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Case Study of 250 ML Glass Drinking Water Product Defects with Lean Six Sigma and FMEA

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A B S T R A C T

The quality of this product/service is critical because it is a component of consumer needs that provides an assessment of the product that has been purchased; consumers will buy the product again if the quality matches existing specifications; and consumers will indirectly recommend it to other consumers who will purchase it. The same product of established quality. Clue for business actors: product/service quality is essential for a company's survival; ongoing quality improvement measures in response to competition that can match product quality; and minimizing faults in the manufacturing process. PT. XYZ, the findings of this study will help to reduce waste (defects) by recognizing, understanding, and managing the quality of drinking water glass products in a measured and systematic way. The results show that there is a lot of waste that occurs in product faults (27), and it can be noted that activities have a VA value of 11%, NNV 64%, NVA 11%, and a sigma value of 3, dpmo 12,256 in 250ml bottled glass drinking water goods. There is a need for repairs and control, material inspection prior to the process, regular operator training, warning operators not to make mistakes, replacing or replacing machine units that are no longer suitable, and providing clearer work procedures to resolve defects and waste problems.

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1. INTRODUCTION

In the industrial era 4.0, business actors will take steps or actions to be able to maintain/improve the quality of products or services in order to maintain the existence of what has been done (Escobar et al., 2022). The quality of this product/service is very important because it is part of consumer needs that provides an assessment of the product that has been purchased, so consumers will buy the product again if the product quality matches existing specifications and consumers will indirectly provide recommendations to other consumers. buy the same product with the quality that the user already knows about (Grace et al., 2021)(Lina, 2022)(Taufik et al., 2022). This is a clue for business actors. Product/service quality is part of maintaining the existence of the business they are running, therefore it requires attention to how quality can be maintained properly in accordance with consumer needs. Continuous quality improvement actions are important as a continuous strategy for a manufacturing company in responding to competition, so it must be able to meet product quality and minimize defects in the production process (Afandi & Sulistiyowati, 2022). Most people define quality by attributing one or more desirable characteristics to a product/service (Andhika & Jatra, 2022).

PT. XYZ is a national private company and is an industry that carries out packaged drinking water production activities with the dedication of the quality of quality products in all activities in the business sector to meet the needs and desires of consumers who are growing. The basic need for drinking water motivates us to make a breakthrough by creating branded bottled drinking water products. There are several product variations and packaging sizes for bottled drinking water at PT. XYZ based on the size alone is 19 liters, 250ml, 330ml, 600ml, 1,500ml and quality control is only carried out on 250ml glasses.
PT. This was obtained from field observations, the number of rejects that occurred in 250 ml glasses was 178,080 per glass of drinking water with a production target per year of 3,558,816 per glass of drinking water and a sales target per year of 74,142 boxes. The following is graphic data on production defects and damage to 250 ml drinking water glass products at PT. XYZ along with graphic images.

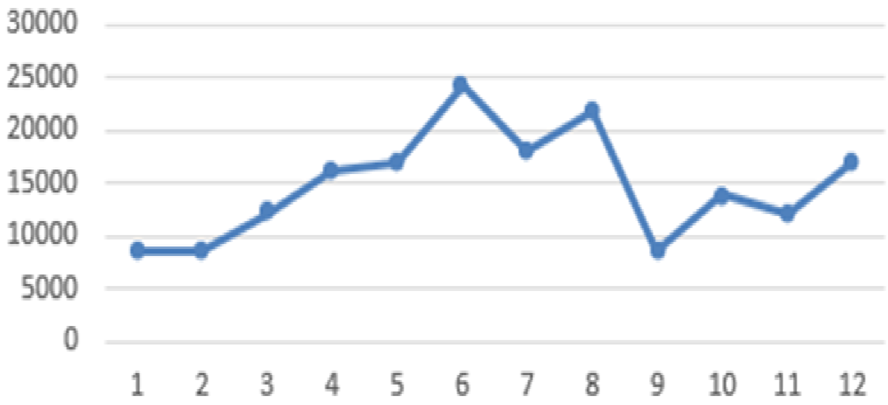

Figure 1. Defects per glass of drinking water 250ml

Based on the table and figure above, it can be seen that the number of defects in the 250 ml drinking water glass product at PT.XYZ a total disability percentage of 57.93%, the number of defects reached 178,080 per glass of drinking water. The defects that affect product quality include: leaking defects, tilted lid defects, dirty water, and water volume less than the established standard and many others. However, according to the company's quality target guidelines for bottled drinking water, this bottled drinking water product is said to be of quality if it achieves conformity between the production results produced and the standard target plan or quality target set by the company. This means that the program that has been implemented by the quality control section at PT.XYZ This problem will of course trigger a large need for resources ranging from electrical energy, materials, machines and labor, this can of course have a negative impact on the company because it can cause losses, especially damaged products occur continuously and in large quantities and have There is a big potential for waste, namely defects.

