Poll Res. 41 (2) : 519-528 (2022)

ISSN 0257–8050
DOI No.: http://doi.org/10.53550/PR.2022.v41i02.019

STUDY OF RISK MINIMIZATION UTILIZATION OF BOTTLED WATER BY CONSUMERS USING HAZARD ANALYSIS CRITICAL CONTROL POINT (HACCP) AND EXTENDED PRODUCER RESPONSIBILITY (EPR) METHODS

MAS AGUS MARDYANTO[1], NIEKE KARNANINGROEM[2], ADHITIA SATRIA PRADANA[3] AND ALYSIA SAFI DAMAYANTI[4]

Department of Environmental Engineering, Faculty of Civil, Planning and Geo Engineering, Institut Teknologi Sepuluh Nopember (ITS), Indonesia

(Received 30 October, 2021; Accepted 17 December, 2021)

ABSTRACT

The demand for drinking water in Cirebon City is increasing and is not proportional to the drinking water supply capacity of DWTP (PDAM) Cirebon City. So the Bottled Water Company was established, which is engaged in bottled water company, whose production rate continues to increase. The need for quality control methods to improve the quality of bottled drinking water products that can affect the quality of products consumed by the customers. Bottled Water Company applies the HACCP and EPR methods which aim to evaluate the performance of the bottled water production processing unit in planning quality control with the HACCP method, determine the quality control of bottled drinking water products to minimize negative risks to consumers with the EPR method, and compare the quality of freshly produced bottled water with products that consumers accept. Based on the analysis of existing conditions on the Bottled Water Company, the poor performance of the processing unit and the need for quality control monitoring is caused by replacing the membrane, cartridge micro filter and ozone generator, the ozone injection unit that exceeds the usage limit, poor quality of raw water pumps and backwash scheduling of carbon filter media affect the quality of production water and products. Quality control using the EPR method is carried out on the use of raw materials, production processes, finished products, product storage and distribution, sanitation and waste treatment, and product quality to consumers. Changes and decreases in product quality are due to the distance between the delivery to the store, the shipping or transportation process, the method of storage, and the length of time the product is stored.

KEY WORDS : Bottled Water, Extended Producer Responsibility, Hazard Analysis Critical Control Point, Quality Control, Risk Minimization.

INTRODUCTION

The demand for drinking water in Cirebon City is increasing and is not proportional to the drinking water supply capacity of the DWTP. Cirebon city has the potential for vulnerability to the availability of drinking water because it depends on water sources from Kuningan Regency, West Java. DWTP Cirebon City services reach 78% of total population of Cirebon City, while the demand for drinking water has increased and has become a problem because people need drinking water (DWTP Cirebon City, 2014). To overcome this, people choose bottled drinking water for their daily needs. But it is necessary to be aware of namely, the quality of water from the bottled water products used by the community, whether it meets the applicable drinking water quality requirements and is listed in the Indonesian National Standard Number 3553 of 2015 and Regulation of the Minister of Industry of the Republic of Indonesia Number 78 of 2016. So, the need for monitoring and controlling the results of the production process so that it is suitable for consumption and reducing the negative risk of bottled drinking water (Dahlan and Wahyunus, 2016). Therefore, the bottled water company located in Cirebon City, seeks to apply the method Hazard Analysis Critical Control Point to fulfill monitoring and control measures, as well as to reduce the negative risk of bottled water products using the method Extended Producer Responsibility.

METHODS

Collecting laboratory research data to support HACCP and EPR methods, conducted interview surveys and questionnaires containing aspects of production and aspects of human resources aimed at 6 expert judgments, namely Head of production, Head and *Co.* Head of QA / QC, Head of Management Representative, Head of Maintenance, and Head of PPK. Meanwhile, to support the EPR method, a questionnaire survey was obtained from 4 shops selling complete bottled drinking water, namely the Bayu shop, Jaguar 99, Jembar Agung, and 100 mundu. The research area was carried out at the Bottled Water Company which is located on Jalan Pangeran Cakrabuana, Wanasaba Kidul Village, Talun District, Cirebon City, West Java Province.

