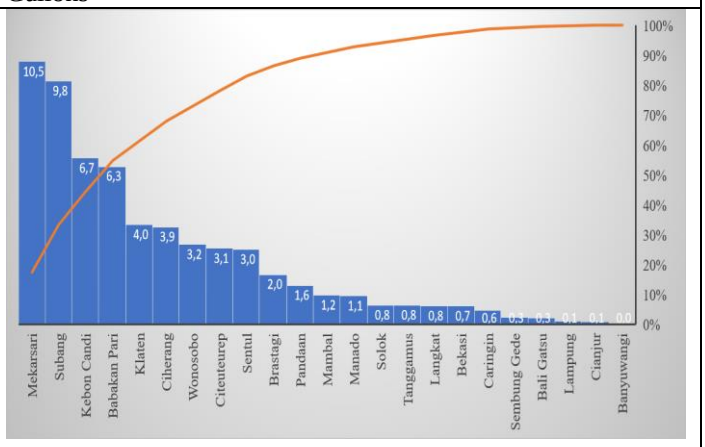
implemented with a focus on the three factors mentioned, improves the level of quality of the process, making it more stable and with less variability by reducing the insertion strength to a near-nominal value.

The results of research from Kreem et all (2020), Mitreva et all (2017), and Maswadeh (2017) concluded that in increasing competitiveness and superiority over its competitors through quality costs, to improve quality. increased employee motivation/improved performance and performance of available resources, a better work environment and most importantly satisfied customers. The company will reduce wasteful production costs and implement cost methodology in JSP, for the survival of the company and its sustainable development.

Table 1.1 Quantity of Product Customer Returns 5 Gallon

Factory Name	2016	2017	2018	2019	2020	Total	Average
Manado	0,3	0,2	0,2	0,2	0,3	1,1	0,2
Lampung	0,1	0,0	-	-	-	0,1	0,0
Subang	2,0	2,1	1,9	1,9	1,9	9,8	2,0
Wonosobo	0,6	0,7	0,6	0,7	0,7	3,2	0,6
Pandaan	0,3	0,3	0,3	0,3	0,4	1,6	0,3
Mambal	0,2	0,2	0,3	0,2	0,2	1,2	0,2
Citeureup	0,4	0,4	0,2	0,1	0,2	1,3	0,3
Babakan Pari	1,3	1,4	1,1	0,3	-	4,1	0,8
Klaten	0,8	0,7	0,7	0,8	1,0	4,0	0,8
Kebon Candi	1,7	1,3	1,2	1,2	1,3	6,7	1,3
Cianjur	0,0	0,0	0,0	0,0	0,0	0,1	0,0
Ciherang	0,8	0,8	0,7	0,7	0,9	3,9	0,8
Bali Gatsu	0,1	0,1	0,1	0,0	-	0,3	0,1
Solok	0,1	0,1	0,2	0,2	0,1	0,8	0,2
Tanggamus	0,0	0,1	0,2	0,2	0,3	0,8	0,2
Langkat	0,0	0,2	0,1	0,2	0,2	0,8	0,2
Sentul	0,1	0,3	0,6	0,8	1,2	3,0	0,6
Sembung Gede	-	-	-	0,1	0,2	0,3	0,1
Mekarsari	2,6	2,0	1,7	1,9	2,4	10,5	2,1
Citeureup	0,4	0,4	0,3	0,3	0,3	1,8	0,4
Bekasi	0,1	0,1	0,1	0,2	0,2	0,7	0,1
Babakan Pari	-	-	-	0,9	1,3	2,2	0,4
Brastagi	0,5	0,4	0,3	0,3	0,5	2,0	0,4
Caringin	-	-	-	0,1	0,5	0,6	0,1
Banyuwangi	-	-	-	-	0,0	0,0	0,0
TOTAL	**13**	**12**	**11**	**12**	**14**	**61**	**12**

Graph 1.1 Pareto Diagram Quantity of Product Returns 5 Gallons



(Source: Finance and Logistic data of PT. Tirta Investama)

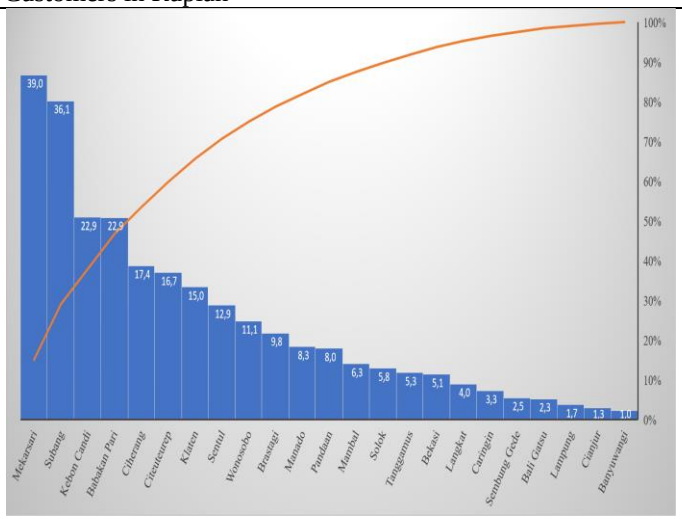
Table 1.1 Is an overview of the quantity of special customer returns of 5 gallon products from 25 factories in millions, the red yellow color is the data of subang factories

Graph 1.1 Is a pareto diagram of the quantity of returns of 5 gallon product customers from 25 factories in millions, subang factory ranks second with the amount of 9.8 Million Pcs.

Table 1.2 Customer Return 5 Gallon Products in Rupiah

Factory Name	2016	2017	2018	2019	2020	Total	Average
Manado	1,4	1,1	1,4	2,1	2,2	8,3	1,7
Lampung	0,8	0,3	0,2	0,2	0,2	1,7	0,3
Subang	6,9	7,0	6,4	8,0	7,8	36,1	7,2
Wonosobo	1,9	2,2	2,1	2,5	2,4	11,1	2,2
Pandaan	1,6	1,7	1,3	1,6	1,9	8,0	1,6
Mambal	1,1	1,0	1,5	1,2	1,6	6,3	1,3
Citeuteurep	2,0	2,0	1,1	1,1	1,9	8,1	1,6
Babakan Pari	4,2	4,4	3,9	1,1	0,2	13,8	2,8
Klaten	2,9	2,4	2,7	3,1	3,9	15,0	3,0
Kebon Candi	5,2	4,1	4,0	4,5	5,0	22,9	4,6
Cianjur	0,3	0,3	0,3	0,3	0,3	1,3	0,3
Ciherang	3,7	3,5	3,0	3,4	3,8	17,4	3,5
Bali Gatsu	0,5	0,6	0,6	0,4	0,2	2,3	0,5
Solok	1,1	1,0	1,3	1,3	1,2	5,8	1,2
Tanggamus	0,3	0,6	1,0	1,5	1,9	5,3	1,1
Langkat	0,4	0,8	0,7	1,0	1,1	4,0	0,8
Sentul	0,7	1,2	2,1	3,8	5,1	12,9	2,6
Sembung Gede	0,2	0,2	0,2	0,7	1,2	2,5	0,5
Mekarsari	8,8	6,5	6,9	7,5	9,3	39,0	7,8
Citeuteurep	1,6	2,0	1,5	1,6	1,9	8,6	1,7
Bekasi	0,9	0,8	0,8	1,1	1,4	5,1	1,0
Babakan Pari	0,2	0,2	0,2	3,4	5,0	9,0	1,8
Brastagi	2,6	1,7	1,8	1,7	2,0	9,8	2,0
Caringin	0,2	0,2	0,2	0,5	2,2	3,3	0,7
Banyuwangi	0,2	0,2	0,2	0,2	0,2	1,0	0,2
TOTAL	**50**	**46**	**45**	**54**	**64**	**259**	**52**

Graph 1.2 Diagram Pareto Returns 5 Gallon Product Customers in Rupiah



(Source: Finance and Logistic data of PT. Tirta Investama)

Table 1.2 is a picture of Rupiah special customer returns of 5 gallon products from 25 factories in Billion, yellow red highlight is subang factory data.

