

## QUALITY CONTROL OF 240 ML CUP PRODUCT PACKAGING USING SIX SIGMA AND FMEA METHODS TO REDUCE PRODUCT REJECT FAILURE AT PT. XYZ

M. Riyanto <sup>a</sup>, Misbach Munir <sup>b</sup>

<sup>Department</sup> Industrial Engineering , Yudharta University Indonesia

<sup>b, c</sup> Department of Mechanical Engineering , Yudharta University Indonesia

Writer Related : [riyanto.tech87@yahoo.com](mailto:riyanto.tech87@yahoo.com)

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### ABSTRACT

*Manufacturers of bottled drinking water (AMDK) experience quality problems, namely the presence of defective products in each production that have not reached zero defects, especially in the 240 ml glass packaging production line which has the most product defects. Six Sigma can be defined as a methodology that provides tools for business process improvement with the aim of reducing process variation and improving product quality using the DMAIC approach (define, measure, analyze, improve and control). From the results of data measurement, it is obtained that for critical to quality (CTQ) locks based on the Pareto diagram, that 80% of the highest defects are in the type of lid defect where the lid defect itself consists of a lid leak, a lid rupture and an oblique lid. For the sigma level of bottled drinking water production at PT. XYZ before the application of the DMAIC method is 4.98 Sigma. And after the application of the DMAIC method is 5.00 Sigma. Then proceed with analyzing the causes of lid defects using causal diagrams and failure mode and effect analysis (FMEA). From the analysis of the cause and effect diagram, the factors that cause disability come from machine, material and human factors. Meanwhile, the RPN value before the application of the FMEA method was 221 RPN. And after the application of the FMEA method, the RPN value is 209 RPN. To improve the problem, it is necessary to check the condition of the sealing unit before carrying out the production process and sand the sealing unit once a week on an already uneven surface.*



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### 1. Introduction

Every industry ensure system company walk with good and trying guard results product Can compete For fulfill and satisfaction consumers ( Prasastono & Pradapa , 2012; Sukarmen et al ., 2013). This is push company For push quality results that meet standards and specifications that have been determined . With This need public to drinking water very high . That's one of the reason birth companies industry drinking water treatment Keep going increase .

For get quality production that can compete in need method control quality sustainable products (Ilham, 2012) . ” are a number of draft method control quality production including Total Quality Management (TQM), Statistical Process Control (SPC), six sigma method and FMEA.

Control statistical quality with Six Sigma methods and FMEA methods are often implemented by the company in control quality product ( Widyarto et al ., 2015).

PT. XYZ is manufacturers who process water for produced drinking water in packaging . For compete in the market then demanded For guard quality from goods produced Because quality products Can give trust For customers ( Masrufah , 2018). However , for guard still stable and continuous get trust from customers . PT. XYZ still own a number of problem especially related issues with quality from products produced .

Types of products defects in production at PT. XYZ 240 ml Cup packaging is divided over 3 types disability namely disabled closed , defective container and volume defects . Defect level highest occurs in defects close . This is shown with disabled closed with amount disabled as many as 22611 out of 27209 total defects products produced .

## 2. Review Literature

(Sanjaya & Susiana, 2017), researched How company do improvements and enhancements quality product with achievement level disabled product approach *zero defect* , through efficiency and focus self on minimization disabled with implement *six sigma* method from drinking water production process line in packaging . Research This done on the type mineral water production , namely mineral water in 240 ml Cup, 600 ml Bottle and 19 liter Gallon. The role Six Sigma concept is needed For increase quality results production so that company can compete in a way competitive . Problems disability results production that occurs at PT Tirta Sibayakindo divided on three type disability in every packaging namely disabled closed , defective container and volume defects . From the results discussion about analysis disability packaging mineral water products at PT Tirta Sibayakindo are obtained that the level of disability highest occurs in defects closed For each packaging . This is shown with defect sigma level value close on each packaging , namely 240 ml Cup, 600 ml Bottle, 19 l Gallon respectively 3.64; 3.84; 3.78, with the amount existing cash receipts 15,393, 15 ; 9,154.63 ; 10,145.77 per one million amount production . Amount defects that occur For each packaging Good disabled closed , defective receptacle and also volume defect still is at in limit reasonable that is lower limit line (LCL) of  $-0.43 = 0$  and upper limit line (UCL) of 0.65.

( Utami et al ., 2017), conducted research entitled " Risk Failure in Quality Refill Drinking Water Production in Sub - district Sukolilo Surabaya Using FMEA" Research This use Guan found the Failure Mode and Effect Analysis method highest risk because failure in the process of processing water content repeat . Failure scale must have mark measuring so that For Can Risk found . Use UV rays and ozonation , 3 priorities main is at the time use of the ozonation system , while the duration of application of the UV system has a value of 100 for each RPN .

### **Control Theory Quality**

According to ( Oktavianus & Caesaron , 2017) Implementation control quality is a efforts that are carried out in order to be able to ensure the ongoing production process walk to be able to in accordance with plan or target and if happen failure , then failure the can corrected so that what to expect can achieved . According to (Ayuk, 2018) control quality can interpreted as " an activity carried out" For monitor activities and ensure performance Actually " .