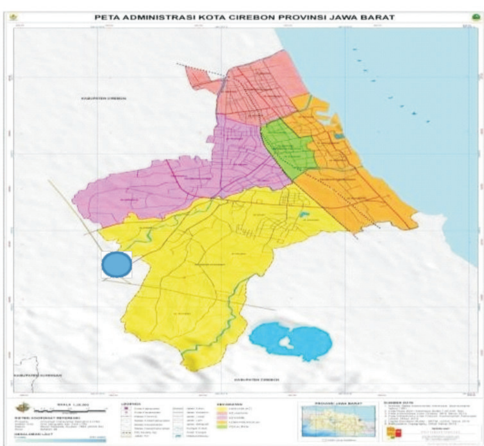

Fig. 1. Location of Research Area, Bottled Water Company

Pre-requisites method, namely the initial procedure to support risk analysis and preparation of critical points which aims to facilitate the identification of the causes of failure and the impact of the production process using the method fishbone analysis and Failure Mode and Effect Analysis. Fishbone analysis can find the root causes of problems based on questionnaires sourced from expert judgments, surveys of the existing conditions of the production process and can be used as problems to be analyzed (Suryani, 2018). Identify potential failures in FMEA to assess aspects of failure based on incidence rate, severity, and detection, then obtain the RPN value for failure prevention efforts so that companies focus on dealing with problems identified as critical points, so as to reduce costs and increase the effectiveness of time and energy in solve problems (Sari *et al*., 2011). These two methods consider the Indonesian government program regarding the appeal for HACCP implementation and as a method pre-requisite to guarantee the quality of bottled drinking water products based on SNI 01-4852-1998, ISO 9001 series, and ISO series 22000 (Fitrianti, 2016). HACCP is a quality assurance method that not only guarantees the safety of bottled drinking water without risk, but this method is based on the anticipation of hazards and supervision that prioritizes preventive measures rather than emphasizing final product testing with control measures to minimize negative risks and the occurrence of hazards (Daulay, 2014). The application of the HACCP method consists of 5 principles, namely risk and hazard analysis with the method pre-requisite, identification and determination of critical control points, determination of critical limits from critical control points, preparation of monitoring systems, and determination of corrective actions (SNI 01-4852, 1998).

EPR or producer responsibility for its products is a form of producer responsibility in producing and distributing its products, as well as monitoring the use of raw materials, production processes, distribution, product quality, and so on, to minimize the risk of negative products to consumers or distributors and reduce the potential risk of defects. products and decreased product quality (Law Number. 8 of 1999). After the production process produces a product, an inspection is carried out which includes two things, namely checking the conformity of the product with product quality standards and checking the conformity of the product with consumer requirements. From this examination, it is known whether the product can be marketed to consumers or whether it has to be reprocessed because it is not by customer needs, so quality control is needed from the beginning of the production process to become bottled water (Nugroho *et al*., 2012).

RESULTS AND DISCUSSION

Identification of Risks and Hazard Cause of Failure

Sampling was conducted once a day for 7 working days, starting on Monday, 17 February 2020 to Monday, 24 February 2020 which is a time series. Sampling in this study was carried out using a 250 ml beaker glass with the top covered with aluminum foil, while for the microbiological analysis of bacteria *Escherichia coli* using a 140 ml glass bottle. Following are the results of the analysis carried out at the Laboratory Quality Control of the Bottled Water Company:

pH Analysis, Total Dissolved Solids, Turbidity, Ozone Remaining Levels, and *E. coli* Microbiology