Graph 1.2 Is a diagram of 5 gallon product customer returns from 25 factories in billion, subang factory ranks second with a total of Rp. 36.1 billion

2. LITERATURE REVIEW

a. Teori Agensi

In this study agency theory is used to explain between the first two parties the owner (principal) and the second management (agent). The agency theory states that if there is a separation between the owner as the principal and the manager as the agent who runs the company, it will cause agency problems because each

party will always try to maximize its utility function (Astria, 2011).

Separate ownership and control in a company is one of the factors that trigger the emergence of conflicts of interest that can be called agency theory. There will be agency conflicts between parties who have different interests and goals can complicate and hinder the company in achieving positive performance to generate value for the company itself and also for shareholders (Putra, 2012).

b. Quality Cost Control

Good quality cost management requires quality costs to be reported and controlled. Control makes quality costs comparable to standards as a benchmark for performance and for the basis of taking remedial action. The standards used should emphasize on the opportunity of cost reduction.

c. Quality Cost Categories

According to Bhimani *et al* (2019: 637) Quality costs are classified into four categories:

1. Prevention costs are costs incurred to hinder the production of products that are not suitable for specifications. Examples of training costs, supplier quality evaluation, quality audit, process control, new product design costs and quality planning.
2. Appraisal costs are costs incurred to detect which product units are not in accordance with specifications. Examples are supervision and testing of the arrival of materials, products in process, finished products, product quality audits, equipment maintenance / calibration and stock review
3. Internal failure costs are costs incurred when an unsuitable product is detected before the product is delivered to the customer. Scrap example, rework/rework, failure analysis, review and retesting, downgrading, and avoidable process losses
4. External failure costs are costs incurred when an unsuitable product is detected after the product is delivered to the customer. Example of Warranty (warrancty), settlement of complaints, returned products, Rewards (Allowance)

d. Quality Cost Goals

Quality costs are structured by the company on the basis of a purpose that underlies it. (Hasen, 2009) reveals the purpose of quality costs as follows:

1. Improve and facilitate managerial planning, control, and decision making.
2. Projecting on when those costs and savings occur and are made. So, the purpose of making quality costs is to simplify the management decision process. In addition, so that the company can project when costs occur, and so that the company can streamline costs. With the goal of quality costs, the company expects that quality costs can be used properly.

e. Performance

The performance in question is a puzzle with the goals / objectives / KPIs, according to Sinambela (2016: 485) the organization / company goal is a target that the company wants to achieve for a certain period of time, usually consisting of the main goal that the company wants to achieve.

Because the manager of a cost center has responsibility for the costs incurred in the cost center, the appropriate performance measure can be: (a) Cost variance, which is the difference between budgeted costs and standard costs with actual costs (b) Cost per unit (c) Cost per employee (d) Non-financial performance measures such as employee turnover rate or employee attendance.

3. ANALYZE METHODS

According to Nursapia (2020: 69) data analysis using Miles and Huberman models: Data reduction, Display data (data presentation). Draw conclusions.

Data processing uses quality control tools with the Seven tools Method. The order of processes is as follows:

1. Collect data using check sheets.

Collecting the entire amount of data on both good products and damaged products (Check Sheet) The data obtained is good product data and the next defective product data will be processed into a neat and structured table. This is done to make it easier for researchers to understand the data which can then be done further analysis.

2. Create a histogram.

To make it easier to read and explain the data that has been obtained from the checking sheet. Thus, the data can be presented into the form of a histogram in the form of a visual data presentation tool in the form of a block graphic that shows the distribution of values that have been obtained in the form of numbers.

3. Identify the type of damage & determine the priority of repair (pareto diagram)

After knowing the type of damage regarding product data that occurs then a pareto diagram is made. With this pareto diagram, it can be known the highest type of product damage.

4. Create a control chart

A control chart is a tool for knowing and evaluating whether a quality control process is within the upper maximum limit or the lower maximum limit. Control charts can also be used to find out and detect whether a process is in quality control or not.

5. Find the dominant causative factor with a cause-and-effect diagram (fishbone diagram)

After it is known the most dominant main problem in product damage by using a histogram, then an analysis of the factors causing product damage is carried out using fishbone diagrams, so that it can analyze what factors are the cause of product damage.

4. ANALYZE RESULT

1) Causes of increased return of 5-gallon products

1. Collect data using check sheet

Check sheet Table 4.1 Product Return Quantity Report 5 gallon

Volume PCs In Mio

No	Year	Production Quantity	Jenis Retur (*Return Type*)					
			Cracked	Dent	Broken	Mossy	Low Volume	Amount
1	2016	60,74	1,84	0,06	0,04	0,02	0,02	1,98
2	2017	59,91	1,90	0,06	0,04	0,02	0,02	2,04
3	2018	61,81	1,70	0,05	0,04	0,02	0,02	1,83
4	2019	60,43	1,78	0,06	0,04	0,02	0,02	1,91
5	2020	59,33	1,74	0,06	0,04	0,02	0,02	1,87
6	2021	56,93	1,98	0,06	0,04	0,02	0,02	2,13
TOTAL		359,15	10,93	0,35	0,24	0,12	0,12	11,76

Check Sheet Table 4.2 Rupiah Report Customer Return of 5-gallon products

IDR In Bn

No	Year	Production Quantity	Jenis Retur (*Return Type*)					
			Cracked	Dent	Broken	Mossy	Low Volume	Amount
1	2016	202,14	6,13	0,20	0,13	0,07	0,07	6,59
2	2017	197,80	6,27	0,20	0,13	0,07	0,07	6,74
3	2018	205,93	5,67	0,18	0,12	0,06	0,06	6,10
4	2019	244,43	7,19	0,23	0,15	0,08	0,08	7,73
5	2020	236,79	6,93	0,22	0,15	0,07	0,07	7,45
6	2021	235,19	8,17	0,26	0,18	0,09	0,09	8,78
TOTAL		1.322,29	40,35	1,30	0,87	0,43	0,43	43,39

(Source: Finance and Logistic data of PT. Tirta Investama)

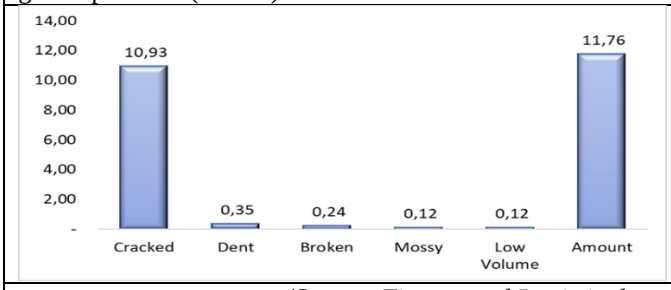
Check Sheet Table 4.1 is a report on the quantity of returns of 5-gallon product customers with the total production in 2016-2021 of 359.15 million Pcs with a total return of 11.76 million Pcs.

