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Study of Clean Water Management in Water Treatment Plant Grand Cikarang City

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ABSTRACT: In the last few months, residents of the North Cikarang GCC housing have complained that the water supplied by the PAPs is smelly, cloudy and unfit for bathing, washing dishes and clothes. This encourages the PAP developers to be able to improve the clean water treatment process so that it is suitable for residents to use. The purpose of this study is to analyze whether the management of the Grand Cikarang City WTP has met the quality standards of clean water quality in Indonesia. Clean water treatment process starting from intake, coagulation, flocculation, sedimentation, filtration, and reservoir. The results of the analysis at the Grand Cikarang City WTP, namely that the WTP has carried out procedural procedures in managing clean water treatment from the raw water stage, production to quality and distribution to consumers, namely residents of Grand Cikarang City housing and in providing chemicals such as alum and chlorine. WTP also pays attention to the maximum standard of chemical use, so as not to have an impact on consumer health, in order to meet quality standards before water is distributed to residents of housing as many as 7,643 housing units, but in the process of managing clean water in WTP there are problems, namely the quality of the results of WTP processing even though it is still enter the quality standard.

KEYWORDS: clean water, process, sedimentation, filtration, coagulation

I. INTRODUCTION

In early 2008 PT Sri Pertiwi Sejati established a housing estate named Grand Cikarang City Housing which is located in Karang Harja village, North Cikarang, Bekasi Regency. The housing built by PT Sri Pertiwi Sejati is subsidized housing intended for the lower middle class community. In the North Cikarang area, there are not many housing facilities that provide clean water treatment facilities, water is the main need for humans, but few people realize how important it is to use clean water that is free of bacteria or viruses. Therefore, the Grand Cikarang City water treatment plants (WTP) which is managed by PT GCC Tirta Utama Pertiwi which is still under the same umbrella as PT Sri Pertiwi Sejati, came up with the idea of establishing clean water treatment in the Grand Cikarang City Housing area to meet the water needs of residents in the housing. Before the idea of establishing a WTP, residents used groundwater (bore wells) but residents were constrained by the quality of the well water because physically the color of the water was not clear or clear, but brownish yellow and smelled. This condition initiated the developer to carry out the AMDAL (Environmental Impact Analysis) process. The result of the analysis is the establishment of WTP to meet the need for quality water with quality standards in early 2009. Grand Cikarang City Housing is one of the housing estates that has an independent clean water treatment called a water treatment plant (WTP), which operates for 24 hours which must distribute 65 liters/second to residents for 24 hours which one day is able to distribute 4,963 m^3/day water. 4,963,000 liters, with 7,463 housing units in the Grand Cikarang City housing estate [1].

One of them is the Grand Cikarang City WTP clean water treatment process taking raw water from the Kali Ulu river that crosses Grand Cikarang City housing, processing raw water from the river is not easy because of the high level of turbidity mixed with mud and unpleasant odors because there are still many home industries that dump waste into rivers, therefore we need water treatment that has a gradual process and tools that can actually purify water according to standards suitable for consumption, but the results of water treatment at WTP Grand Cikarang City even though in checking pH, turbidity, color is still included in the quality standards suitable for use, but in reality the water that has been treated and tested for pH, turbidity, color and cod and bod but there are still shortcomings, namely water what is distributed to residents still smells bad, the water is cloudy and sometimes the smell of chlorine still arises It stings, and many residents complain of itching after bathing [1].

Based on the above background, a study was conducted to identify and analyze the treatment of clean water in the Grand Cikarang City WTP housing from raw water to clean water and distribution to residents, so as to analyze what the problems are in the processing and management of WTP. The purpose of this study is to analyze whether the management

of the Grand Cikarang City WTP has met the quality standards of clean water quality in Indonesia.

II. METHOD

This study uses a qualitative descriptive method, which is a technique that describes and interprets the meaning of the data that has been collected by paying attention and recording as many aspects of the situation as possible at that time, so as to obtain a general and comprehensive picture of the actual situation.

This research is divided into 4 steps, namely the preparation stage, implementation stage, evaluation stage and follow-up. The research stages are presented in Figure 1.