The pH analysis results obtained the highest pH value of 7.54 and the lowest of 6.99. These results are still by the quality standards in SNI 3553: 2015, namely 6.0 to 8.5. The results of TDS analysis obtained the highest TDS value of 184 mg /l and the lowest value of 177 mg /l. These results are still by the quality standards stipulated in SNI 3553: 2015, namely a maximum of 500 mg /l. The results of the analysis of the highest turbidity were 0.86 NTU and the lowest was 0.45 NTU. These results are still by the quality standards in SNI 3553: 2015, namely a maximum of 1.5 NTU. However, it was found irregularities in the fluctuation of the turbidity value on all laboratory analysis days. The increase in turbidity value is always in the carbon filter effluent, which should function to reduce turbidity, but there is an increase in the turbidity value of the carbon filter effluent. This requires further analysis related to problems that occur in the carbon filter unit. These problems can be caused by replacing filter media and carbon filter membranes that are not by the SOP, washing the media that is not based on the sanitation procedure of the carbon filter unit which is not routine, or the lack of supervision and control of water quality by the production department (Industry Ministry Regulation Number 96 of 2011). The results of the analysis of ozone levels in bottled drinking water products obtained the value of residual ozone levels of 0.1 ppm or constant forall products tested with UV irradiation unit contact time for 14 - 16 hours divided into 2 *shifts* work. The results of the analysis are still by the quality standards stipulated in the Industry Ministry Regulation of the Republic of Indonesia Number 78 of 2016, which is between 0.05 - 0.3 ppm. The results of the analysis of bacteria *Escherichia coli* at the sampling point obtained that the bacteria content *Escherichia coli* was negative or not detected (ND). The negative results of the MPN analysis of the bacteria *Escherichia coli* in the sample stated that the bacteria were *Escherichia coli* not detected in the sample water. These results are by the quality standards stipulated in SNI 3553 : 2015, namely the absence of bacteria *Escherichia coli* in the results of each samplingpoint.

Fish bone Analysis

In the preparation of fishbone analysis is based on a questionnaire sheet is divided into two, namely the questionnaire sheet and the technical part of human resources. The technical section questionnaire sheet includes questions about raw water quality, carbon filter, microfilter, ozone injection, mixing tank, and ultraviolet light. Meanwhile, the human resources

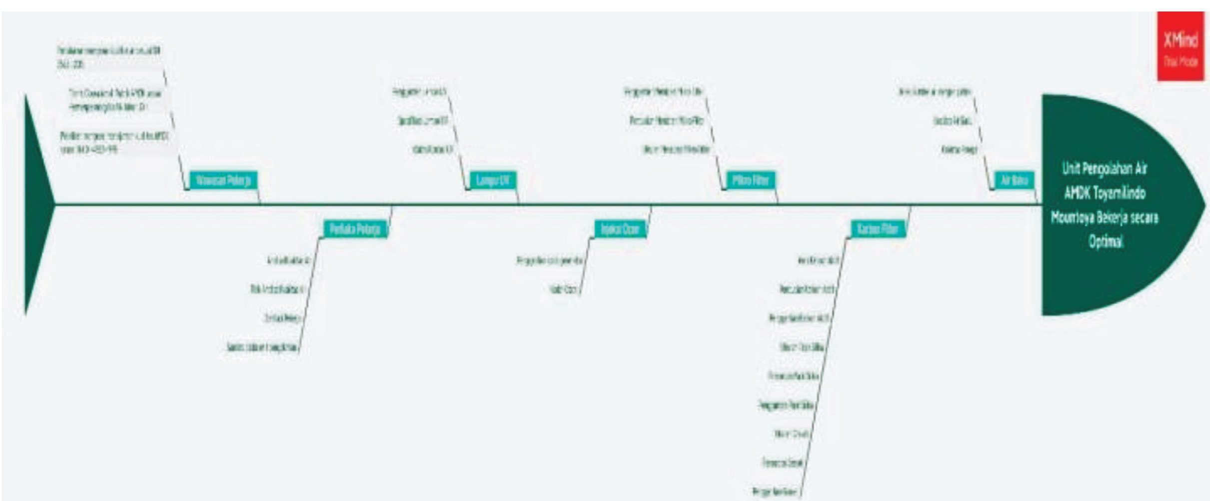

Fig. 2. Fishbone Diagram Analysis

section of the questionnaire sheet includes questions about worker behavior and worker insights. From the diagram fishbone, it is that found there are problems in the Bottled Water production process such as the burning of raw water intake pumps, rotating blackouts by DWTP, washing media and replacing ozone generators that are not according to schedule and SOP as well as excessive use of the membrane cartridge in the microfilter processing unit.