Check Sheet Table 4.2 is a report of rupiah return of 5-gallon product customers with rupiah in 2016-2021 amounting to Rp. 1,322.29 billion with the number of customers returns of Rp. 43.39 billion

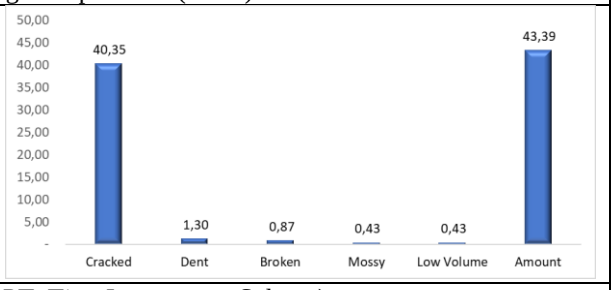
From Table 4.1 and 4.2 data on the 5-gallon product return report in 2016-2021 there are 5 types of 5-gallon product returns, namely Cracks: 10.93 million PCs / 40.35 billion, Dents: 0.35 million Pcs / 1.3 billion, Broken: 0.24 million Pcs / 0.87 billion, Mossy: 0.12 million Pcs / 0.43 billion and Volume less than 0.12 million / 0.43 billion

2. Create a histogram

Histogram Graph 4.1 Quantity of Customer Returns of 5 gallon products (in Mio)



Histogram Graph 4.2 Rupiah Customer Return of 5 gallon products (in Bn)



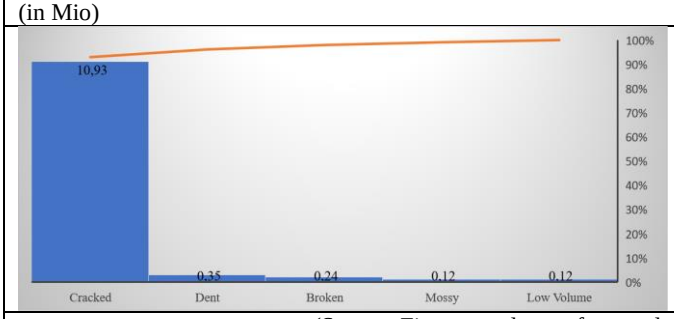
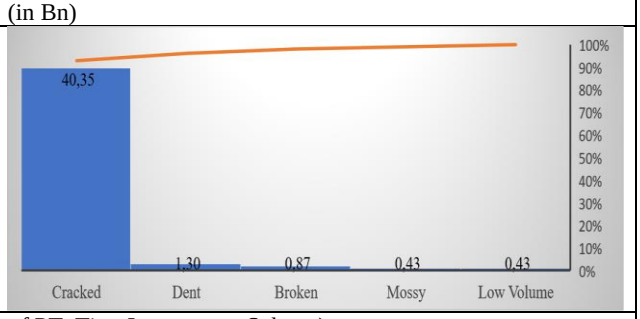
(Source: Finance and Logistic data of PT. Tirta Investama - Subang)

Histogram Graph 4.1 is a report on the quantity of customer returns of 5-gallon products with a total return of 11.76 million Pcs

Histogram 4.2 graph is a graph of rupiah returns of 5-gallon product customers with a total return of Rp.43.39 billion.

From Histogram Graph 4.1 and 4.2 data 5-gallon product return report in 2016-2021 there are 5 types of 5-gallon product returns, namely Cracks: 10.93 million PCs / 40.35 billion, Dents: 0.35 million Pcs / 1.3 billion, Broken: 0.24 million Pcs / 0.87 billion, Mossy: 0.12 million Pcs / 0.43 billion and Volume less than 0.12 million / 0.43 billion

3. Identify the type of damage & determine the priority of repair (pareto diagram)

Pareto Graph 4.1 Quantity of Product Customer Returns 5 gallons (in Mio)	Pareto Graph 4.2 Rupiah Customer Return of 5 gallon products (in Bn)
	
(Source: Finance and manufacture data of PT. Tirta Investama - Subang)	
Pareto 5.1 graph is a report on the quantity of returns of 5-gallon product customers with a return of 11.76 million Pcs, with the largest result in the return category, namely cracking 10.93 million Pcs.	Pareto 5.2 graph is a graph of rupiah return of 5-gallon product customers with a total return of Rp.43.39 billion, with the largest result in the return category, namely cracks of Rp. 40.35 billion.

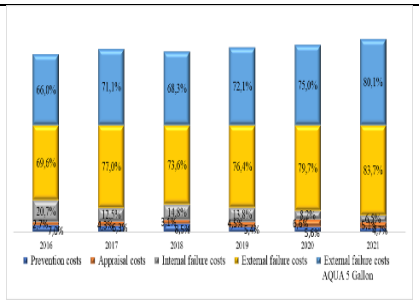
2) Research results / improvement of 5-gallon product process to lower defective products / returns

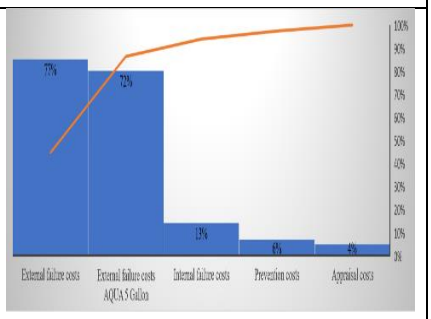
A. Quality Cost Category

1. Collect data using check sheets	2. Create a Histogram Chart	3. Identify the type of damage & determine the priority of repair (pareto diagram)
Check Sheet Table 4.5 Comparison Report on Classification of Quality Costs with Total Quality Cost	Pareto Graph 4.3 Classification of quality costs	Pareto Graph 4.3 Classification of quality costs

PT. TIRTA INVESTAMA - Subang
% Quality Cost from Total Quality Cost

Tahun	Prevention costs	Appraisal costs	Internal failure costs	External failure costs	External failure costs AQUA 5 Gallon	Diff
	a	b	c	d	e	f	g (e - f)
2016	7,0%	2,7%	20,7%	69,6%	66,0%	3,6%
2017	6,3%	4,3%	12,5%	77,0%	71,1%	5,8%
2018	8,5%	3,1%	14,8%	73,6%	68,3%	5,3%
2019	5,4%	4,5%	13,8%	76,4%	72,1%	4,3%
2020	5,6%	6,6%	8,2%	79,7%	75,0%	4,7%
2021	4,7%	5,1%	6,5%	83,7%	80,1%	3,6%
Average	6,2%	4,4%	12,8%	76,6%	72,1%	4,5%
IDR In Bn	0,62	0,44	1,26	7,68	7,23	0,45





(Source: Finance and manufacture data of PT. Tirta Investama - Subang)

From table 4.5 classification of quality costs, for 5 (five) years the cost of external failure is the largest value is an average of 76.6%/7.68 Billion and the cost of special external failure of 5 gallon products averages 72.1%/7.23 Billion	Histogram Graph 4.3 is a comparison graph of the classification of Quality Costs with Total Quality Costs when viewed the average percentage of the largest is the external failure cost of 76.6%, while the average percentage for the cost of external failure of 5 gallon products is 72.1%.	Pareto 4.3 graph is the largest percentage quality cost classification of external failure cost category which is 77% (of the amount of 77% of 72% is the external failure cost of 5 gallon products.