Based on the problems above, it shows that this research will analyze how to control product quality using the Lean Six Sigma method and also identify the causes of defects in the production process, as well as analyze waste using lean six sigma (Muchsinin & Sulistiyowati, 2022). Lean six sigma can also provide solutions related to product/service quality by being able to map defects that occur and knowing the criteria for quality (CTQ) to be able to make continuous improvements (Thakur et al., 2023). The aim of researchers is to reduce waste (defects) by identifying, knowing the level of product quality and controlling the quality of drinking water glass products that occur in a measurable and systematic manner, therefore the lean approach can be combined with six sigma which focuses on measured operational performance targets. statistically with a vision of improving quality towards the target of 3.4 (99.9966%) failures for every one million opportunities (DPMO) for every product transaction. motivating efforts towards perfection (Gaspersz, 2007). The benefits obtained from six sigma are controlling defects in products, and product development, making improvements so that product quality can be maintained.

2. LITERATURE REVIEW

Quality has become an integrated part of all products and services, along with technological developments and advances, developments in quality control and improvement have also evolved, starting from traditional quality control to modern quality control (Ridwan et al., 2020).

2.1 Lean

The goal of Lean is to continuously increase customer value through continuously increasing the ratio between added value to waste or known as the value-to-waste ratio (Ridwan et al., 2020). Lean can be applied in all fields within an organization or corporation. Lean that is applied to all aspects of a company is called lean enterprise (Novitasari & Iftadi, 2020).

E-DOWNTIME is an approach used to identify and type one waste and type two waste (Setyawan, 2023).

2.2 Six Sigma

Six sigma is one of the important and popular developments in the field of quality and six sigma has saved large amounts of capital, improved consumer experience, but its implementation is still less consistent and often reductive in many companies (Escobar et al., 2022). A simple 6σ table along with the probability of defects occurring in each sigma, as in Table 1.

Table 1. Simple sigma (σ) conversion

Percentage	DPMO	Sigma (σ)	Percentage	DPMO	Sigma (σ)
30.85 %	691,500	1	99.38%	6,200	4
69.15%	308,500	2	99.997%	230	5
93.32%	66,800	3	99.99%	3,4	6

Applying Six Sigma in manufacturing companies must understand six aspects which can be the basic parameters in determining the initial actions that need to be taken before implementing the six sigma approach (Gaspersz, 2007).

2.2.1 Define

This stage is the stage for identifying and describing specifically everything related to the criteria and characteristics that have been determined, and related to the specifications and expectations of consumers (Ridwan et al., 2020).

2.2.2 Measures

Measuring process capability is one of the tools that is often used to determine the level of sigma that has been achieved, as well as to determine DPU (Defect Per Unit) and DPMO (Defect Per Million Opportunities).

Control Chart is a statistical tool used to explain variations in intervening processes caused by various causes and variations in general problems caused by specific causes of problems (Muchsinin & Sulistiyowati, 2022; Thakur et al., 2023).

$$p = \frac{\sum np}{\sum n} \quad (1)$$

namely: p= average number of defects, np= number of defects, n = number of samples

determine the UCL (Upper Control Limit) and LCL (Lower Control Limit) using formula equations 2 and 3

$$UCL = p + 3\sqrt{\frac{p(1-p)}{n}} \quad (2)$$

$$LCL = p - 3\sqrt{\frac{p(1-p)}{n}} \quad (3)$$

namely: p=average number of defects, n= number of samples, UCL =Upper Control Limit, LCL =Lower Control Limit .