Failure Mode and Effect Analysis (FMEA) Method

Weighting is adjusted to fishbone analysis and entity weighting aims to make it easier to determine the priority of HACCP critical points if there is the same RPN calculation (Wahyuningsih, 2018). Then, determining the value severity or the level of seriousness of the impact, the more severe the impact, the higher the value severity. The limitation of the value of the severity analysis is 1 - 5. Furthermore, each scale of environmental conditions is described to ensure consistency in risk analysis (Fitrianti, 2016). Then the results of the estimation of the existing conditions can be known the value severity of each entity is equation (1) below and then in Table 1 is the result of the ranking severity of eachentity

$$\text{Severity} = \frac{\text{Ideal Scale Value} - \text{Existing Scale Value}}{\text{Ideal Scale Value}} \times 100\% \quad .. (1)$$

Table 1. Rangking of each Entitity

Entity	Value Severity	Rating
RawWater		
Quality of raw water	0%	1
Distance of raw water source to factory	0%	1
Quality of pumps for water transportation	60%	3
CarbonFilter		
Silica sand replacement	0%	1
Washing silica sand	40%	3
Size silica sand	0%	1
Replacement gravel media	0%	1
Washing gravel media	40%	3
size Gravel media	0%	1
Replacement activated carbon	0%	1
Washing activated carbon	40%	3
type active carbon	0%	1
MicroFilter		
Replacement membrane cartridge	80%	4
Wash membrane cartridge	0%	1
The size of the membrane cartridge	0%	1
Injectionozone		
Replacement ozone generator	80%	4
levels of ozone	0%	1
UVLamp		
Replacement Lamp UV	0 %	1
UV Lamp Specifications	0%	1
UV Contact Time	0%	1
WorkerBehavior		
Water Quality Analysis	0%	1
Water Quality Analysis Point	0%	1
Worker Sanitation	0%	1
Sanitation Bottled Water Treatment Units	0%	1
Worker InsightsWorkers'		
understanding of quality of water according to SNI 3553: 2015	0%	1
Insights of workers related to factoryoperations in accordance with PERMENPERINDAG Number. 705 of 2003	0%	1
Training on drinking water quality management system according to SNI 01-4852-1998	0%	1

Occurance or the rate of failure of the processing unit illustrated the number of events in 1 year, where the probability of failure was based on a scale of 1-5. A value of 5 means the level of high impact frequency or the number of frequent occurrences and a value of 1 means that the level of impact frequency is low or the number of events rarely occurs. Detection or the value of the ability to control failure associated with that control based on the frequent failure occurs or a value occurrence performed because the number of failures became more frequent if less effective methods of prevention do. Assessment Detection has a scale range of 1 - 5. Scale 5 explains that the ability of the control device to detect the causes of failure is low (undetected) and scale 1, namely the control device can detect failure easily and with a certainty of detection (Wahyuningsih, 2018).

In Table 2, the results of the Risk Priority Number are the multiplication of assessments severity, occurrence, and detection, to determine the potential failure that occurs and the critical point for the HACCP method. The RPN values are sorted from largest to smallest value. The largest RPN value is that the type of failure has a significant effect, has a high risk, requires handling, and a monitoring method to repair failure. The smallest RPN value is that the type of failure never occurs, the risk of danger does not have the potential to arise, and does not need it but is still given a monitoring method to minimize the potential for failure. This type of failure has a significant and high-risk influence which is included as a critical control point whose RPN value is above 10, because it indicates that failure can disrupt the production process so that it affects the characteristics or quality of production water directly, such as laboratory analysis results that exceed quality standards. The results of the RPN analysis obtained ratings of 1 to 27 identified hazards and not all types of hazard failures can be used as critical control points. Determination of critical control points is only rated 1-6 which is controlled because it has a large

RPN number or above 10 which can disrupt the production process, while ratings 7 - 27 do not need to be put into a critical control point because the RPN value is small and does not have the potential to cause failure in the production process. Potential failure occurs due to replacing the membrane cartridge in the microfilter unit and the ozone generator in the ozone injection unit which exceeds the period of use, the quality of the pump for raw water transportation that is often damaged, backwash media for silica sand, gravel, and activated carbon in the carbon filter unit that is not suitable with the applicable schedule or SOP. Then the above failures will be identified at the critical controlpoint.

