Analysis Water Quality in Reservoir of PDAM Tirta Bhagasasi Bekasi City Branch

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Abstract

Water is needed to support various living systems. Almost all of human life needs require water, both for household needs, agriculture, industry and other economic activities. It's need for clean water increases along with the reduction in clean water available in the area, which if not managed properly, it can be scarcity. This type of research is quantitative descriptive. This research was conducted at the reservoir of Water Treatment Plant of PDAM Tirta Bhagasasi, Bekasi City Branch. Sampling was carried out for five days on January 29-February 2 in 2024. The parameters tested in this study are temperature, pH, turbidity, odor and taste. Testing was carried out at the PDAM Tirta Bhagasasi Laboratory. It aim of this research is to analyze the water quality in the reservoir of Water Treatment Plant in PDAM Tirta Bhagasasi Bekasi City and then the results are compared with the clean and drinking water quality standards in accordance with Minister of Health Regulation Number 32 of 2017. The results of the research show that the water quality of the Water Treatment Plant in PDAM Tirta Bhagasasi Bekasi City in terms of temperature, pH, turbidity, odor and taste parameters have fulfilled the standard of clean water by the government. Based on the results of this research, it is hoped that PDAM will continue to carry out regular inspections and cleaning of each Water Treatment Plant building, because this can affect water quality, where water quality is one of the most important factors in maintaining customer satisfaction with PDAM Tirta Bhagasasi Bekasi City Branch.

Keywords: *Clean water, water quality, PDAM.*

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A. INTRODUCTION

Indonesia is a country with the seventh largest renewable water resources in the world amounting to 2,019 billion m^3, but only 0.75% can be utilized, form of mountain springs, river water, lake water and ground water (Andianti et al., 2020). Water is needed to support various living systems. Almost all of human life needs require water, both for household needs, agriculture, industry and other economic activities (Silviana et al., 2020). The need for clean water has increased significantly along with population growth, improvements in the industrial sector and people's living standards (Sumantri & Parwiyanto, 2017). The availability of water will be limited if there are pollutant sources that produce pollutants, thereby polluting water sources and reducing water quality. Drinking water quality is one of the biggest factors influencing human health (Li & Wu, 2019). Regional Drinking Water Company (PDAM) of Tirta Bhagasasi is a Regional Owned Enterprise which operates in the field of clean water services for industrial areas or residential areas in the Bekasi City area. Every year there is an increase in the number of customers from PDAM Tirta Bhagasasi. This proves that it's need for clean water in Bekasi City is increasing from year to year. It's need for clean water for household purposes, such

as drinking water, bathing water, and so on must fulfilled the requirements of the Minister of Health Regulation Number 32 of 2017 concerning Environmental Health Quality Standards and Health Requirements for Water for Hygiene, Sanitation, Swimming Pools, Solus Per Aqua, and Public Baths. Therefore, water processed by PDAM must go through an appropriate processing process to produce water quality that is in accordance with Minister of Health Regulation Number 32 of 2017. The aim of this research is to analyze the water quality in reservoir of PDAM Tirta Bhagasasi, Bekasi City Branch.

B. LITERATURE REVIEW

1. Clean Water

Clean water is water that is suitable for use by the community based on its physical, chemical and biological quality (World Health Organization, 2003). Minister of Health Regulation Number 416 of 1990 concerning Conditions and Monitoring of Water Quality states that clean water is water that can be used for daily needs and whose quality meets health requirements and can be drunk if cooked. According to (Kodoatie, 2003) clean water is water that is used for daily activities such as washing, bathing, cooking and can be drunk after cooking. Clean water is water that is clear, colorless, odorless, tasteless, and does not contain minerals or germs that are harmful to the body, which is used for daily needs, where clean water can also be used as a means of improving welfare, life through efforts to improve health status, so that it becomes important to fulfilled it in adequate quantity and quality (Wahyuni & Junianto, 2017). According to (Suripin, 2002) clean water is water that is safe (healthy) and good for drinking, colorless, odorless, with a fresh taste. Clean water is water that meets the requirements for the supply of drinking water (Richter et al., 2018)