B. Field Observation

1. Collect data using check sheet

Check Sheet Table 4.7 Sampling return results (internal process)	Figure 4.6 Manual Handling loading	Check Sheet Table 4.8 Fresh sampling return (Distribution)

Retur type	5 Gallon Line 2	5 Gallon Line 4	Amount
Cracked	6	11	17
Dent	7	5	12
TOTAL	**13**	**16**	**29**
Number of samples	480	480	960
%	1,35%	1,67%	3,02%

Retur Category	Depo Metro	Depo Sedakeling	Amount
Cracked	30	19	49
Dent	5	2	7
Broken	2	1	3
Mossy	16	14	30
Low Volume	26	11	37
TOTAL	**79**	**47**	**126**
Number of samples	4.063	2.417	6.480
%	1,22%	0,73%	1,94%

(Source: Processed from observations in the field of data manufacture PT. Tirta Investama - Subang)

Table Check Sheet 4.7 is an internal sampling return of the production process	Figure 4.6 Manual Handling loading sample amount of 1 truck / 528 bottles	Table Check Sheet 4.8 is a sampling return for distribution of 5040 bottles

of 960 bottles / 20 Jug ruck, with a quarantine method for two weeks, there are 29 bottles / 3.02% that are out of standard, with the following details: 13 bottles / 1.35% of the production of 5 Gallon line 2 there is a return category of 6 crack bottles and 7 dent bottles, and 16 bottles / 1.67% of the production of 5-gallon line 4 there is a return category of 11 cracked bottles and 5 dent bottles.	with the method of raising bottles to trucks and then quarantined for 2 weeks, the result is no bottles that are out of standard.	with the method of participating in the truck departing from the factory to the depot there are some return products in 9 trucks for 2 metro depots and sedakeling. Obtained 126 bottles / 1.94% which came out standard with details of 79 / 1.22% bottles from Metro Depot and 47 / 0.73% bottles from Sedakeling Depot.
Check Sheet Table 4.9 Returns sampling of storage	Check Sheet Table 4.10 Effectiveness of bottle blowing machine leak tester machine to detect leaks)	Table Check Sheet 4.11 Effectiveness of leak tester machine after engine repair

Layer	Number of samples	Number of Returns	Persentase	Description
Trayless storage				
3	20	0	0,00%	
4	40	1	2,50%	Low Volume
5	70	0	0,00%	
Total	130	1	0,77%	
Storage with tray				
3	20	1	5,00%	Cracked
4	40	2	5,00%	Cracked
5	70	1	1,43%	Dent
Total	130	4	3,08%	

New Bottle 8 PCS		EX-RETURN 96 PCS		Number of samples	EFFECTIVENESS
thrown	Not thrown	thrown	Not thrown		
2	6	64	32	104	63,46%

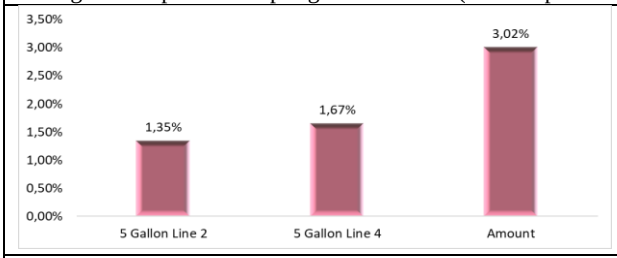
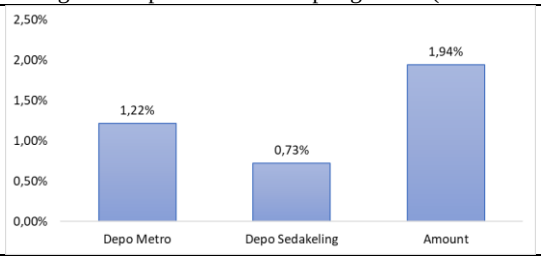
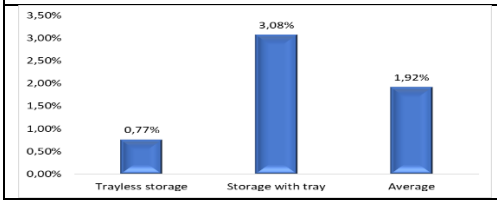
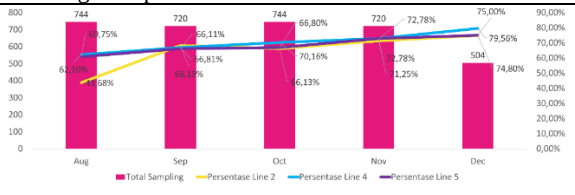
DAMAGE	JUMLAH 32 PCS	PERSENTASE
AREA OF DAMAGE 0	0	0%
AREA OF DAMAGE 1	0	0%
AREA OF DAMAGE 2	5	16%
AREA OF DAMAGE 3	15	47%
AREA OF DAMAGE 4	12	38%

Bulan	Total Sampling	Persentase Line 2	Persentase Line 4	Persentase Line 5
Aug	744	43,68%	62,10%	60,75%
Sep	720	68,19%	66,81%	66,11%
Oct	744	66,13%	70,16%	66,80%
Nov	720	71,25%	72,78%	72,78%
Dec	504	74,80%	79,56%	75,00%
Average	686,40	64,81%	70,28%	68,29%

(Source: Processed from observations in the field of data manufacture PT. Tirta Investama - Subang)

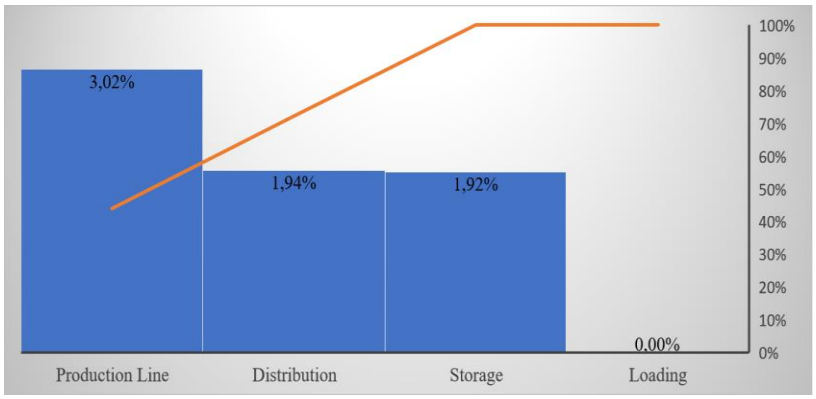
Table Check Sheet 4.9 is a storage sampling return of 260 bottles (using new bottles) with 1) storage method without tray sample 130 bottles quarantined for 8 days with the number of returns of 1 bottle (less volume return category), 2). With a storage method without a sample tray of 130 bottles, quarantined for 8 days with the number of returns of 4 bottles (category of repair three cracked bottles and 1 dent bottle).	Table Check Sheet 4.10 is the effectiveness of the leak tester machine (bottle blowing machine to detect leaks) conducted a trial by taking a sample of 104 empty bottles consisting of 96 leaking bottles, 8 new bottles, the result of 96 leaking bottles 64 kicked by the machine, the remaining 32 bottles were not kicked so the effectiveness of the leak tester machine rose 63.46%.	Table Check Sheet 4.11 is the effectiveness of the leak tester machine (bottle blowing machine to detect leaks) after repairing the machine on average from 3 Line 5 gallon The effectiveness of the leak tester machine rose by 67.79%, which we researched is the machine, humans, products and the environment.