Hazard Analysis Critical Control Point Method

After analyzing the risks and hazards, the second principle is the determination of a critical control point or a hazard prevention procedure that has been missed from the control, resulting in the emergence of a negative risk to Bottled Water Company. Then, a critical limit can be determined to facilitate risk control as the third principle (Hassan and Masduqi, 2016). The critical limit is a criterion that separates acceptable and unacceptable conditions for each critical control point so that it is not exceeded to avoid loss of control in corrective efforts based on legislation, safety standards, and scientifically tested values (Sudarmaji, 2015). Arrangement of a monitoring system as the fourth principle to provide information before any deviation occurs so that corrective action is taken and does not affect the entire Bottled Water production system (SNI 01-4852, 1998). Monitoring activities include determining the person in charge for each production process, checking the critical control point handling procedure, testing the effectiveness of the critical control point control handling procedure, and determining critical limits to ensure that it is still on a safe level. The fifth principle is the establishment of corrective actions for each critical control point to deal with deviations that occur so as not to affect production results. If the critical limit is not within a tolerable level, corrective action is needed depending on the level of risk in each product production process to ensure that the product production process does not cause new potential hazards (Daulay, 2014). After all the principles of the HACCP method have been carried out, all the results of the analysis are entered in Table 3.

Analysis of Extended Producer Responsibility Method

Supervision and quality control are carried out as a whole from the production process, finished product, storage form, process transportation, sanitation, waste treatment, and consumer products. Good quality of drinking water products will increase consumer satisfaction and minimize the

Table 2. Results Calculation of Risk Priority Number

Source	Type of Failure	S	O	D	RPN	Priority for handling
Raw Water	Quality of raw water	1	1	1	1	23
	Distance source ofraw water with factory	1	1	1	1	24
	Pump quality	3	3	3	27	3
Carbon Filter	Replacement of silicasand	1	1	1	1	14
	backwashSilica sand	3	2	2	12	4
	Size of silica sand	1	1	1	1	17
	Replacementof mediagravel	1	1	1	1	15
	Backwash mediagravel	3	2	2	12	5
	media size Gravel	1	1	1	1	18
Carbon Filter	Replacement activated carbon	1	1	1	1	16
	backwash Activated carbon	3	2	2	12	6
	Types of activated carbon	1	1	1	1	19
Micro Filter	Replacement cartridgemicrofilter	4	3	3	36	1
	Backwash membrane cartridge	1	1	1	1	20
	Sizemembran catridge	1	1	1	1	21
Ozone injection	Replacement of ozonegenerator	4	3	3	36	2
	Ozone levels	1	1	1	1	22
UV	lamp Replacement of UV lamp	1	1	1	1	25
	UV lampspecifications	1	1	1	1	26
	UV Contact Time	1	1	1	1	27
Worker behavior	Water quality analysis	1	1	1	1	10
	Water quality analysis points	1	1	1	1	11
	Worker sanitation	1	1	1	1	12
.	Sanitation treatment units	1	1	1	1	13
insights Workers'	Understanding water qualityworkers SNI 3553: 2015	1	1	1	1	7
	Insights PERMENPERINDAG. factory operational workers Number. 7052003	1	1	1	1	8
	training water SNI 01-4852-1998	1	1	1	1	9

occurrence of contamination and product damage and maintain product quality to remain good for consumers (Batarfie, 2006).