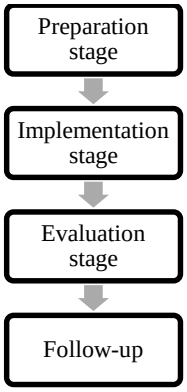

Figure 1. Flowchart of research stages

Figure 1 shows the research stages is divided into 4 steps: preparatory stage, the administrative process was carried out to obtain approval for the implementation of research at the WTP Grand Cikarang City, at this stage a literature study was also started relating to clean water treatment plants. The implementation phase is the initial observation carried out to obtain company existing data related to the Clean Water Treatment Plant in WTP Grand Cikarang City, which includes operational data of WTP, pollutant quality data, processed water quality data, and company profile data. The evaluation stage is to analyze the processing results of the WTP whether it has met the specified quality standards. The follow-up stage was carried out by providing several suggestions for improvements in clean water treatment in the GCC housing.

The research location is in the WTP of GCC housing as shown in Figure 2.

Figure 2. The research location

III. RESULT AND DISCUSSION

A. Clean Water Treatment Process

In the process of treating clean water in the WTP, the raw water used comes from river water, which can change according to climatic conditions and natural conditions, therefore the manager conducts periodic checks every three months. The results of periodic checks for the last 1 year resulted in concentrations of ammonia, COD, BOD, nitrite and nitrate that exceeded the class 3 clean water quality standard. This WTP has an operating unit to treat clean water, starting from intake, coagulation, flocculation, sedimentation, filtration, and reservoir.

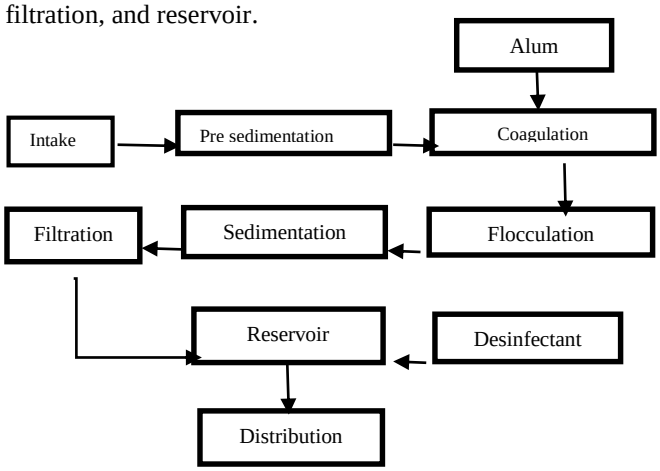

Figure 3. Flowchart of WTP GCC

Figure 3 shows that the raw water enters the intake using a pipe that passes through the bar screen by gravity, then enters the V notch tub which functions for pre-sedimentation before the coagulation process to remove or prevent sand, mud and coarse material from entering the inside WTP. Next is the deposition process to separate suspended flocs of particles, where after entering the flocculation process the water enters the sedimentation process, in the sedimentation process at Grand Cikarang City WTP using a 9m x 9m x 4m tank. Then enters the filtration tank at the WTP which consists of 8 holes with an area of each hole having a length of 1m and a width of 5m. In this process the water that has been processed in the sedimentation unit is flowed into a quick sand filter tank which aims to make flocs and other substances carried away by the flow that will be filtered by the sand filter, the fast sand filter consists of a layer of sand and a nozzle. After this process, the water will enter a reservoir with a capacity of 5,000 m^3, where every day it will be distributed to 7,643 housing units of 4,963 m^3 through 18 inch galvanized pipes.

The coagulation process uses a coagulant in the form of alum that uses PAC (Poly Allumunium Chloride) which functions as a coagulant or flocculant which decomposes a cloudy solution and agglomerates the particles so that they can separate from the solution medium. The concentration of coagulant depends on the turbidity. If turbidity >1000 NTU using 25 ppm coagulant and added 0.2 ppm polymer, if it is still around 100-1000 NTU use 12ppm coagulant.

B. Water Quality

The quality of clean water produced by WTP Grand Cikarang City which has gone through a treatment process with a raw water turbidity value with an average pH of more than 7.84 after being processed to an average of less than the previous pH indicates that the processing carried out by WTP Grand Cikarang City is still in accordance with quality standards, in addition there are periodic checks which are carried out once in a period of 3 months, with TDS, TSS, and tested for COD and BOD levels every three months and combined with standard standards. quality that the water produced by the WTP can meet the quality standards for the feasibility of clean water.

The results of checking clean water in the reservoir are presented in table 1.

