Internal Water Treatment Plant Effectiveness Improving The Quality of Clean Water Treatment

Metta Dhamayanti*, Dewi Sulistyorini, Lilik Hendro Widaryanto

Civil Engineering, Faculty of Engineering, Universitas Sarjanawiyata Tamansiswa, Yogyakarta
**Corresponding author: amettadhammay114@gmail.com*

ABSTRACT
Clean water is of the human rights that must be fulfilled in order to survive. Water demand is not only related to quality, but also quantity. Therefore, adequate water treatment is needed to make water fit for consumption. This research was conducted at the West Semarang SPAM Water Treatment Plant. The purpose of this study was to determine the effectiveness of the Water Treatment Plant (WTP) in improving the quality of clean water treatment . The method used is using qualitative data. The results obtained from this study are that the Water Treatment Plant is very influential and has been effective in water treatment and the results of monitoring the level of turbidity of water in September showed the average turbidity of raw water was 43.07 NTU. After going through the water treatment process, the turbidity of the water decreased by an average of 42.38 NTU with an average turbidity of 0.69 NTU. The results of monitoring the level of water turbidity in October showed an average raw water turbidity of 14.59 NTU. After going through the water treatment process, the turbidity of the water decreased by an average of 13.92 NTU with an average turbidity of 0.67 NTU. The results of monitoring the pH of water in October showed the average pH of the water was 8.44, after going through the water treatment process, it changed to an average of 7.6. The results of monitoring the pH of water in October showed the average pH of the water was 7.64, after going through the water treatment process it changed to an average of 7.51. The results of the September and October water quality tests with parameters of Microbiology, Inorganic Chemistry, Physical, Chemical are in accordance with the drinking water quality standards set by PERMENKES.

Keywords: *WTP, Water Treatment*

1. INTRODUCTION

The Clean water is of the human rights that must be fulfilled in order to survive. Soemarwoto (Soemarwotol 2001: 34, referred 2006) explains that water is a basic need for life. Water is a necessity of life that is very important for human life. Humans really need clean water that meetsquality requirements in accordance with drinking water standards that have been set by the Government of the Republic of Indonesia through the Ministry of Health of the Republic of Indonesia which is stipulated by Minister of Health regulation no. 492/SK/2010. Water demand is not only related to quality, but also quantity. The amount or quantity of available water is closely related to weather conditions, especially rainfall. Rainfall is generally not evenly distributed throughout the year, namely there is a rainy season and there is a dry season. Therefore, the supply of water is also uneven, ie. a lot in the rainy season and a little in the dry season. Regarding quality, the airx used must be in accordance with the quality according to its use and each use has a quality standard. Effendi [1]states that water quality is influenced by 3 main components, namely hydrological components, physical components chemical and biological Assessment of the quality of a water body must include these three components.

Research purposes

To determine the effectiveness of the Water Treatment Plant (WTP) in improving the quality of clean water treatment

2. METHODS

Literature review

Aldo Ieven Setiyawan, Puput Ratri Cahyaningrum, and Djoko Suwarno [2], conducted research on the quality of clean water in the Water Treatment Plant. Clean water that is managed is processed according to the treatment steps that have been determined. The result of the research is that WTP has a significant effect on changes in the value of raw water quality. With the quality of raw water decreasing, PAPs must work hard to balance parameter values in accordance with existing statutory regulations. And the quality of the water supplying clean water is good because the water quality parameters for the water supply are within the water quality standards permitted in the Regulation of the Minister of Health. Republic of Indonesia No. 416/Menkes/Pe based on a survey by Laila Rismwarti, Husnaini and Laily Khairiyati [3], which is an analytical observational study which aims to determine the treatment of drinking water at Pinus PDAMi Intan Banjar viewed from the physical, chemical, and biological parameters. The research design used is cross-sectional. The subject of this research is the raw water of the Liam Kanan for drinking water samples that have not been treated. The results of the study were that there was a significant difference in turbidity before and after drinking water treatment (p-value = 0.0001), a significant difference in color before and after drinking water treatment (p-value = 0.0001), and one significant difference . There was no difference in TDS (p-value = 0.002) before and after drinking water treatment, pH value before and after drinking water treatment (p value = 0.535), Fe before and after drinking water treatment (p-value = 0.002), There was a significant difference. Mn before and after drinking water treatment (p-value = 0.002), and there was a significant difference in the total number of coliforms before and after drinking water treatment (p-value = 0.002). There was a significant difference in E-coli (p-value = 0.002).