DPMO (Defect Per Million Opportunities), is a way to measure the failure rate in the six sigma program which shows the level of product damage for every million products produced. Six sigma uses the standard normal distribution as a measurement system. Meanwhile, DPU (Defect Per Unit) in SPC (Statistical Process Control) is often denoted by (μ) , RTY are calculated numbers that describe the ability of the process to produce zero defects (Escobar et al., 2022). In calculating DPO (Defect Per Opportunities) and DPMO, use formula equations 4 and 5, namely:

$$\text{DPO} = \frac{\text{Number of Defective Products}}{\text{Defective Products} \times \text{CTQ potential}} \quad (4)$$

$$\text{DPMO} = \text{DPO} \times 1000000 \quad (5)$$

calculate the RTY (Rolled Throughput Yield) value using formula 6, namely:

$$\text{Yield} = 1 - \frac{\text{Number of Defective Productst}}{\text{Defective Products}} \times 100\,\% \quad (6)$$

Capability (Capability Process), has an average value that exceeds or is equal to the target value expected by the company, namely USL (Upper Specification Limit) and LSL (Lower Specification Limit)(Mittal et al., 2023), namely:

a. High process capability, occurs when the process range is within specifications,
$$6\sigma < (\text{USL} - \text{LSL}) \quad (7)$$
b. Process capability is almost insufficient, occurs when the process range is equal to specifications,
$$6\sigma = (\text{USL} - \text{LSL}) \quad (8)$$
c. Missing process capability, occurs when the process range is outside specifications,
$$6\sigma > (\text{USL} - \text{LSL}) \quad (9)$$

Process Capability Index (CP), there is a separate specification regarding the relationship between capability and process, (Fitriani & Rochmoeljati, 2023)

And the following is the formula used to calculate the process capability index:

$$C_P = \frac{\text{USL} - \text{LSL}}{6\sigma} \quad (10)$$

namely: USL= Upper Specification Limit, LSL= Lower Specification Limit

2.2.3 Analyze

In this phase, the aim is to find and determine the cause of a problem and analyzed using FMEA cause and effect diagrams are one of the tools used to determine and connect the factors that cause problems. potential cause of a problem (Alamsyah & Rochmoeljati, 2023)

2.2.4 Improve

FMEA is useful for improving six sigma quality by identifying potential problems before the product is produced, can help in avoiding scrap and rework, minimizing failures (Mittal et al., 2023), namely:

RPN (Risk Priority Number), the failure that must be followed up is when the RPN (Risk Priority Number) value is > 125. The risk priority number is the product of the SOD (Severity. Occurance. Detection) (Gaur, 2019):

$$\text{RPN} = \text{SEV} \times \text{OCC} \times \text{DET} \quad (11)$$

2.2.4 Controls

This is the final operational stage in the six sigma quality improvement program, in this phase the results of quality improvement are documented and disseminated and standardization is carried out (Ishak et al., 2019).

2.3 Lean Six Sigma

Implementing the lean six sigma method in the manufacturing industry can be followed in stages, (Gaspersz, 2007).

Table 5. Process cycle efficiency-PCE

Application	Typical Cycle Efficiency	Wort Class Cycle Efficiency
Machining	1%	20%
Fabrication	10%	25%
Assembly	15%	35%
Continuous Manufacturing	30%	80%
Transactional Business Processes	10%	50%
Creative / Cognitive Business Processes	5%	25%

3. RESEARCH METHOD

There are four stages in the lean six sigma method, namely: the first stage is conducting field observations to see the condition of the company, then collecting data to identify problems, the second is processing the data using lean, the third is analyzing the results, the fourth is providing recommendations and conclusions for the company, What steps should be taken next to ensure follow-up efforts.

4. RESULT AND DISCUSSION

As a result of observations made at PT. actual. Six sigma is an important tool for production management to maintain, improve, maintain product quality and especially to achieve quality improvement towards zero defects.

4.1 Define

This stage includes product identification, major process identification, and waste identification.

Table 6. Data on Types of defects in 250 ml drinking water glass products in 2023

Month	Production Amount per month (Box)	Type of defect				Number of defective products
		Leaking defects	Slanted Lid	Dirty water	Less volume	
January	3,692	62	32	49	38	181
February	3,458	56	34	47	41	178
March	5,928	82	44	73	55	254
April	6,838	98	72	103	64	337
May	7,800	105	64	93	89	351
June	9,851	162	104	113	124	503
July	7,900	118	79	98	83	378
August	7,670	134	103	121	98	456
September	6,540	63	32	45	39	179
October	5,200	74	63	81	71	289
November	4,325	83	61	45	62	251
December	4,940	112	81	108	52	353
Total	**74,142**	**1,149**	**769**	**976**	**816**	**3,710**

In table 6 above it can be seen that the total production of drinking water in 250 ml glass packaging is 74,142 boxes with a total reject (defective product) of 3,710 boxes, where each box contains 48 glasses (pcs) with a size of 250 ml. To find out the flow of the production process before identifying waste related to waste with the SIPOC diagram on drinking water glass products, namely glass drinking water.