2. Create a histogram

Histogram Graph 4.4 Sampling return results (internal process)	Histogram Graph 4.5 Fresh sampling return (Distribution)
	
(Source: Finance and manufacture data of PT. Tirta Investama - Subang)	
Histogram Graph 4.4 is an internal sampling return of the production process of 960 bottles / 20 Jugruck, with a quarantine method for two weeks, there are 29 bottles / 3.02% that are out of standard	Histogram Graph 4.5 is a sampling return graph of distribution of 5040 bottles with the method of participating in trucks departing from the factory to the depot there are how many return products as many as 9 trucks 2 metro depots and sedakeling. 126 bottles/2.5% are out of standard.
Histogram Graph 4.6 Storage Returns sampling	Histogram Graph 4.7 Effectiveness of leak tester machine after engine repair
	
(Source: Finance and Manufacture PT. Tirta Investama - Subang)	
Table 4.6 is a storage sampling return of 260 bottles (using new bottles) with 1) storage method without tray sample 130 bottles produced return 1.92%	Table 4.7 is the effectiveness of the leak tester machine (bottle blowing machine to detect leaks) after the repair of the machine is on average from 3 Line 5 gallon The effectiveness of the leak tester machine rose 67.79%

3. Identify the type of damage & determine the priority of repair (pareto diagram)

Pareto Graph 4.4 Summary Observation Results



(Source: Finance and manufacture data of PT. Tirta Investama - Subang)

Pareto 4.4 graph is a summary graph of the four processes that have been observed, for further research into the production line of 3.02% (leaked bottles).

4. Create a control map (*control chart*)

Calculating the Percentage of Damage	Calculating the Midline	Calculate the lower control limit
$P = \frac{np}{n}$ Description : np = Number of failures in sub group n = Number of checked in sub group Subgroup = Days to-	$CL = \bar{p} = \frac{\sum np}{\sum n}$ Description . $\bar{p}$: Average product damage $\sum np$: Total number of damaged $\sum n$: Total number checked	Description : $LCL = \bar{p} - 3\frac{\sqrt{\bar{p}(1-\bar{p})}}{n}$ $\bar{p}$: Average product damage n : Production quantity
Calculate the data as follows for example in 2016: 1,98 Juta Pcs P =---------- = 3,26% 60,74 Juta Pcs	11,76 Juta PCs CL = ---------- = 0,033 Pcs 359,15 Juta PCs	0,033 (1 – 0,033) UCL = 0,033 - 3 --------- = 0,047 Pcs 60,74
Control map table 5.1 yield percentage calculation	Calculating the Limit of Control Over	Control map table 5.2 CL, UCL and LCL Calculation Results

No	Year	Production Quantity	Return/type						Persentase Retur (%)
			Cracked	Dent	Broken	Mossy	Low Volume	Amount	
1	2016	60,74	1,84	0,06	0,04	0,02	0,02	1,98	3,26
2	2017	59,91	1,90	0,06	0,04	0,02	0,02	2,04	3,41
3	2018	61,81	1,70	0,05	0,04	0,02	0,02	1,83	2,96
4	2019	60,43	1,78	0,06	0,04	0,02	0,02	1,91	3,16
5	2020	59,33	1,74	0,06	0,04	0,02	0,02	1,87	3,15
6	2021	56,93	1,98	0,06	0,04	0,02	0,02	2,13	3,73
TOTAL		359,15	10,93	0,35	0,24	0,12	0,12	11,76	3,27

(Source: Results of data processing)

$UCL = \bar{p} + 3\frac{\sqrt{\bar{p}(1-\bar{p})}}{n}$

Description :
$\bar{p}$: Average product damage
n : Production quantity

No	Year	Production Quantity	Number of Returns	Persentase Retur (%)	CL	UCL	LCL
1	2016	60,74	1,98	3,26	0,033	0,048	0,047
2	2017	59,91	2,04	3,41	0,033	0,049	0,048
3	2018	61,81	1,83	2,96	0,033	0,047	0,046
4	2019	60,43	1,91	3,16	0,033	0,049	0,047
5	2020	59,33	1,87	3,15	0,033	0,049	0,048
6	2021	56,93	2,13	3,73	0,033	0,051	0,050
TOTAL		359,15	11,76	3,27	0,033	0,008	0,008

(Source: Results of data processing)

	0,033 (1 – 0,033) UCL = 0,033 + 3 ----- = 0,048 Pcs 60,74	

Based on table 5.2 control of return products above it appears that all return number data is out of control, so there must be a process of improvement in the production, handling and quality processes.

5. Find the dominant causative factor with a cause-and-effect diagram (fish bone diagram).

Figure 4.6 Fishbone Analyze

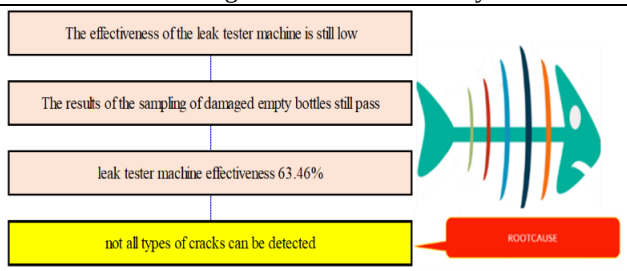
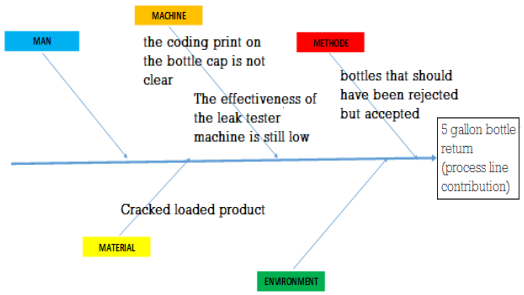


Figure 4.7 Causal analysis



(Source: Finance and manufacture data of PT. Tirta Investama - Subang)

Figure 4.6 Is a fishbone analysis of observations that is because the effectiveness of the leak tester machine is still low, why is it still low because not all types of cracks can be detected.
To increase the effectiveness of the leak tester machine to 100%, we do a root analysis using fish bone diagram and 5W analysis

Figure 4.7 Is a causal analysis of the results of observations, namely in the machine (the effectiveness of the leak tester machine is still low

3) Impact on company performance

1. Collect data using check sheet

Check Sheet Table 4.3 Quality Cost Performance Report

PT. TIRTA INVESTAMA - Subang
Quality Cost Report
IDR in Bn
VOL in Mio

	2016	2017	2018	2019	2020	2021
VOLUME PRODUCTION-LTR	1.254	1.236	1.276	1.239	1.189	1.134
VOLUME PRODUCTION-PCS	228	223	232	212	163	144
Prevention costs:						
Planning Cost	0,55	0,43	0,34	0,42	0,43	0,39
Process control	0,15	0,17	0,42	0,15	0,12	0,13
Supplier quality evaluation	-	-	-	-	-	-
Internal Audit Fee	-	-	-	-	-	-
Training fee	-	-	-	-	-	-
Total Prevention costs	0,70	0,60	0,76	0,58	0,55	0,52
Appraisal costs:						
Material arrival test	0,01	0,01	0,01	0,01	0,01	0,01
Product in process testim	0,00	0,00	0,01	0,01	0,01	0,00
Finish goods testing	0,05	0,01	0,02	0,09	0,12	0,02
Inspection	-	-	-	-	-	-
Audit Fee	0,09	0,18	0,11	0,09	0,21	0,11
Maintenance of testing equipment accuracy	0,12	0,19	0,13	0,28	0,31	0,41
Stock evaluation	-	-	-	-	-	-
Total Appraisal costs	0,27	0,40	0,28	0,48	0,65	0,55
Internal failure costs:						
Scrap/Reject	2,07	1,19	1,32	1,47	0,81	0,72
Rework	0,0	0,0	0,0	0,0	0,0	0,0
Re-inspection and retest	0,0	0,0	0,0	0,0	0,0	0,0
Total Internal failure costs	2,07	1,19	1,32	1,47	0,81	0,72
External failure costs						
Customer complain	0,00	0,00	0,00	0,00	0,00	0,00
Guarantee	0,00	0,00	0,00	0,00	0,00	0,00
Product returns	6,94	7,30	6,57	8,19	7,92	9,17
Total External failure costs	6,94	7,30	6,57	8,19	7,92	9,17
Total Quality Costs	9,98	9,48	8,93	10,72	9,94	10,96
Cost per Ltr	7,95	7,67	7,00	8,65	8,35	9,67
Cost per Pcs	43,75	42,55	38,52	50,44	61,06	76,09