Research methods

The research method used is qualitative data. Qualitative data is a problem solving procedure investigated by observation by describing the current state of the object of research based on the facts.

Method of collecting data

The data collection methods used in this research are primary data collection methods and secondary data collection methods. In this study the authors also researched and utilized data from West Semarang SPAM. The data collected was in the form of a water quality lab test at the Water Treatment Plant in West Semarang SPAM.

3. RESULTS AND DISCUSSION

Lab Test Results of Raw Water and Reservoir Water on Turbidity and pH Parameters in the West Semarang Drinking Water Supply System. Water testing samples at the West Semarang SPAM were taken in September and October. The parameter that is monitored daily by ASB in this water treatment plant is the pH of the raw water and the pH of the water after going through the processing, the level of turbidity of the raw water and the level of turbidity of the water after going through the processing. Turbidity Level and pH of September Raw Water .The results of the Turbidity Test and pH of raw water in September can be seen in Table 1 below:

Table 1 Test Results of Turbidity and pH of Raw Water in September

No	Turbidity Test Results	pH Test Results
	5.39	8.46
1	6.22	8.43
2 3	6.6	8.45
4	8.07	8.45
5	9.83	8.42
6	10.76	8.48
7	11.6	8.44
8	7.63	8.43
9	4.71	8.44
10	6.37	8.43
11	6.79	8.42
12	6.43	8.44
13	5.96	8.45
14	393.73	8.4
15	27.85	8.42
16	10.71	8.48
17	8.83	8.49
18	8.15	8.48
19	8.99	8.47
20	108.82	8.53
21	486.58	8.51
22	60.31	8.35
23	14.16	8.43
24	9.9	8.48
25	9.93	8.46
26	10.58	8.48
27	10.09	8.57
28	8.5	8.51
29	9	8.44
30	9.55	7.98
Average	43.07	8.44

Table 1 shows a very drastic increase in turbidity on September 14 and 21. The highest level of turbidity occurred on September 21, which was 486.58 NTU. Water turbidity in September has an average of 43.07 NTU. The pH test results in diagram 5.2 above show that there is no very drastic increase and is still stable. The pH of water in September has an average of 8.44 and is in accordance with the maximum pH set by the PERMENKES. The Turbidity Level and pH of October Raw Water. The results of the turbidity test and pH of raw water in October can be seen in Table 2 below.

Table 2 Test Results of Turbidity and pH of Raw Water in October

No	Turbidity Test Results	pH Test Results
1	9.96	7.75
2	10.71	7.75
3	12.54	7.78
4	13.48	7.73
5	11.46	7.75
6	20.65	7.63
7	14.71	7.86
8	10.30	7.43
9	9.58	7.39
10	11.27	7.47
11	11.93	7.59
12	14.91	7.58
13	13.59	7.56
14	11.24	7.46
15	14.55	7.40
16	15.41	7.49
17	12.56	7.46
18	10.05	7.39
19	12.35	7.65
20	9.95	7.69
21	12.58	7.71
22	50.50	7.71
23	15.90	7.67
24	12.54	7.73
25	20.46	7.74
26	19.97	7.71
27	11.73	7.74
28	14.05	7.86
29	10.52	7.77
30	14.32	7.70
31	18.40	7.70
Average	14.59	7.64

The highest level of turbidity occurred on October 22, which was 50.50 NTU.
Water turbidity in October has an average of 14.59 NTU. The pH test results in diagram 5.2 above show that there is no very drastic increase and is still stable. The pH of water in September has an average of 7.64 and is in accordance with the maximum pH set by the PERMENKES. Turbidity Level and Reservoir Water pH in September. The results of the turbidity test and the pH of the reservoir water after going through the water treatment process can be seen in Table 3 below.