Table 1. The results GCC WTP treatment water analysis [2,3,4,]

Parameters	Average concentration	Quality standards		Unit	Methods
		Class 3	Class 4		
Temperature	16	Dev 3	Dev 3	◦C	APHA.2550 B
TDS	409	1000	2000	mg/L	APHA.2540 C
TSS	17,7	400	400	mg/L	APHA.2540 D
Colour	7,21	100	150	PtCo	APHA. 2120 C
pH	7,26	6 – 9	5 - 9	Ph unit	APHA. 4500-H^+B
Cyanide	<0,001	0,02	0,02	mg/L	APHA. 4500 CN E
Sulfide	<0,003	0,002	0,04	mg/L	APHA.4500-S^{2-} D
Fluoride	0,355	1,5	1,5	mg/L	SNI 06-6989.29-2005
Ammonia	8,36	1	1,5	mg/L	SNI 06-6989.30-2005
Nitrate	3,15	20	20	mg/L	SNI 06- 6989.79-2011
Nitrite	3,32	0,06	0,06	mg/L	SNI 06- 6989.9-2004
Free chlorine	<0,0193	0,03	0,03	mg/L	APHA. 4500-Cl-G
Sulphate	106	300	400	mg/L	APHA. 400SO_4 E
Phosphat	0,0598	1	5	mg/L	APHA. 4500-P-D
Chloride	30,9	300	600	mg/L	APHA. 4500 Cl B
DO	1,32	3	1	mg/L	APHA. 4500 - O- B
BOD	10,8	6	12	mg/L	APHA.5210 B
COD	23	40	80	mg/L	APHA. 5220 -C
Surfactant (MBAS)	<0,0108	200	500	mg/L	APHA.5540 C
Phenol	0,179	10	20	mg/L	APHA.5530 C
Fat Oil	0,6	1000	1000	mg/L	APHA.5520 B
Fe	<0,0305	1	1,5	mg/L	APHA. 3111 B,3030 B
Mn	0,659	0,5	1	mg/L	APHA.3111 B,3030 B
Ba	<0,0731	1	1	mg/L	APHA.3111 D,3030 B
Cu	<0,0210	0,02	0,2	mg/L	APHA.3111 B,3030 B
Zn	0,029	0,05	2	mg/L	APHA.3111 B,3030 B
Cr^{6+}	<0,0112	0,05	0,05	mg/L	SNI-06-6989.71-2009
Cd	<0,0018	0,01	0,01	mg/L	APHA.3111 B,3030 B
Hg	<0,0003	0,002	0,005	mg/L	APHA.3111 B,3030 E
Pb	<0,009	0,03	0,5	mg/L	APHA.3111 B,3030 B
As	<0,0004	0,05	0,1	mg/L	APHA.3114 C,3030 F
Se	<0,0006	0,05	0,05	mg/L	APHA.3114 C,3030 F
Ni	<0,0319	0,05	0,1	mg/L	APHA 3111 B ,3030 B
Co	<0,0252	0,05	0,2	mg/L	APHA 3111 B ,3030 B
Fecal Coliform	N/T	2000	>2000	amount/100 mL	APHA. 9221 B D
Total coliform	1200	10000	>10000	jml/100 mL	APHA. 9221 B D

Based on the laboratory results in table 1, it shows that the water managed by the GCC WTP has met the quality standards set out in government regulation number 82 of 2001. For the next water treatment so that powdered activated carbon can be added to reduce odor and turbidity in the water after treatment. Powdered activated carbon (PAC) is a promising technology for reducing organic micropollutants (OMPs) in drinking water treatment plants and combined

with biological treatment processes such as rapid sand filters (RSF), has the potential to remove various OMPs during water treatment [17].

IV. CONCLUSIONS

The results of the analysis at the Grand Cikarang City WTP, namely that the WTP has carried out procedural procedures in managing clean water treatment from the raw water stage, production to quality and distribution to consumers, namely residents of Grand Cikarang City housing and in providing chemicals such as alum and chlorine. WTP also pays attention to the maximum standard of chemical use, so as not to have an impact on consumer health, in order to meet quality standards before water is distributed to residents of housing as many as 7,643 housing units, but in the process of managing clean water in WTP there are problems, namely the quality of the results of WTP processing even though it is still enter the quality standard.

Suggestions for companies to improve water quality, such as the color of the water which physically still looks cloudy and the water still smells or water that smells of chlorine, so that in the treatment of clean water add active carbon in the process from sedimentation to the filtration process and the addition of active carbon at the same time. before being distributed by making a second reservoir (reservoir) to filter with carbon so when the water is in reservoir 1 the water is injected again with a filter after that the water enters reservoir 2 by passing through activated carbon in order to remove the smell of chloroine, or bad smell or to purify water, because the function of Active Carbon is to purify water.

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