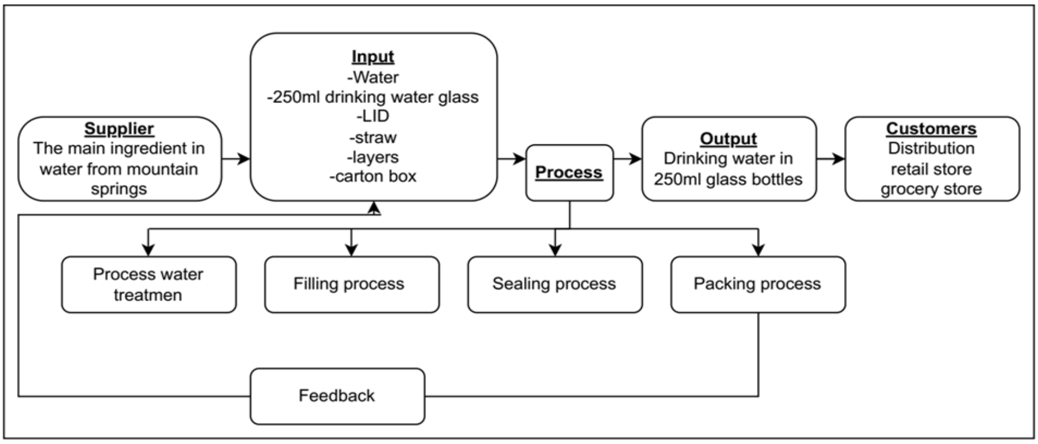

Figure 2. SIPOC production process for 250ml

The SIPOC above in Figure 4 explains the stages of the process sequence and each process is interrelated, one of which is the production process of drinking water in 250 ml glass packaging such as the water treatment process, filling process, LID placement process, manual packing process, feedback process and carton packing process.

Identification of waste involves all activities of the drinking water production process in 250 ml glass packaging which consists of work stations including: water treatment process, filling process, LID placement process, manual packing process, and carton packing process, waste value. The highest waste is found in defects, not utilizing knowledge skills and abilities, waiting, motion, transportation, and inventory.

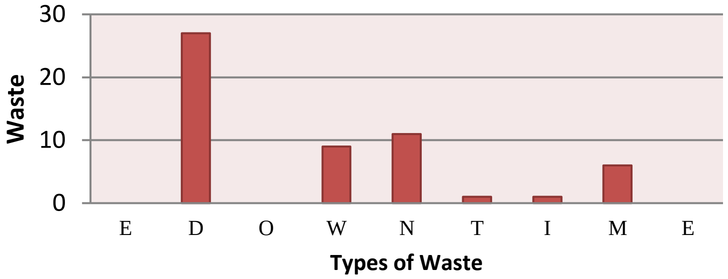

Figure 3. Waste value in the production

Table 7 . Details of types of waste

No.	Types of Waste	The waste that occurs
1.	Defective product	Defective goods during the raw material process are placed into the filtering machine. Defective goods in the filling process area (filling area). Defective goods in the seeing process area (LID closure). Defective goods in testing the quality of water and packaging in the laboratory. Defective goods during manual packing.
2.	HR (Human Resources)	Lack of understanding of checking machine settings. Lack of expertise in checking water conditions during laboratory tests. Ability is less than optimal and slow in preparing equipment, arranging and checking the operation of machines.
3.	Wait	Waiting to check the machine settings. Waiting for a long screening process. Waiting to check the filling line while the production process is underway. Waiting for tests on water quality and packaging is too long due to lack of expertise in microbiological testing of water.
4.	Unnecessary movement.	Workers carry out other activities and non-value added movements during the screening process. Workers carry out other activities and non-value added Necessary movements in the filling process and seeing process (LID closing). Workers carry out other activities, Necessary non value added and Non value added movements in the manual packing process.

4.2 Measures

By taking logical and measurable actions with this measure, you will be able to assess activities that have added value or no added value. Preparation of Process Activity Mapping (PAM) is an identification stage that involves all activities including value added (VA), Necessary non value added (NNVA), and non value added (NVA) that occur on the production process floor of drinking water in 250 ml glass packaging at PT.