Table 3 Test Results of Turbidity and Reservoir Water pH in September

No	Turbidity Test Results	Ph Test Results
	0.52	7.72
1	0.68	7.78
2 3	0.51	7.78
4	0.56 0.62	7.68
5		7.75
6	0.65	7.54
7	0.61	7.65
8	0.69	7.68
9	0.82	7.73
10	0.72	7.7
11	0.72	7.74
12	0.77	7.78
13	0.86	7.8
14	0.97	7.78
15	0.7	7.42
16	0.56	7.35
17	0.57	7.46
18	0.65	7.48
19	0.66	7.58
20	0.73	7.61
21	0.98	7.42
22	0.58	7.4
23	0.49	7.42
24	0.49	7.35
25	0.67	7.65
26	0.66	7.71
27	0.86	7.6
28	0.98	7.38
29	0.8	7.39
30	0.58	7.6
Average	0.69	7.6

From Table 3, it is known that the results of the turbidity test after the water was processed during September experienced an average decrease of 42.38 NTU with an average of 0.69 NTU. The level of turbidity from Table
5.5 is in accordance with the drinking water quality standard set by PERMENKES, which is a maximum of 5 NTU. The pH of the water decreased with an average decrease of 0.84. The pH of the water in Table 5.5 is in accordance with the water quality standards set by the PERMENKES, which is 6.5-8.5. Turbidity Level and Reservoir Water pH in October. The results of the turbidity test and water pH after going through the water treatment process during October can be seen in Table 4 below.

Table 4 Test Results of Turbidity and Reservoir Water pH in October

No	Turbidity Test Results	pH Test Results
	0.39	7.34
1	0.58	7.65
2	0.6	7.71
3	0.72	7.77
4	0.6	7.47
5	0.54	7.4
6	0.44	7.51
78	0.61	7.47
9	0.7	7.4
10	0.69	7.37
11	0.67	7.48
12	0.61	7.47
13	0.64	7.49
14	0.67	7.4
15	0.55	7.45
16	0.64	7.57
17	0.61	7.38
18	0.58	7.58
19	0.6	7.56
20	0.62	7.6
21	0.59	7.64
22	0.58	7.39
23	0.97	7.53
24	0.8	7.37
25	1.08	7.5
26	0.89	7.51
27	0.73	7.53
28	0.69	7.52
29	0.95	7.54
30	0.73	7.53
31	0.55	7.55
Average	0.67	7.51

It is known that the results of the turbidity test after the water was processed during October experienced an average decrease of 13.92 NTU with an average of 0.67 NTU. The level of turbidity from table 5.5 is in accordance with the drinking water quality standard set by PERMENKES, which is a maximum of 5 NTU. The
pH of the water decreased with an average decrease of 0.13. The pH of the water in table 5.7 is in accordance with the water quality standards set by the PERMENKES, which is 6.5-8.5. West Semarang SPAM Water Quality Lab Test on Microbiological, Inorganic Chemistry, Physical and Chemical Parameters in September. The results of the water quality test according to these 3 parameters can be seen in Table 5 below.

Table 5 Lab Test Results of Water Quality Parameters Microbiology, Inorganic Chemistry, Physical, and Chemical September

Parameter	Unit	Standard PERMENKES	Test results	Test Method
E-Coli	Quantity/ 100 ml	0	0	9222 G#)
Total Bacteria coliform	Quantity/ 100 ml	0	0	9222 B#)
Nitrite	mg/L	3	< 0.003	SNI 06-6989.9-2004
Nitrate	mg/L	50	1.42	4500-NO3 B#)
Smell	mg/L Odorless		Odorless	SNI 3554:2015 part 3.2.2
Color	Pt-Co	15	< 2.5	SNI 06-6989.80-2011
Total Dissolved Solid (TDS)	mg/L	500	89.2	SNI 06-6989.11-2019
NTU cloudiness		5	1.2	SNI 06-6989.25-2005
Flavor	mg/L Tasteless		Tasteless	SNI 3554:2015 part 3.2.1
Temperature	°C	Air temperature ±3	30°	SNI 06-6989.23-2005
Aluminum mg/L		0.2	< 0.010	3113 B,3030 E#)
Iron mg/L mg/L mg/L		0.3	< 0.030	SNI 06-6989.84-2019
hardness	mg/L	500	96.4	SNI 06-6989.12-2004
Chloride		250	11.7	SNI 06-6989.19-2019
Manganese		0.4	< 0.030	SNI 06-6989.84-2019
pH		6.5-8.5	7.5	SNI 06-6989.11-2019
Sulfate	mg/L	250	< 0.400	SNI 06-6989.20-2019
Ammonia	mg/L	1.5	< 0.036	SNI 06-6989.30-2005