Quality Control of Production and Finished Products

Bottled Water Company carries out a program hold and release, namely if there are raw materials or final products that do not comply with the specified specifications after testing, the QC section provides information on parts of raw material and finish goods to separate these raw materials or products and provide a clear identity. There are 3 types of identities used in the implementation, namely quarantine, reject, and QC passed. Products that meet the specifications are given the status of QC passed. The finished product is checked against the specifications of each product, such as checking the volume, expiration date, foreign matter, appearance of the packaging. Control of the quality of the packaging process by checking the condition of the product again if anything has been missed from the previous process, gluing the box, and also the expiration date on the packaging box. Product withdrawal is carried out if discrepancies are found during the production process that can endanger consumers in terms of food safety and the product has been sent to consumers. The product recall mechanism has been documented in the form of a procedure by performing mock recall at least once a year. The process of controlling rework is the implementation of repacking of products that occur due to imperfections during the packaging process, storage in finished goods warehouses, or duringtransportation.

Quality Control of Storage and Transportation

Storage of finished products is used in special warehouses to prevent damage to materials which must comply with procedures QC passed, to

Table 3. Result of Hazard Analysis Critical Control Point Method

Type Failure	Critical Control Point		Critical Limits		Monitoring System			Correction
	Failure Risk	CCPs	Critical Limits	Reference	Procedure	Frequency The	PJ	
Use of amembrane cartridge in the micro filter unit exceeds the usage power (RPN value = 36)	Themembrane catrige cannot filter fine water particles effectively.	Replacement and the period of use of themembrane cartridge in the micro filterunit	1Month Once	USEPA2005 on Membranes Filtration Guidance Manual	Check the condition of themembrane cartridge on all parts	Every week at the beginning of the production process	Head of QA / QC and the unit operator microfilter	Membrane cartridge be replaced at least 1 month
Use of ozone generators at the injection unit of ozone that exceed the period of the power usage (Value RPN = 36)	Power ozone generator so that pathogens gonedown hill and is not effective	Period of the use of ozone generators at the injection unit ozone	5 Once a Year	US EPA 2011 Water Treatment Manual Disinfection	Check themicrobial parameter data E. Coli on the ozone injection effluent for1 year with quality standards	Every year at the begin-ning of the production process	Head of QA /QCand ozone injection unit operator	Replace ozone generator ozone injection unit at least once a year The
Quality of the main pump is not up to standard and is damaged (RPN value = 27)	Raw water treatment for bottled drinking water production is hampered, disturbances inquality, quantity, and continuity	Available spare pumps and selection pump of the highest quality.	Once a month	PERMEN PERINDA G No. 705 of 2003 concerning Technical Requirements for thecompany	Check the condition of the main pump and the backup pump. Selection of the best pump for 1 month at least according to the rules	At the begin-ning of eachp ergantian shift production	Head of maintanance and operator unit groundtank raw water	Pengcekan primary pump minimum conditions before the shift of production
Backwash silica sand media filter carbon units late and not according to the standard schedule (RPN value = 12)	Contaminants attached to silica sand can dissolve in water and cause turbidity	Schedule for Backwash silica sand media on the carbon filter unit	1 Week Once	Indonesian National Standard Number 6774 of2008	Check the headloss on the tank according to the results of parameter data especially turbidity on carbon filter effluent with quality standards	Every begin-ning of the shift production	Head of QA / QCand operator of the carbon filter unit	Wash the silica sand media unit carbon filter every day at least 1 time

Table 3. *Continued ...*

Type Failure	Critical Control Point		Critical Limits		Monitoring System			Correction
	Failure Risk	CCPs	Critical Limits	Reference	Procedure	Frequency The	PJ	
Backwash the media gravel or gravel carbon filter unit late and not according to the standard schedule (RPN value = 12)	Contaminants sticking to the media gravel can dissolve in water and cause turbidity	Schedule backwash media gravel on the carbon filter unit	1 Week Once	Indonesian National Standard Number 6774 Year 2008	Check the head loss on the tank according to the results of the parameter data, especially the turbidity in the carbon filter effluent with quality standards	Every beginning of the shift production	Head of QA/ QC and operator of carbon units filter	Laundering media gravel units of carbon filters every day at least 1 time
Backwash media activated carbon carbon units filterlate and did not match the standard schedule (Value RPN =12)	Contaminants attached to the activated carbon can be dissolved in water and turbidity	Schedule backwash media activated carbon in the carbon filter unit	Once a week	Indonesian National Standard Number 6774 Year 2008	Check headloss on tank according to results of parameter data, especially turbidity in carbon filter effluent with standards	Every beginning of the shift production	Head of QA / QC and operators of carbon filter units	Wash the activated carbon media of the carbon filter unit every day at least 1 time