Check Sheet Table 4.4 Customer return performance report (5 Gallon product

PT. TIRTA INVESTAMA - Subang
Customer Return Performance Report (Product 5 Gallon)
IDR in Bn
VOL in Mio

Product Return (AQUA 5 Gallon) :						
Volume in mio Ltr	37,61	38,80	34,78	36,30	35,47	40,39
Volume in mio Pcs	1,98	2,04	1,83	1,91	1,87	2,13
Compare Vol Return vs Vol Total Production	3,3%	3,4%	3,0%	3,2%	3,1%	3,7%
Value IDR	6,59	6,74	6,10	7,73	7,45	8,78
Cost per Ltr	175	174	175	213	210	217
Cost per Pcs	3.328	3.302	3.332	4.045	3.991	4.131
Compare AC21 vs AC-1 Value (Volume Pcs)	0,15	0,08	0,30	0,22	0,26	
Compare AC21 vs AC-1 % (Volume Pcs)	7,4%	4,1%	16,1%	11,3%	13,9%	
Compare AC21 vs AC-1 Value IDR	2,19	2,04	2,68	1,05	1,33	
Compare AC21 vs AC-1 % IDR	33,3%	30,2%	44,0%	13,6%	17,9%	

VOLUME PRODUCTION-LTR :						
AQUA 5 GALLON	1.154	1.138	1.174	1.148	1.127	1.082
AQUA 600mL	100	98	102	91	62	52
Total Volume	1.254	1.236	1.276	1.239	1.189	1.134
VOLUME PRODUCTION-PCS :						
AQUA 5 GALLON	61	60	62	60	59	57
AQUA 600mL	167	163	170	152	103	87
Total Volume	228	223	232	212	163	144

(Source: Finance and manufacture data of PT. Tirta Investama - Subang)

From Table 4.3 The Performance Report on Quality Cost returns of 5 (five) Gallons almost every year experienced the following increases in explanation:
Comparison of returns of 5 (five) Gallons with the production of 5 (five) Gallons:
Year 2016: 1.98 Million Pcs/3.3%/IDR 6.59 Billion , Year 2017: 2.04 Million Pcs/3.4%/IDR6.74 Billion, Year 2018: 1.83 Million Pcs/3%/IDR 6.1 Billion, Year 2019: 1.87 Million Pcs/3.1%/IDR 7.45 Billion, Year 2021: 2.13 MillionPcs/3.7%/IDR 8.78 Billion.
Comparison of Return Volume of 5 (five) Gallons in 2021 with previous years: Year 2021 vs 2016: 0.15 Million pcs/7.4%, Year 2021 vs 2017: 0.08 Million Pcs/4.1%, Year 2021 vs 2018: 0.30 Million Pcs/16.1%, Year 2021 vs 2019: 0.22 Million pcs/11.3%, Year 2021 vs 2020: 0.26 Million pcs/13.9%.
Comparison of Rupiah return 5 (five) Gallons in 2021 with previous years: Year 2021 vs 2016: 2.19 Billion/33.3%, Year 2021 vs 2017: 2.04 Billion/30.2%, Year 2021 vs 2018: 2.68 Billion/44%, Year 2021 vs 2019: 1.05 Billion/13.6%, Year 2021 vs 2020: 1.33 Billion/17.9%

Check Sheet Table 4.4 is a report on the performance of special returns for 5-gallon products, a comparison of the quantity of returns with the results of production in 2016: 3.3%/ Rp. 6.59 billion, in 2017: 3.4%/ 6.74 billion, in 2018: 3%/ Rp. 6.1 billion, in 2019: 3.2%/ Rp. 7.73 billion, Year 2020: 3.1 billion / Rp. 7.45 billion and 2021: 3.7%/ Rp. 8.78 billion.

Check Sheet Table 4.6 Comparison of quality costs vs Budget

PT. TIRTA INVESTAMA - Subang
Quality cost report (long term)
For the year ended December 31, 2021