### **Six Sigma**

According to ( Gaspersz , 2005) Six sigma is A method or effort For lower variation from a process to improve reliability a process in make a product or service For remove error from the process (zero defects) with a minimum target of 3.4 DPMO for give mark plus to customer

### **FMEA (Failure Mode and Effect Analysis)**

According to John Moubry (1992) in his book entitled reliability centered maintenance II (RCM II) (Wulandari et al . , 2016), FMEA (*Failure Mode and Effect Analysis*) defined as the method used For identify cause and effect from a failure .

### 3. Methodology

#### Research Location

Study This take place The location of PT. Sumber Bening Lestari is located in a fairly good location . strategic , namely between Surabaya- Malang. Precisely on Jl. Raya Suwayuwu no.168 KM 51 Sukerojo-Pandaan, Pasuruan , East Java Province . With wide building approximately 6992 m<sup>2</sup> . Most of the land is plains low and have climate tropical with temperature around 24-32°C.

#### Data collection

##### 1. Observation ( Observation )

Study This do observation with observe direct production process and activities quality control to obtain objective and systematic data .

##### 2. Interview

In the method interview this , researcher digging and collecting research data with submit semi- structured questions in a way oral direct to production operators and officers quality control that becomes subjects and respondents in study This . Interviews were also conducted with Company Managers , Managers Production , Engineering Manager . Next researcher take notes what the respondent answered ( subject research ) as research data . From the results interview known results production and most dominant defects from product 240 ml cup packaging .

##### 3. Literature review

One of method in data search with stage studies review to books , literature , notes and related reports with problems solved ” ( Manggala & Setiawan, 2017) .

##### 4. Documentation

According to ( Nilamsari , 2017) explains document is notes or work somebody about something that has been passed . Document This can shaped text written , artifacts, images , and photo . Documentation techniques is with look for fact about matter or variables in the form of product data defects and products damaged .

#### Data processing

Methods used in the data processing process is with use approach method *Six Sigma* and FMEA for increase quality product as well as give proposal design process improvement , then count change efficiency cost repair quality .

### 4. Results and Discussion

#### Identification Defective Product

In research This has been identified as occurring in the production process making drinking water products in 240 ml cup packaging . Where the results observation and discussion .

#### Types of Defective Products

From category disabled packaging 240 ml cup products have 5 categories differentiated defects become three type defective , Variable data defect = Water is lacking . Attribute data defect = Cup defect, Water dirty , Machine Defect . Process defect = LID Defect.

Disability Rate Data Bottled Drinking Water Products 240 ml *cup*

Date	Defective Variable					Number of Defects
	Lack of water	Cup defect	Dirty water	Machine Defect	LID Defect	
01/02/2020	85	40	13	39	947	1124
01/03/2020	105	65	9	65	869	1113
01/04/2020	97	30	27	45	953	1152
01/06/2020	91	50	5	33	869	1048
01/07/2020	102	10	3	54	790	959

01/08/2020	95	21	9	34	892	1051
01/09/2020	98	11	13	23	769	914
10/01/2020	8	17	21	65	910	1021
11/01/2020	106	20	15	45	820	1006
01/13/2020	108	3	22	44	895	1072
01/14/2020	112	9	27	22	840	1010
01/15/2020	98	42	29	22	794	985
01/16/2020	97	31	31	32	795	986
01/17/2020	77	30	39	29	865	1040
01/18/2020	49	22	11	24	874	980
01/20/2020	121	29	16	20	806	992
01/21/2020	109	20	17	34	953	1133
01/22/2020	90	36	23	36	894	1079
01/23/2020	84	21	20	29	859	1013
01/24/2020	97	19	11	45	848	1020
01/25/2020	108	26	29	54	891	1108
01/27/2020	101	40	22	43	904	1110
01/28/2020	97	16	9	49	1021	1192
01/29/2020	96	33	9	51	885	1074
01/30/2020	79	15	20	46	796	956
01/31/2020	101	38	8	52	872	1071
Total	2411	694	458	22611	22611	27209

Source : internal company , 2020

## 5. Conclusion

- Reason the occurrence disability product based on cause diagram consequence Lid defects include : 1) leaking lid: heater is not hot enough, heater is too hot hot , bucket with off- center trimming , dirty disk seal and less operator careful . 2) Break lid : Brittle lid and poor handling good 3) Tilted Lid: The position of the roll lid wobbles and the operator is less thorough
- Based on the Pareto diagram, it can be seen that 80% level disability AMDK products packaging 240 ml *cup* is available in type disabled *lid* . *Risk Number Priority* in the production process at

PT.XYZ is on lid defects where lid defect consists of from the tilted lid, cracked lid and leaking lid. After being known and determined *Risk Number Priority* implementation control quality used is with control *seven tools* that go through stages analysis that is *define, measure, analyze*.

3. For production sigma level at PT.XYZ before implementation DMAIC method is 4.98 Sigma. And after implementation DMAIC method is 5.00 Sigma. Whereas For RPN value before implementation FMEA method is 221 RPN. And after implementation FMEA method RPN value is 209 RPN.

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