prevent users that are not by health requirements. The storage area must be clean and no scattered material stored in a special area with a storage area air circulation system that is formed to prevent unwanted things from affecting the product. Stacker and hand pallets as a means of transfer and unloading in the finished goods warehouse to the distribution equipment are maintained so that contamination does not occur. Warehouses and General Affairs must regulate the traffic of vehicles used for the transportation of raw materials, process auxiliary materials, packaging materials, and final products. The General Affairs arranges vehicles for garbage collection and waste disposal. The supervisor warehouse arranges for container truck inspections for product delivery to run properly and according to the SOP. Inspection for vehicles is carried out to see that the vehicle used meets the specifications set by QC and security to ensure that no product is damaged or dirty during the process loading.

Sanitation and Waste Management

The company performs environmental sanitation before, during, and after processing. Production room sanitation is carried out before and after the production process as well as thorough cleaning every 2 weeks. Equipment sanitation is carried out to avoid quality changes that occur in the Bottled Water processing process.sanitation is a Ground reservoir carried out every 1 month, using food grade soap. Sanitation of the carbon filter is carried out every 1 month with backwash repeatedly until the water is not cloudy. To maintain the effectiveness of activated carbon, it is replaced every 6 months. sanitation is Microfilter carried out every 1 week with a physical wash. Cleaning the holding tanks and filling machines is done by soaking using food grade soap and rinsing thoroughly. Sanitation for production workers uses equipment, namely uniforms and other equipment, namely hairnet, masks, boots, gloves, and is sprayed with alcohol every 5 minutes. Waste from the Bottled Water Company processing process is in the form of liquid and solid waste. For liquid waste, namely water from washing bottles and gallons and water wasted from filling. Solid waste is activated carbon, bottle caps, and gallons. For liquid waste, it is disposed of into a sewer that is connected to the irrigation of the population because the wastewater that is disposed of is not dangerous because when washing the gallon it uses soap *food grade.* Solid waste in the form of activated carbon is sprinkled on the ground so that it will decompose, while waste for the production of *cups,* damaged bottles, and gallons is collected and then sold tocollectors.

Quality Control of Product for Consumers

Supervision of product quality for consumers is carried out in 3 ways, the first is to identify and trace products based on monitoring and measurement of each stage of the production process. For finished products, the status identity is given after the last stage of the process. Tracing is maintained by implementing the use and filling of forms in each company department. Second, establish and implement a non-conformance control system, especially for potentially unsafe products, by establishing corrective and preventive action procedures and product recall procedures. This corrective and preventive action procedure regulates the handling if a non-conformity is identified from the results of internal or external audits of customer complaints. Third, validation of the ozonation process, where the company has regulations to determine the level of injected ozone to ensure the product is by specifications and records the results of ozonation to re-validate the quality and safety of bottled water products according to quality standards every 6 months to ensure the suitability of the products produced

Analysis Quality Product Bottled Water for Consumer

The purpose of comparing product quality to consumers with product quality data when it is newly produced is to maintain the quality of the product that has been produced and to detect a decrease in product quality when it is in the hands of consumers because it can endanger consumer health. Factors that cause a decrease in the quality of bottled water products, for example, are the influence of the distance of the delivery process from the company to the store, damage during the product transportation process to distributors or consumers, the wrong way to store products, and also the length of product storage. The Bottled Water Company as a producer is not only responsible for the production process but is also obliged to monitor the quality of its products in the hands of consumers or distributors by the Minister of Industry Regulation Number 96 of 2011. Based on the results of analysis from 4 stores, changes in the quality of bottled drinking water products are caused by product delivery, product storage, product storage time, and contamination from outside the product as evidenced by a significant change in the pH number in glass and bottled products which can cause changes in the taste of the product. For the turbidity parameter, there is an increase in the value of turbidity in bottled and gallon products which can affect the physicality of the product. In one shop, moss was also found in gallons due to the lack of cleanliness of washing and improper storage due to direct exposure to sunlight. Meanwhile, for TDS parameters, residual levels of ozone, and *Escherichia coli* bacteria, there was no change in the quality of theproduct.