IDR in Bn
VOL in Mio

Description	2016				2017				2018				2019				2020				2021			
	BU	AC	Diff Value	Diff %	BU	AC	Diff Value	Diff %	BU	AC	Diff Value	Diff %	BU	AC	Diff Value	Diff %	BU	AC	Diff Value	Diff %	BU	AC	Diff Value	Diff %
VOLUME PRODUCTION-LTR	1.237	1.254	17	1,4%	1.280	1.236	- 44	-3,4%	1.081	1.276	195	18,0%	1.237	1.239	2	0,2%	1.233	1.189	- 43	-3,5%	1.178	1.134	- 44	-3,7%
VOLUME PRODUCTION-PCS	215	228	13	6,3%	238	223	- 15	-6,5%	188	232	44	23,4%	215	212	- 3	-1,2%	233	163	- 71	-30,3%	185	144	- 41	-22,1%
Prevention costs:																								
Planning Cost	0,50	0,55	0,04	8,4%	0,5	0,4	- 0,1	-11,3%	0,5	0,3	- 0,1	-30,3%	0,4	0,4	0,1	17,0%	0,4	0,4	0,1	19,0%	0,3	0,4	0,0	11,2%
Process control	0,16	0,15	- 0,01	-4,4%	0,1	0,2	0,0	17,5%	0,3	0,4	0,1	26,9%	0,1	0,2	0,0	16,6%	0,1	0,1	0,0	10,1%	0,1	0,1	0,0	4,7%
Total Prevention costs	0,66	0,70	0,04	5,4%	0,6	0,6	- 0,0	-4,7%	0,8	0,8	- 0,1	-7,2%	0,5	0,6	0,1	16,9%	0,5	0,6	0,1	16,9%	0,5	0,5	0,0	9,5%
Appraisal costs:																								
Material arrival test	0,01	0,01	- 0,00	-4,4%	0,0	0,0	0,0	17,5%	0,0	0,0	0,0	26,9%	0,0	0,0	0,0	16,6%	0,0	0,0	0,0	10,1%	0,0	0,0	0,0	4,7%
Product in process testim	-	0,00	0,00	0,0%	0,0	0,0	0,0	17,5%	-	0,0	0,0	0,0%	-	0,0	0,0	0,0%	0,0	0,0	0,0	10,1%	0,0	0,0	0,0	4,7%
Finish goods testing	0,05	0,05	- 0,00	-4,4%	0,0	0,0	0,0	17,5%	0,0	0,0	0,0	26,9%	0,1	0,1	0,0	16,6%	0,1	0,1	0,0	10,1%	0,0	0,0	0,0	4,7%
Audit Fee	0,09	0,09	-	0,0%	0,2	0,2	-	0,0%	0,1	0,1	-	0,0%	0,1	0,1	-	0,0%	0,2	0,2	-	0,0%	0,1	0,1	-	0,0%
Maintenance of testing equipment accuracy	0,12	0,12	- 0,01	-4,4%	0,2	0,2	0,0	17,5%	0,1	0,1	0,0	26,9%	0,2	0,3	0,0	16,6%	0,3	0,3	0,0	10,1%	0,4	0,4	0,0	4,7%
Total Appraisal costs	0,28	0,27	- 0,00	-1,7%	0,4	0,4	0,0	8,9%	0,2	0,3	0,0	17,3%	0,4	0,5	0,1	14,5%	0,6	0,7	0,0	6,6%	0,5	0,6	0,0	3,7%
Internal failure costs:																								
Scrap/Reject	2,17	2,07	- 0,10	-4,8%	1,2	1,2	- 0,1	-4,8%	1,4	1,3	- 0,1	-4,8%	1,5	1,5	- 0,1	-4,8%	0,9	0,8	- 0,0	-4,8%	0,8	0,7	- 0,0	-4,8%
Total Internal failure costs	2,17	2,07	- 0,10	-4,8%	1,2	1,2	- 0,1	-4,8%	1,4	1,3	- 0,1	-4,8%	1,5	1,5	- 0,1	-4,8%	0,9	0,8	- 0,0	-4,8%	0,8	0,7	- 0,0	-4,8%
External failure costs																								
Product returns	6,86	6,94	0,09	1,2%	6,6	7,3	0,7	11,4%	6,4	6,6	0,2	2,5%	5,8	8,2	2,4	41,1%	7,9	7,9	0,0	0,5%	7,3	9,2	1,9	26,4%
Total External failure costs	6,86	6,94	0,09	1,2%	6,6	7,3	0,7	11,4%	6,4	6,6	0,2	2,5%	5,8	8,2	2,4	41,1%	7,9	7,9	0,0	0,5%	7,3	9,2	1,9	26,4%
Total Quality Costs	9,96	9,98	0,01	0,1%	8,8	9,5	0,7	7,8%	8,9	8,9	0,1	0,8%	8,3	10,7	2,5	29,7%	9,8	9,9	0,1	1,2%	9,0	11,0	1,9	21,6%
Compare AC21 vs AC-1 (Quality Costs) Value			0,99				1,48				2,03				0,25				1,03					
Compare AC21 vs AC-1 (Quality Cost) %			9,9%				15,6%				22,7%				2,3%				10,3%					
Compare AC21 vs AC-1 (External failure costs) Value			2,23				1,88				2,60				0,99				1,26					
Compare AC21 vs AC-1 (External failure costs) %			32,1%				25,7%				39,5%				12,0%				15,9%					

(Source: Finance and manufacture data of PT. Tirta Investama - Subang)

Check Sheet Table 4.6 is a Comparison Report on Quality Costs with Budget in 2016: increased by Rp. 0.01 billion / 0.1%, Year 2017: increased by Rp. 0.7 billion / 7.8%, Year 2018: increased by Rp. 0.01 Billion / 0.8%, Year 2019: increased by Rp. 2.5 billion / 29.7%, Year 2020: increased by Rp. 0.01 billion / 1.2%, In 2021: increased by Rp. 1.9 billion / 21.6%

From Table 5.5 Comparison of cauldron costs vs Budget comparison of quality costs with high budget 2016: 1.2%/0.09 billion, 2017: 11.4%/0.7 Billion, 2018: 2.5%/0.2 Billion, 2019 41.1%/2.4 Billion, 2020: 0.5%/0.04 Billion, 2021: 26.4%/1.9 Billion.

Check Sheet Table 4.12 Production Results	Check Sheet Table 4.13 Industrial Cost	Check Sheet Table 4.14 Industrial cost per Liter

Check Sheet Table 4.12 Production Results

Product In Mio Liter	2016	2017	2018	2019	2020	2021	2021 vs 2020	2020 vs 2021
A-600 ml	100	98	102	91	62	52	-10,6%	-32,0%
A-5 Gallon	1.154	1.138	1.174	1.148	1.127	1.082	-2,2%	-1,8%
TOTAL	1.254	1.236	1.276	1.239	1.189	1.134	-2,9%	-4,0%
%Growth		-1,5%	3,3%	-2,9%	-4,0%	-4,7%		

Check Sheet Table 4.13 Industrial Cost

Industrial Costs IDR in Mio	2016	2017	2018	2019	2020	2021	2021 vs 2020
MLC	20.081	21.562	22.324	23.903	27.003	25.828	-4,4%
DPC	115.088	120.990	135.850	139.171	121.323	118.090	-2,7%
MAO	60.772	60.995	64.018	68.495	73.614	77.691	5,5%
TOTAL	195.942	203.547	222.192	231.569	221.940	221.609	-0,1%
%Growth		3,9%	9,2%	4,2%	-4,2%	-0,1%	
Total Quality cost (Potensial failure costs)	6.942	7.296	6.575	8.185	7.916	9.171	
Total Quality cost (External failure costs product 5 Gallon)	6.587	6.743	6.099	7.728	7.451	8.782	
% From Overhead Cost	11%	11%	10%	11%	10%	11%	
% From Industrial Cost	3%	3%	3%	3%	3%	4%	

Check Sheet Table 4.14 Industrial cost per Liter

Industrial Costs/Liter	2016	2017	2018	2019	2020	2021	2021 vs 2020
MLC	16,01	17,44	17,49	19,29	22,70	22,77	0,3%
DPC	91,75	97,88	106,43	112,29	102,01	104,13	2,1%
MAO	48,45	49,35	50,15	55,27	61,89	68,51	10,7%
TOTAL	156,21	164,67	174,08	186,85	186,60	195,42	4,7%
%Growth Cost/lt		5,4%	5,7%	7,3%	-0,1%	4,7%	
%Growth Vol		-1,5%	3,3%	-2,9%	-4,0%	-4,7%	

(Source: Finance and manufacture data of PT. Tirta Investama – Subang)

Table Check Sheet 4.12 is a trend of production results from 2016 - 2021, the majority from 2016 - 2021 decreased, in 2017: -1.5%, in 2019: -2.9%, in 2020: -4% and in 2021: -4.7%.

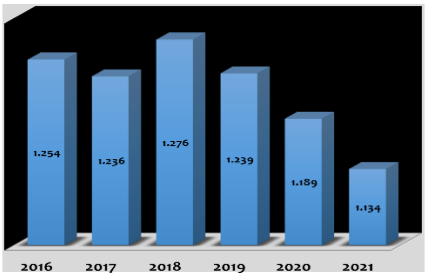
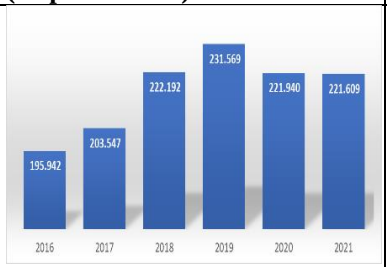
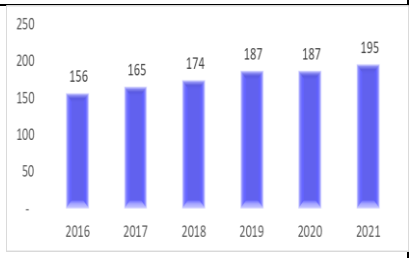
From table 5.10 above shows that production has decreased in 2017: 1.5%, in 2019: 2.9%, in 2020: 4% and in 2021: 4.7%, only in 2018 which experienced an increase of 3.3%

From table 4.13 Industrial Cost above shows that industrial cost results increased in 2017: 3.9%, in 2018: 9.2%, and in 2019: 4.2%, only in 2020: 4.2% and in 2021: 0.1% decreased.