Table 8. Observation data on the production process of 250 ml glass bottled drinking water in 2023

No.	Production Process Activities	Activity Type					Nature of Activity			Time (Minute)
		O	Q	I	S	D	VA	NNVA	NVA	
1.	Taking water from an 80,000 liter water tank		V					63		63
2.	Check the engine faucet			V				10		10
3.	Open the machine tap	v						5		5
4.	Raw materials below to the filtering place		V					25		25
5.	Putting raw materials into the screening place	v					15			15
6.	Pressing the button on the screening machine	v						5		5
7.	Waiting for the screening process					v			45	45
8.	Store filtered water				V			38		38

No.	Production Process Activities	Activity Type					Nature of Activity			Time (Minute)
		O	Q	I	S	D	VA	NNVA	NVA	
9.	The raw water material is taken from the filtering site	v						26		26
10.	prepare 250 ml glass cup packaging	v						8		8
11.	take the glass to the filling station		V					10		10
12.	check the filling machine			V			10			10
13.	Check water conditions			V			5			5
14.	check the charging line			V			10			10
15.	press the fill button	V						5		5
16.	Checking the charging process			V			5			5
17.	Prepare the closing process for packaging	V					8			8
18.	Preparing the plastic lid (LID)	V					9			9
19.	Place the plastic lid on the machine	V					10			10
20.	check the filling machine			V				5		5
21.	Press the machine button	V					5			5
22.	Check the closing process			V			10			10
23.	Take finished product samples to the laboratory		V					15		15
24.	Carry out tests on water and packaging quality	V						15		15
25.	Place drinking water in 250 ml glass containers that have been quality tested							8		8
26.	Check the running of the machine			V				10		10
27.	Take cardboard	V						15		15
28.	Putting cardboard	V							5	5
29.	Open the cardboard	V					5			5
30.	Place the straw, layer, and glass cup filled with 250 ml water into the cardboard	V					10			10
31.	Close the cardboard	V					5			5
32.	Bringing cardboard to the cardboard sealing process (gluing)		V				15			15
33.	Lifting finished drinking water products in 250 ml glass packaging in the form of boxes (cartons) into the warehouse				V			45		45
	Total	**16**	**5**	**8**	**2**	**1**	**122**	**308**	**50**	**480**

If calculations are made using percentages

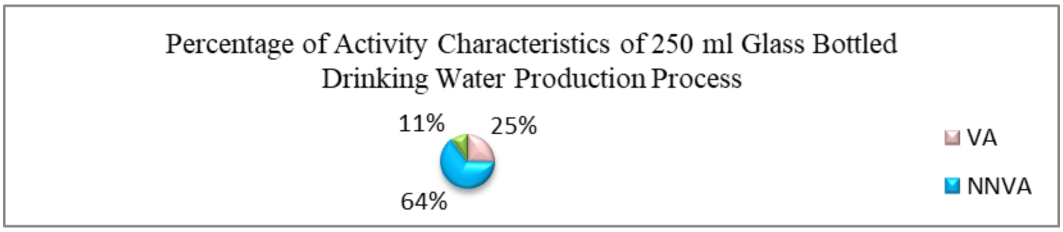

Figure 4. Percentage of activity

Characteristics of the 250 ml Glass Bottled Drinking Water Production Process Process Cycle Efficiency (PCE), is a comparison between Value Added (VA) and total Lead Time. Where the greater the comparison value, it can be said that the process runs more efficiently. The following is the Process Cycle Time calculation for the production process of drinking water in 250 ml glass packaging

$$\text{PCE} = \frac{122}{480} \text{ x } 100\% = 25{,}42\%$$

PCE is 25.42%, this value shows that the opportunity to increase system efficiency is still very large. Process Lead Time, calculation of the process lead time to produce the number of requests for drinking water products in 250 ml glass packaging during 2023, namely:

Average completion speed

$$= \frac{74142 \text{ Box}}{308 \text{ day}} = 240{,}72 = 241 \text{box /day}$$

Process Lead Time

$$= \frac{74142 \text{ Box}}{240{,}72} = 308{,}00 = 308 \text{ day}$$

Control diagram (P-Chart), data taken from PT.

a) Calculating the mean (CL) or average of the final product, namely:

$$CL = \frac{3710}{74142} = 0.05004$$

b) Calculating the upper control limit (UCL) to calculate the upper control limit and Lower Control Limit (LCL) to calculate the lower control limit is done using the formula:

$$UCL = 0.05004 + 3 \text{ x} \frac{\sqrt{0{,}05004\text{x } 0{,}94996}}{6178{,}5}$$

$$= 0.0583$$

$$LCL = \; = 0.05004 - 3 \text{ x} \frac{\sqrt{0{,}05004 \text{ x } 0{,}94996}}{6178{,}5}$$

$$= 0.0417$$

So you will know the control limits for the proportion of defects in drinking water in 250 ml glass packaging, namely:

Table 9. P-Chart of 250 ml glass bottled drinking water in 2023

Month	Production Amount per month (Box)	Number of Defects	CTQ	Defect proportion	CL	UCL	LCL
January	3,692	181	4	0.0490	0.05004	0.0583	0.0417
February	3,458	178	4	0.0514	0.05004	0.0583	0.0417
March	5,928	254	4	0.0428	0.05004	0.0583	0.0417
April	6,838	337	4	0.0492	0.05004	0.0583	0.0417
May	7,800	351	4	0.045	0.05004	0.0583	0.0417
June	9,851	503	4	0.0510	0.05004	0.0583	0.0417
July	7,900	378	4	0.0478	0.05004	0.0583	0.0417
August	7,670	456	4	0.0594	0.05004	0.0583	0.0417
September	6,540	179	4	0.0273	0.05004	0.0583	0.0417
October	5,200	289	4	0.0555	0.05004	0.0583	0.0417
November	4,325	251	4	0.0580	0.05004	0.0583	0.0417
December	4,940	353	4	0.0714	0.05004	0.0583	0.0417

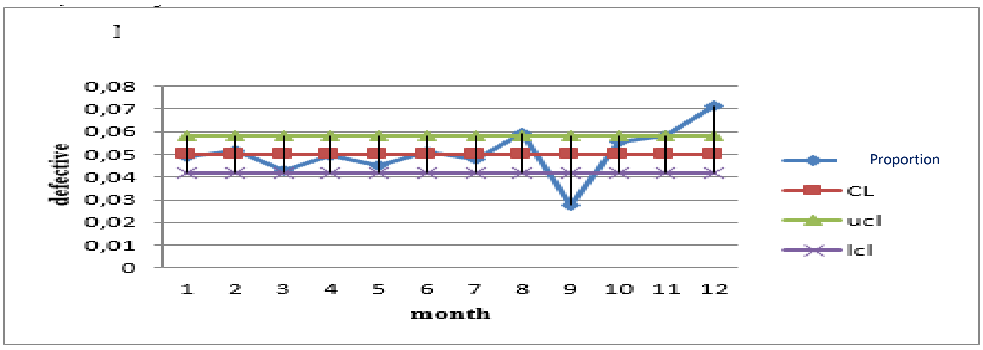

Figure 5. P-chart in the 250ml glass drinking water production process.

Thus, quality control in observing the production process of drinking water in 250 ml glass packaging requires improvement to reduce the level of defects so that it reaches a maximum value of 0%, because some

experienced out of line in the 9th and 12th months.

DPO (Defect per Opportunity) measurement. and Defect Per Million Opportunities (DPMO) to measure the Six Sigma level of PT (Gaspersz, 2007).

Calculating DPO:

$$= \frac{181}{3.692 \text{ x } 4}$$

$$= 0.012256$$

Calculating DPMO

$$= \frac{181}{3.692 \times 4} \times 1,000,000$$

$= 12,256 \approx$ sigma 3 σ table results

Calculating RTY

$$= 1 - \frac{3.710}{74.142} \times 100\ \%$$

$$= 94,99\%$$

capability process or process capability is a stage for calculating the company's ability to determine the achievement value of each criterion for the type of defect $_P$ calculation

$$C_P = \frac{104,6 - 49,97}{6 * 17,6985}$$

$$= 0.5144503772 = 0,51$$

$C_P < 1$ specification range is lower than the process, then the process does not have capability (not capable). sigma value $_{CP} = 0.51$ σ so $_{CP} < 1σ$

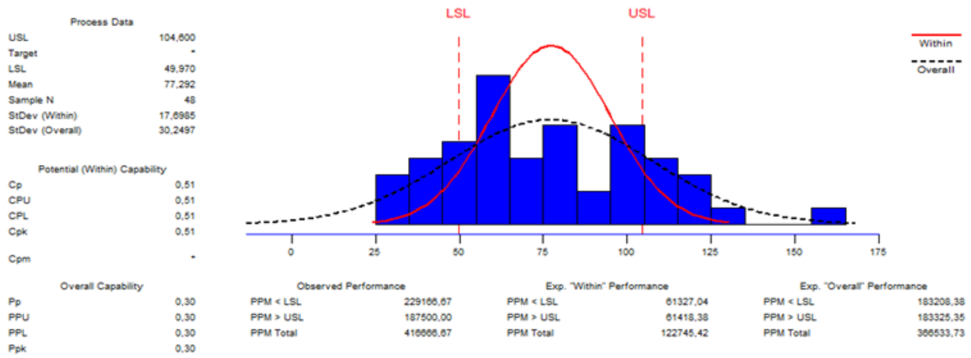

Figure 6. Process Capabilities Types of

Defects in the 250 ml Glass Bottled Drinking Water Production Process. The resulting Cp value = 0.51, because the Cp value is in the range Cp <1, the process must be improved to reach a minimum value of 1.