Water quality in September with microbiological test parameters showed that the levels of E-Coli bacteria were 0 ml and the total coliform bacteria was 0 ml. Inorganic chemistry parameters include Nitrite content of <0.003 mg/L, and Nitrate of 1.42 mg/L. Physical Parameters, among others odorless water, color in water < 2.5 Pt-Co, TDS of 89.2 mg/L, turbidity of 5 NTU, tasteless water, water temperature of 30ÿC. For chemical parameters, among others, aluminum content in water is <0.010 mg/L, iron content is <0.030 mg/L, hardness is 96.4 mg/L, chloride content is 11.7 mg/L, manganese is <0.030 mg/L, water pH of 7.5, sulfate levels of <0.400 mg/L, ammonia levels in water of <0.036 mg/L. This means that the results of drinking water treatment in September have met the requirements for the standard quality of drinking water that have been set. And the drinking water itself can already be distributed to the local community. West Semarang SPAM Water Quality Lab Test on Microbiological, Inorganic Chemistry, Physical and Chemical Parameters in October. SThe results of the water quality test according to these 3 parameters can be seen in Table 6 below.

Table 6 Water Quality Lab Test Results Microbiological Parameters, Inorganic Chemistry, Physical and Chemical October

Parameter	Unit	Standard PERMENKES	Test results	Test Method
E-Coli	Quantity/ 100 ml	0	0	9222 G#)
Total Bacteria coliform	Quantity/ 100 ml	0	0	9222 B#)
Nitrite	mg/L	3	< 0.003	SNI 06-6989.9-2004
Nitrate	3.2.2 4500-NO3 B#) mg/L	50	2.53	Odorless SNI 3554:2015 section
Smell				
Color	Pt-Co	15	< 2.5	I 06-6989.80-2011
TDS	mg/L	500	91.6	I 06-6989.11-2019
NTU cloudiness		5	0.904*)	I 06-6989.25-2005
Flavor	mg/L Tasteless	Tasteless	SNI 3554:2015 section 3.2.1	
Temperature	°C	Air temperature ±3	26	SNI 06-6989.23-2005
Aluminum	mg/L	0.2	< 0.010	3113 B,3030 E#)
Iron	mg/L	0.3	< 0.030	SNI 06-6989.84-2019
hardness	mg/L	500	95.7	SNI 06-6989.12-2004
Chloride	mg/L	250	10.9	SNI 06-6989.19-2019
Manganese	mg/L	0.4	< 0.030	SNI 06-6989.84-2019
pH		6.5-8.5	7.5*)	SNI 06-6989.11-2019
Sulfate	mg/L	250	< 0.400	SNI 06-6989.20-2019
Ammonia	mg/L	1.5	< 0.036	SNI 06-6989.30-2005

of 0 ml E-Coli bacteria and 0 ml of total coliform bacteria. Intermediate Inorganic Chemical Parameters

others, Nitrite levels are <0.003 mg/L, and Nitrate is 2.53 mg/L. Physical parameters include odorless water, color in water < 2.5 Pt-Co, Total Dissolved Solid (TDS) of 91.6 mg/L, turbidity of 0.904 NTU, tasteless water, water temperature of 26ÿC. For chemical parameters, among others, aluminum content in water is <0.010 mg/L, iron content is <0.030 mg/L, hardness is 95.7 mg/L, chloride content is 10.9 mg/L, manganese is <0.030 mg/ L, water pH of 7.5, sulfate levels of <0.400 mg/L, ammonia levels in water of <0.036 mg/L. From the results of the research that has been carried out, it shows that the Water Treatment Plant is effective in improving the quality of drinking water treatment and the results of drinking water treatment have met the standard quality requirements set by PERMENKES. And the drinking water itself can already be distributed to the local community.

4. CONCLUSION

Based on the results of observations and analysis obtained from research on the effectiveness of Water Treatment Plant in improving the quality of clean water treatment can be seen from the results of laboratory tests for raw water and reservoir water based on predetermined drinking water quality standards PERMENKES RI Number 492/MENKES/PER/IV/2010 on SPAM (Drinking Water Supply System) West Semarang) it can be concluded that the Water Treatment Plant is very influential and has been effective in water treatment.

ACKNOWLEDGMENT

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