The percentage of external quality costs from overhead costs averages 11%/6.5 billion and 3% percentage of external quality costs from industrial costs.

From the table of 4.14 Industrial cost per Liter shows that industrial cost per liter has increased in 2017: 5.4%, in 2018: 5.7%, and in 2019: 7.3%, and in 2021: 4.7% only in 2020 which decreased by 0.1%.

2. Create a histogram

Histogram Chart 4.8 Production Results (in Mio Liter)	Histogram 4.9 Industrial Cost (Rupiah in Mio) Chart	Histogram Chart 4.10 Industrial Cost Per Liter
		
(Source: Finance and manufacture data of PT. Tirta Investama - Subang)		
Histogram 4.8 graph is a trend of production results from 2016-2021, which is quite significant due to the decrease in 2021 by 1,134 Million Liters	Histogram 4.9 graph is an industrial cost trend from 2016-2021, which is quite significant in 2019 amounting to Rp 231,569 billion.	Histogram 4.10 graph is an industrial cost per liter trend from 2016-2021, experiencing a significant increase in 2021 of Rp. 195 per liter

6. RESULTS AND DISCUSSIONS

A. Causes of increased return of 5-gallon products

From the results of the analysis of Table 4.1 and 4.2 data on the 5-gallon product return report in 2016-2021, there are 5 types of 5-gallon product returns, namely Cracks, dents, ruptures, mossy and less volume.

The cause of the increase in 5 Gallon product returns is supported by the results of interviews with performance managers (Mr. Aditya Rachman), logistic managers (Mr. Yopie Mahendrik) and quality managers (Mrs. Tutik Siswanti) as follows:

a. Materials/Raw Materials: micro crack bottles, uneven mouth bottles and materials
b. Machine: leak tester machine and less volume
c. Manpower: handling TKBM (loading and unloading labor), negligence of checking by Visual Control of Finished Products and negligence of checking by visual control empty bottles
d. Methods: checking by visual control, storage in factory warehouses and storage in depot warehouses
e. Environment: distribution and transportation

According to the Indonesian Accounting Association (2015: 28) "Damaged products are products that do not meet quality standards, both technically and economically irreparable. Damaged products can occur due to internal factors and external factors".

This is in line with research conducted by Setiabudi *et al*. (2020), Puspasari *et al*. (2019), Sudibyo *et al*. (2019) and Rufaidah *et al*. (2018) concluded that the cause of defective products is due to engine performance factors (incomplete documents), method factors, capital factors, raw material / material factors, environmental factors, weather factors and labor factors, machine performance factors when taking measurements are not checked continuously, labor factors due to lack of focus, lack of thoroughness and hasty in doing work.

B. Research Results / improvement of 5-gallon product processes to lower Defective Products / Returns

To lower the defective product, we conducted a study on 5-gallon products, namely empty bottles and finished products, the observation object of 8,228 bottles divided into:

a. Internal production process (product sampling) can be seen in table 4.7 results Of Sampling Return (internal process), histogram graph 4.4 Sampling return results (internal process as much as 960 bottles / 20 Jug ruck.
b. Manual handling Loading (load) can be seen in figure 4.6 Manual Handling loading (load) as many as 528 bottles / 1 truck.
c. Distribution can be seen in table 4.8 Fresh sampling returns (Distribution), Histogram Graph 4.5 Fresh sampling returns (Distribution) as many as 6,480 Bottles / 9 trucks 2 (two) metro depots and sedakeling.
d. Storage test can be seen in table 4.9 Return sampling display, Histogram Graph 4.6 Return sampling and as many as 260 Bottles, From the results of check sheet table 4.11 Effectiveness of leak tester machine and histogram graph

The effectiveness of the leak tester machine and Figure 4.7 Causal analysis, the results of research to reduce the product defect / return the effectiveness of the leak tester machine is only 67.79%, what we research is the machine we researched is the machine, humans, products and the environment. This shows that the field observation process must be continued why because the effectiveness of the machine has not reached 100%

Improvement of the 5-gallon product process to lower defect products / returns is supported by the results of interviews with performance managers (Mr. Aditya Rachman), logistic managers (Mr. Yopie Mahendrik) as follows:

a. To identify product defect factors with PSG Breakdown List (Problem Solving Group), and conduct workshops (morning briefings, training) and visits to distributors related to handling
b. Some Alternatives to improve in manufacturing departments and Logistics department

- Packing officers do handling packing well, automatic pusher to Jug rack, PM review, routine maintenance & repair of Leak tester machine (manufacturing department)
- TKBM (loading and unloading labor) Packing bottles to contents to truck bearings, and adjustable platform direct loading unloading (Logistics Department)

The results of this study are in line with the research:

Rufaidah *et al*. (2018) Quality improvements in proposed chocolate coffee products using PDCA and 5S cycles that solve problems by determining problem priorities based on causal diagrams. In PDCA and 5S resistance, namely by conducting training to improve the operator's ability and skil, machine tools are always maintained so that damage can be minimized.

Costaa *et al*. (2019) three factors that cause excessive insertion power, one of which is the wear of engine components. A series of improvements, implemented with a focus on the three factors mentioned, improves the level of quality of the process, making it more stable and with less variability by reducing the insertion strength to a near-nominal value.

C. Impact on company performance

The impact of improving quality costs very clearly affects the company's performance from the financial side, this is seen in the Check Sheet Table 4.3 Quality Cost Performance Report, Check Sheet table 4.4 Customer return performance report (5-gallon product), Check Sheet table 4.5 Quality Cost Classification Comparison Report with and Check Sheet Table 4.6 Comparison of cauldron vs Budget costs, Check Sheet Table 4.12 Production Results, Check Sheet Table 4.13 Industrial Cost And the Check Sheet Table 4.14 Industrial cost per Liter of the sixth table above the cost of external quality, especially 5 (five) gallons has increased significantly enough that improvements are needed to reduce these costs. The percentage of external failure quality costs from overhead costs averages 11% and 3% or 6.5 billion external quality costs of industrial costs.

The performance referred to as a goal / goal / KPI, the company's goal is a target that will be achieved for a certain period of time, consisting of the main objectives, namely the final goal that the company wants to achieve (Sinambela (2016: 485).

The results of this study are in line with research from Kreem et all (2020), Mitreva et all (2017), and Maswadeh (2017) concluded that in increasing competitiveness and superiority over its competitors through quality costs, to improve quality. increased employee motivation/improved performance and performance of available resources, a better work environment and most importantly satisfied customers. The company will reduce wasteful production costs and implement cost methodology in JSP, for the survival of the company and its sustainable development.

6. CONCLUSION

1) The cause of the increase in return of 5-gallon products is the leak tester machine (machine for leak test)
2) The improvement of the process to lower the defective product also focuses on the leak tester machine from the results of research on the effectiveness of the leak tester machine is only 67.79% which should be 100% effectiveness.
3) The impact on the company's performance still needs improvements related to the cost control shown by industrial cost / industrial per liter every year has increased, the percentage of external quality costs from overhead costs is an average of 11%/6.5 billion and 3% percentage of external quality costs from Industrial cost.

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