Clean Water Requirements There are several main requirements that must be met in a clean water supply system (Suripin, 2002):

a. Quantitative Terms

   Quantitative requirements in the provision of clean water are viewed from the amount of raw water available that it can be used to filled needs according to the number of people to be served. In addition, the amount of water needed is very dependent on the level of technological and socio-economic progress of the local community. Based on Minister of Home Affairs Regulation Number 23 of 2006 concerning Technical Guidelines and Procedures for Setting Drinking Water Tariffs, the basic water requirement standard is 60 liters/person/day. The provision of clean water must meet the needs of the community because the limited supply of clean water makes it easier for disease to arise in the community.

b. Qualitative Terms

   Qualitative requirements include the quantity or quality of raw water. These requirements include physical, chemical, biological and radiological requirements.

c. Physical Requirements
Physically, clean water must be clear, colorless, odorless and tasteless. Salty, sweet, bitter, sour tastes and so on must not be present in clean water for the community. The smell in water is rotten, fishy, and so on. Smell and taste are usually present together in water. The water temperature should be the same as the air temperature or approximately 25°C. Meanwhile, whether the water is clear or not is due to the presence of colloidal grains from clay. The more colloids it contains, the more turbid the water becomes.

d. Chemical Requirements
Clean water must not contain chemicals in excessive amounts. Clean water must not contain toxic substances, must not contain substances that it can cause health problems, must not contain substances that exceed certain levels so that it cause technical problems, and must not contain certain chemicals that it can cause economic problems. One of the chemical requirements for clean water is hardness. According to (Chandra, 2012) water for drinking and cooking purposes is only permitted with a hardness limit of 50-150 mg/L. Hardness levels above 300 mg/L include very hard water.

e. Bacteriologically Requirements
Clean water must not contain pathogenic and parasitic germs such as typhus, cholera and dysentery, because if pathogenic bacteria are found in drinking water it will disrupt health or cause disease. To determine the presence of pathogenic bacteria, you can observe the presence or absence of E.Coli bacteria, which are indicator bacteria for water pollution. Bacteriologically, the total coliform permitted in clean water is 0 colonies per 100 mL of clean water. Clean water containing more than this level of E.Coli is considered contaminated by human waste.

2. Water Quality

Water quality is a very complex subject and it is reflected in the type of measurement and indicator of water used. In providing clean water, besides from the quantity, the quality must also fulfilled applicable standards. In the case of clean water, it is a general practice to determine the quality and characteristics to obtain raw water of water quality standards. So, to get a real picture of the characteristics of raw water, we need measurements of water properties called water quality parameters. Water quality indicates the quality associated with certain activities. Therefore, water quality varies from one activity to another. Water quality is determined based on physical, chemical and biological parameters (Asdak, 2010).

C. METHOD

This type of research is quantitative descriptive. This research was conducted at PDAM Tirta Bhagasasi, Bekasi City Branch. Sampling was carried out for five days on January 29-February 2 2024. Water quality checks were carried out at the reservoir of the Water Treatment Plant in PDAM Tirta Bhagasasi, Bekasi City

Branch. The parameters tested in this study were temperature, pH, turbidity, odor and taste. Testing was carried out at the PDAM Tirta Bhagasasi Laboratory. The results of the data obtained were then compared with Minister of Health Regulation Number 32 of 2017 concerning Environmental Health Quality Standards and Health Requirements for Water for Hygiene, Sanitation, Swimming Pools, Solus Per Aqua and Public Baths (Departemen Kesehatan, 2017).

D. RESULT AND DISCUSSION

Water quality is the qualitative condition of water which is measured and tested based on certain parameters and methods based on applicable legislation (Kementrian Lingkungan Hidup, 2003). A good water quality should be the physical parameter test requirements, including water that is odorless, tasteless, colorless, and has a normal temperature. The following are the results of water quality tests at the reservoir of PDAM Tirta Bhagasasi, Bekasi City Branch, which can be seen in Table 1.

Table 1. Water Quality Test Results on Reservoir of PDAM Tirtta Bhagasasi, Bekasi City Branch

Parameter	Unit	Quality Standards	Measurement Results					Average Measurement
			1	2	3	4	5	
Temperature	℃	25 ± 3	28.5	29.2	28.3	26.1	27	27.8
pH	-	6.5 – 8.5	7.2	7.2	7.4	7.1	7.1	7.2
Turbidity	NTU	25	4.37	3.32	6.00	5.18	4.55	4.68
Odor	-	Odorless	Odorless	Odorless	Odorless	Odorless	Odorless	Odorless
Flavor	-	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless

Source: Company Data

Based on Table 1, all of water quality parameters at the PDAM Tirta Bhagasasi Reservoir Bekasi City Branch have met the standard standards set by PERMENKES No. 32 of 2017. This shows that the water is clean and suitable for distribution.

a. Temperature

Temperature can be directly affected by sunshine. The heat produced by sunshine and absorbed by water can change at any time based on the season in the area (Eka Putri et al., 2022). The average water temperature in the PDAM Tirta Bhagasasi reservoir is 27.8 ℃, which means the temperature still meets the requirements, so it can be categorized as good for consumption. The water temperature should be cool or not hot, especially so that there is no dissolution of chemicals in the channels/pipes, which can endanger health and inhibit the growth of organisms (Latupeirissa & Manuhutu, 2020). Study (Hasrianti & Nurasia, 2016) explains that good water must be the same as the temperature of the air in the area which ranges between (20 - 30) °C. Water is said to be polluted if it has a temperature above or below the air temperature in that area (Renngiwur & Mahulauw, 2016) reveals that water that has a temperature above or below air temperature means that it contains certain dissolved substances or that the decomposition process of organic matter is underway, which is caused by microorganisms in the water.

b. pH (Power of Hydrogen)

pH is a parameter to indicate the total number of positive ions in water. The pH value is important in determining water quality because water acidity is generally caused by oxide gases dissolved in water, especially carbon dioxide (Latupeirissa & Manuhutu, 2020). The more positive ions in the water, the lower the water pH. The low pH value is caused by the large number of heavy metal pollutants in the waters which result in acidic water hardness. Changes in pH in water greatly influence the physical, chemical and biological processes of the organisms that live in it (Kristanto, 2002). (Rohmawati & Kustomo, 2020) explained that the pH value is also influenced by the soil structure in the area where the water reservoir is located. The average pH measurement results in the reservoir of PDAM Tirta Bhagasasi, Bekasi City Branch are 7.2. The results obtained explain that the water quality conditions in terms of pH parameters still fulfilled the quality standards by PERMENKES No. 32 of 2017.

c. Turbidity

Turbidity is amount of suspended matter in a body of water. Turbidity can be caused by various types of suspended material. The more suspended material, the more turbid the water will look. Turbidity values are expressed in Nephelometric Turbidity Units (NTU). The average turbidity measurement results in the reservoir of PDAM Tirta Bhagasasi, Bekasi City Branh are 4.68 NTU. This results, indicate that the water quality conditions in terms of turbidity parameters still fulfilled the quality standards set by PERMENKES No. 32 of 2017. Turbidity is caused by a lack of dosage in adding coagulants which function to purify water, the buildup of flocs on the water filter due to the accumulated flocs being carried into the reservoir, and due to not routinely washing the filters (Eka Putri et al., 2022). Therefore, in an effort to overcome the turbidity of the water in the reservoir, regular washing out is carried out every week.

d. Smell and Taste

Smell and taste test parameters are carried out by observing the sense of smell and taste using the organoleptic method. Organoleptic testing is testing carried out using human senses as the main tool for assessing the quality of a food/drink product (Eka Putri et al., 2022). The result of the test are odorless, which means the value have fulfilled the established quality standards. This is because the filtration process was carried out properly, namely by adding chlorine at the permitted dose, namely ≤ 5 mg/L which functions as a disinfectant to kill germs and bacteria in the water and can also remove odors originating from the raw water source used by the PDAM.

The taste test is carried out by observation through the sense of taste and directly compared with distilled water using the organoleptic method. Based on the test results, the water are tasteless, so it can be said the water have fulfilled the established quality standards. The taste of water is caused by metal compounds that dissolve into the water through pipes. The taste of chlorine is also caused by the process of adding disinfectant. Taste in water can be prevented if the processing

process carried out by PDAM officers complies with established standards. (Slamet, 2011)also stated that the smell and taste of water can be caused by several factors such as the source of the clean water supply used and the pipes used to drain the water.

E. CONCLUSION

Based on the results analysis water quality of reservoir testing at the PDAM Tirta Bhagasasi Water Treatment Plant, Bekasi City Branch, the parameters of temperature, pH, turbidity, odor and taste have fulfilled the quality standards of Minister of Health Regulation Number 32 of 2017 concerning Environmental Health Quality Standards and Water Health Requirements for Sanitation Hygiene Needs, Swimming Pools, Solus Per Aqua, and Public Baths. The next effort for PDAM is expected to continue to carry out regular inspections and cleaning of each Water Treatment Plant building, because this can affect water quality, where water quality is one of the most important factors in maintaining customer satisfaction with PDAM Tirta Bhagasasi, Bekasi City Branch.