4.3 Analyze

Pareto diagram, data processed to determine the percentage of product types that are defective.

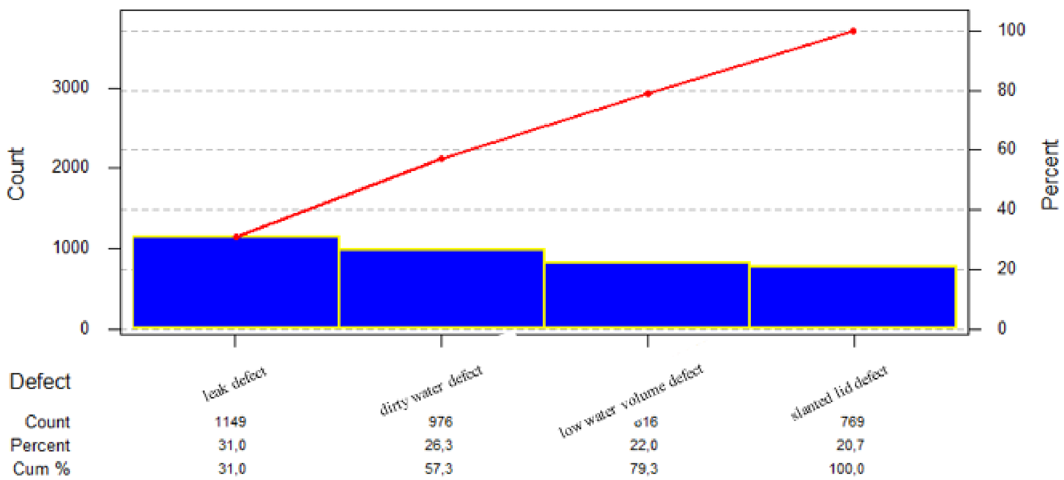

Figure 7. Pareto defect diagram for 250 ml glass bottled drinking water

A cause-and-effect diagram shows the relationship between the problem faced and its possible causes and the factors that influence it.

Cause and effect diagram for Leak defect types

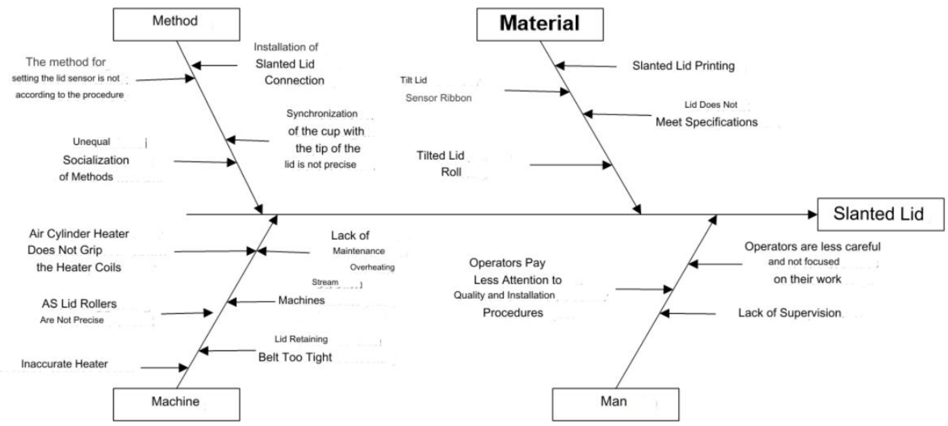

Figure 7 . Cause effect diagram

4.4 Improve

It is an action plan to implement lean Six Sigma quality improvement, technically determining the seriousness values resulting from errors to the process and consumers (severity), the frequency of errors (occurrence), and the seriousness due to errors on control equipment due to potential causes (detection) by means of brainstorm. by knowing the RPN value and SOD value, namely:

FMEA (Failure Mode and Effects Analysis) type of leaking defect.