CONCLUSION

Based on the results of the analysis of the existing conditions at the Bottled Water Company, the poor performance of the processing unit and the need for quality control monitoring is due to the replacement of the membrane *cartridge* on the micro filter and the *ozone generator* on ozone injection that exceeds the usage limit, the poor quality of the raw water transportation pump and *backwash* carbon filter media (silica sand, *gravel,* and activated carbon) that are not on the schedule. Quality control using the EPR method is applied by quality control on the use of raw materials, production processes, finished products, product storage, product distribution, sanitation and waste treatment, and product quality to consumers. The results of the comparison of the quality of bottled drinking water for consumers with the quality of products that have just come out of the production process, there are changes or decreases in quality caused by the distance of product delivery to the store, the product delivery process, how the product is stored, and also the length of storage for bottled waterproducts.

REFERENCES

Batarfie, M. U. A. 2006. Analisis Pengendalian Mutu pada Proses Produksi Air Minum Dalam Kemasan

(AMDK) SBQUA. Departemen Manajemen, Fakultas Eknomi and Manajemen. Institut Pertanian Bogor.

Dahlan, A. and Wahyunus. 2016. Rencana HACCP Pengolahan Kecap. Skripsi. Institut Pertanian Bogor.

Daulay, S. 2014. Hazard Analysis Critical Control Point dan Implementasinya dalam Industri Pangan. Jakarta.

Fitrianti, N. 2016. Analisis Penurunan Kualitas Air Produksi Instalansi Air Minum (IPAM) X dengan Metode Failure Mode and Effect Analysis (FMEA). Institut Teknologi Sepuluh Nopember :Surabaya

Hassan, F. and Masduqi, A. 2016. Application of Hazard Analysis Critical Control Point (HACCP) in The Drinking Water Company. *The 1st International Seminar on Management Technology,* Surabaya.

Industry Ministry Regulation Republic Indonesia No. 96 Tentang Persyaratan Teknis Industri AMDK Tahun 2011.

Law Regulation Number 8 of 1999 about Customer Protection.

Nugroho, M. S., Bisri, M. and Anwar, M. R. 2012. Kajian Terhadap Implementasi Manajemen Mutu pada Pengelolaan Proyek Perumahan. *Jurnal Teknik Sipil, Universitas Brawijaya.* 6 No. 2Malang.

Perusahaan Daerah Air Minum (PDAM) Kota Cirebon Tahun 2014.

Sari, D., Rosyada, Z. and Ramadhani, N. 2011. Analisa Penyebab Kegagalan Produk Woven dengan Menggunakan Metode Failure Mode and Effect Analysis. *Jurnal Teknik Industri.* 1(6) : 6-11.

Standar Nasional Indonesia (SNI). No. 01-4852 Tentang Sistem Analisa Bahaya dan Pengendalian Titik Kritis (HACCP) serta Pedoman dan Penerapannya Tahun1998.

Sudarmaji. 2015. Analisis Bahaya dan Pengendalian HACCP. *Jurnal Kesehatan Lingkungan*. 1(2) : 183-190

Suryani, F. 2018. Penerapan Metode Diagram Sebab Akibat (Fishbone Diagram) and FMEA dalam Menganalisa Resiko Kecelakaan Kerja di PT. Pertamina Talisman Jambi Merang. *Journal Industri Services.* 3(2) : 63-69.

Wahyuningsih, I. 2018. Pengurangan Resiko Kegagalan Produksi Air Minum Isi Ulang Kecamatan Gubeng Kota Surabaya dengan Menggunakan FMEA. ITS: Surabaya.

.