REFERENCES

1. Andianti, R., Mardiyah, S., & Purba, W. S. (2020). *Statistik Lingkungan Hidup Indonesia Air dan Lingkungan Environment Statistics of Indonesia: Water and Environment 2020*. Badan Pusat Statistik.
2. Asdak, C. (2010). *Hidrologi dan Pengelolaan Daerah Aliran Sungai*. Gadjah Mada University Press.
3. Chandra, B. (2012). *Pengantar Kesehatan Lingkungan*. Kedokteran EGC.
4. Eka Putri, F., Fitri, A., Dzikri Andiatama, M., Studi Kesehatan Masyarakat, P., & Kedokteran dan Ilmu Kesehatan, F. (2022). JIK (Jurnal Ilmu Kesehatan) Analisis Kualitas Air Perusahaan Umum Daerah Air Minum Tirta Khayangan Kota Sungai Penuh. *Jurnal Ilmu Kesehatan)*, *6*(1).
5. Hasrianti, & Nurasia. (2016). Analisis Warna, Suhu, Ph dan Salinitas Air Sumur Bor Di Kota Palopo. *Jurnal Kesehatan Lingkungan Indonesia*, *2*(1), 747–896.
6. Kementrian Lingkungan Hidup. (2003). *Keputusan Mentri Lingkungan Hidup No. 115 Tahun 2003 tentang Pedoman Penentuan Status Mutu Air*.
7. Kodoatie, R. J. (2003). *Pengelolaan Sumber Daya Air Dalam Otonomi Daerah*. Yogyakarta: Andi Offset.
8. Kristanto. (2002). *Ekologi Industri*. Yogyakarta: Andi Offet.
9. Latupeirissa, A. N., & Manuhutu, J. B. (2020). Analisis Parameter Fisika dan Kesadahan Air PDAM Wainitu Ambon. *Molluca Journal Chemical Education*, *10*, 1-7.
10. Li, P., & Wu, J. (2019). Drinking Water Quality and Public Health. *Exposure and Health*, *11*(3), 73–79.
11. Peraturan Menteri Kesehatan Nomor 32 Tahun 2017 Tentang Standar Baku Mutu Kesehatan Lingkungan dan Persyaratan Kesehatan Air untuk Keperluan Higiene Sanitasi, Kolam Renang, Solus Per Aqua, dan Pemandian Umum.

12. Renngiwur, J., & Mahulauw, A. (2016). Analisis Kualitas Air Yang Di Konsumsi Warga Desa Batu Merah Kota Ambon. *Journal Biological Science Education*, *5*(2).
13. Richter, B. D., Blount, M. E., Bottorff, C., Brooks, H. E., Demmerle, A., & Gardner, B. L. (2018). Assessing the Sustainability of Urban Water Supply Systems. *J. Am. Water Works*, 40–47.
14. Rohmawati, Y., & Kustomo, K. (2020). Analisis Kualitas Air pada Reservoir PDAM Kota Semarang Menggunakan Uji Parameter Fisika, Kimia, dan Mikrobiologi, serta Dikombinasikan dengan Analisis Kemometri. *Walisongo Journal of Chemistry*, *3*(2), 100.
15. Silviana, E., Fajarwati, I., Syafrida, Y., Dewi, E., & Rinaldi. (2020). Analisis Logam Besi (Fe) Dalam Air PDAM Di Kabupaten Pidie Jaya Menggunakan Spektrofotometer Serapan Atom. *Serambi Engineering*, *5*(3), 1195–1200.
16. Slamet, J. S. (2011). *Kesehatan Lingkungan*. Gadjah Mada University Press.
17. Sumantri, B., & Parwiyanto, H. (2017). Kualitas Pelayanan Perusahaan Daerah Air Minum (PDAM). *Journal of Chemical Information and Modeling*, *1*(1), 11–23.
18. Suripin. (2002). *Pelestarian Sumber Daya Tanah dan Air*. Andi Offset.
19. Wahyuni, A., & Junianto. (2017). Analisa Kebutuhan Air Bersih Kota Batam Pada Tahun 2025. *Jurnal TAPAK*, *6*(2), 116–126.
20. World Health Organization. (2003). *The World Health Report: Shaping the Future*. WHO.