Table 10. Failure mode and effects analysis types of leaking defects

Potential Failure	Potential Cause	Mark S	Mark O	Mark D	RPN	Proposed Corrective Action
Leaking, Slanted LID, Dirty water, Less water volume	Machine settings are incorrect Information RPN = SxOxD = 7x3x4 = 84	7	3	4	84	Create a new work section tasked with supervising and re-checking employee performance, so as to reduce errors caused by human error.
	The machine lacks maintenance Information RPN = SxOxD = 7x4x5= 140	7	4	5	140	Carry out routine machine maintenance and checks, not only when the machine is damaged (preventive maintenance)
	- Operators are less thorough, less disciplined, negligent and rush their work. - Fatigue Information RPN = SxOxD = 3x4x4 = 48	3	4	4	48	There needs to be strict supervision when the production process begins so that operators and employees are not rude or rushed during the production process, thereby reducing operator and employee fatigue which causes decreased concentration and lack of attention to work.
	- Lack of analysis and experience. - Inappropriate soup. Information RPN = SxOxD = 7x7x5 = 245	7	7	5	245	There needs to be strict guidance from superiors during the production process so that operators and new employees understand and comply with the SOPs that have been set by the company.
	Raw materials do not meet specifications. Information RPN = SxOxD = 7x5x6 = 210	7	5	6	210	Re-examine the raw materials received from suppliers more carefully and check whether they meet the standard specifications determined by the company or not.

From the table that has been shown, it can be seen that the highest RPN value for the leak defect type is 245, where the severity value (S) is 7, the Occurance value (O) is 7, and the Detection value (D) is 5. With potential causes: Lack of analysis and experience.

4.5 Controls

As the foundation of a lean six sigma project, the control stage is the most important stage because repeated improvements to the process are undesirable and the benefits of continuous improvement must be obtained. Proposed Improvements using the 5W+1H Method. By looking at the research that has been carried out, the researcher proposes an improvement to the production process of Drinking Water in 250 ml Glass Bottles. The occurrence of waste in the 250 ml glass bottled drinking water production process line which includes: waste of waiting, waste of human resources (HR) which occurs due to not using knowledge, skills and abilities optimally, waste of more movement, and waste of defects. include: leaking defects, tilted LID defects, dirty water defects, insufficient water volume defects which greatly affect the quality of the production process.

a) Where: Which process causes it?
   In raw material processing processes such as: filling process, LID laying process (Seeling process), manual packing process, and carton packing process.
b) When: When did it happen?
   During the production process of Drinking Water in 250 ml Glass Bottles.
c) Why: why did that happen?
   due to inappropriate processes in managing production as well as a lack of employees understanding and implementing existing SOPs every day.
d) Who: who did it?
   employees and operators in the production process of Drinking Water in 250 ml Glass Bottles.
e) How: How to solve it?
   By following some of the improvements below:

Table 11. Proposed corrective controls

No.	Maintenance plan	Proposed Control
1.	Checking materials before processing	Material control is tightened, starting from when the material comes in from the supplier until before the material is processed.
2.	Conduct regular training for operators	There is supervision of the implementation of training so that training objectives can be achieved, as well as questions and answers and discussions are held in dealing with problems that may arise in the field.
3.	Provide a warning to the operator so as not to make mistakes	Intensive work on operators by supervisors or supervisors.
4.	Replace or replace machine units that are no longer suitable	Carry out inspections on each machine so you can find out which machine spare parts are suitable and need to be replaced.
5.	The work procedures provided are more clarified	Provide work procedures to the operator and explain them until the operator understands the work procedures.
6.	Information on changes in raw materials is distributed evenly	Providing information to each operator in each plan in detail and evenly.
7.	Quality inspections are tightened	Inspection of product quality in the production process is carried out carefully by each operator at their respective work stations.
8.	Maintain a clean production environment	Provide directions to all employees or operators to always maintain the factory environment.
9.	Maintain machine cleanliness	Make a regular machine maintenance schedule and clean dirty machine parts.

5. CONCLUSION

With the results of data processing, it can be concluded that the lean six sigma method provides results that can identify defects in the company's 250ml bottled glass drinking water products and provides four types of defects in the product, namely leaking, tilted lid, dirty water, insufficient water volume. The most waste occurs in product defects with a value of 27, and it can be seen that activities have a VA value of 11%, NNV 64%, NVA 11%, and get a sigma value of 3, dpmo 12,256 in 250ml bottled glass drinking water products. product quality control in the 250 ml glass bottled drinking water production process, namely by having a repair plan using repair planning tools using FMEA (Failure Mode and Effect Analysis) and 5W+1H to show that there is a need for repair and material checking control before the process, holding training for operators on a regular basis, giving warnings to operators not to make mistakes, replacing or replacing machine units that are no longer suitable and the work procedures provided are made clearer, so that problems of defects and waste can be resolved and do not happen again in each part.

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