
Analysis Of Drinking Water Treatment At Regional Public Drinking Water Company or Perumda Drinking Water Tirta Mayang Jambi City

Farah Luthfiah Putri Susanto¹⁾, Dwi Noerjoedianto²⁾, Oka Lesmana S³⁾, Fajrina Hidayati⁴⁾, Ashar Nuzulul Putra⁵⁾

^{1,2,3,4,5)}Program Studi Ilmu Kesehatan Masyarakat, Universitas Jambi, Jambi

*Corresponding Author

Email : farahluthfivah14@gmail.com

Abstract

The Batanghari River serves as the primary source of raw water for the Regional Drinking Water Company (Perusahaan Umum Daerah Air Minum/Perumda) Tirta Mayang in Jambi City. Over the past five years, the declining quality of river water has required more complex treatment processes to meet drinking water standards. The main reference for water quality parameters in the water treatment system at Perumda Tirta Mayang is the Indonesian Ministry of Health Regulation No. 492 of 2010. In addition to the deteriorating water quality of the Batanghari River, one of the major challenges faced by Perumda Tirta Mayang is frequent pipe leakage and recurring water supply interruptions, which often cause inconvenience for the community. This study employed a qualitative descriptive approach. The descriptive method was used to portray the current condition of the research subject based on observable facts, employing techniques such as in-depth interviews, field observations, and document analysis. The results of this study show that although the raw water quality requires extensive treatment, the final processed water meets the required standards. Moreover, the challenges encountered in the water treatment process can be effectively addressed through strong coordination and collaboration within the company.

Keywords: *Water Treatment, Perumda Tirta Mayang, Batanghari River, Drinking Water Quality, Water Supply Management*

INTRODUCTION

Clean water is a fundamental need for all people. It can be sourced from both surface water and groundwater, including rivers, lakes, springs, and wells. However, the availability of a water source does not necessarily guarantee that the water meets the criteria for clean or potable water. Increasing levels of pollution—such as improper disposal of domestic waste, industrial effluents, and solid waste into water bodies—have led to a significant decline in the quality of water sources.

This situation is becoming increasingly alarming as clean water is becoming scarcer and is no longer sufficient to meet the needs of daily life. Although water is abundant—found in rivers, reservoirs, lakes, and oceans—its usability is constrained by quality concerns. Water issues remain critical, including the provision of clean water in urban and rural areas, water pollution, and the management of domestic and industrial wastewater. Given that water is essential to all forms of life, ensuring its availability in adequate quantity and quality is of utmost importance.

In terms of clean water and drinking water needs, raw water cannot be directly used without prior treatment. The treatment process is essential to ensure that water meets the required health standards for safe consumption. At the same time, demand for clean and drinking water continues to increase due to population growth and urban development.

The Perusahaan Umum Daerah Air Minum (Perumda) Tirta Mayang of Jambi City is a regional government-owned enterprise responsible for processing surface water into drinking water and distributing it to the public. This agency operates under the supervision of local executive and legislative authorities and follows the guidelines set by the Indonesian Ministry of Health Regulation No. 492 of 2010 on Drinking Water Quality Requirements. However, various challenges prevent the water reaching consumers from consistently meeting potable water standards—though it still qualifies as clean water for domestic use.

One of the most crucial elements in the water treatment process at Perumda Tirta Mayang is the raw water source itself. In Jambi City, the primary raw water source is the Batanghari River. Based on

preliminary observations and interviews with relevant parties, the quality of Batanghari River water has declined over the past five years, with increasing turbidity due to upstream sedimentation and a decreasing water level.

Access to clean water that meets specific quality standards has become increasingly costly due to widespread contamination by various human activities, including domestic, industrial, and other sectors. Consequently, the reliance on water continues to grow along with the population. To address this issue, regional water companies like Perumda play a key role in treating raw water from different sources into potable water for public consumption.

Perumda Tirta Mayang's treatment process includes water intake, coagulation, sedimentation, filtration, and storage in reservoirs. The efficiency of these processes is highly influenced by the quality of the raw water, including its turbidity, color, pH, and presence of metals and chemicals. Additionally, aging infrastructure and equipment often hinder optimal operation, leading to technical and non-technical challenges in ensuring consistent water quality, quantity, and continuity.

Moreover, the rising demand for clean water in Jambi City is not matched by adequate supply. According to Perumda Tirta Mayang, they currently serve only about 79% of the city's population. The growing population increases the number of households requiring access to clean water, placing further strain on the system.

Given these challenges, it is necessary to conduct an analysis of the water treatment process at Perumda Tirta Mayang, Jambi City. This study aims to examine how raw water from the Batanghari River is processed into clean water, identify any challenges encountered during the treatment and distribution stages, and evaluate whether the current system can meet the city's growing needs.

RESEARCH METHODS

This research adopts a qualitative descriptive approach, which is intended to systematically describe and analyze the condition of the research object based on real, observable facts. The descriptive method is used to present a detailed and factual portrayal of the current situation without manipulating variables, thus allowing for a deeper understanding of the phenomena under investigation.

Data collection techniques include in-depth interviews, field observations, and document analysis. These methods were chosen to gain a comprehensive understanding of the drinking water treatment process at *Perusahaan Umum Daerah Air Minum (Perumda) Tirta Mayang*, Jambi City. In-depth interviews were conducted with selected informants to obtain detailed insights and expert opinions. Field observations were carried out directly at the water treatment facility to observe operational practices, equipment conditions, and environmental factors. In addition, document analysis was used to review technical reports, standard operating procedures, and regulatory compliance documents relevant to water treatment operations.

The research was also supported by several instruments to enhance data validity and accuracy, such as audio or video recording devices, structured interview question sheets, notebooks, and electronic tools including cameras and data processing software.

The informants selected for this study included representatives from technical management, production management, and field operational staff of Perumda Tirta Mayang. These individuals were chosen based on their knowledge, roles, and involvement in the water treatment process, ensuring that the data collected would be relevant, credible, and reflect different perspectives within the organization.

RESULTS AND DISCUSSION

This research presents findings obtained through a qualitative descriptive method, focusing on the water treatment process at Perusahaan Umum Daerah Air Minum (Perumda) Tirta Mayang in Kota Jambi. Preliminary observations indicate that the raw water sourced from the Batanghari River has significantly deteriorated in both quality and quantity, rendering it unfit for direct consumption. Consequently, Perumda Tirta Mayang plays a crucial role in transforming this raw water into potable water for the community.

During interviews, the researcher inquired about the specific requirements that treated water must meet before being distributed to the public. Based on responses from key personnel, it was found that the utility refers to Indonesia's Ministry of Health Regulation No. 492/MENKES/PER/IV/2010 as the primary guideline for water quality standards. This was confirmed by the company's Technical Director, who explained that in addition to national standards, the utility also adheres to Jambi City Regional Regulation No. 14 of 2015 on Water Quality Inspection, which outlines technical provisions, supervision measures, and responsibilities for ensuring the safety of drinking water¹⁶.

Other staff members, including those from production and treatment divisions, reaffirmed this statement, consistently citing the Ministry of Health regulation as the operational standard used to evaluate whether treated water is suitable for consumption. The company conducts daily water quality checks focusing on three main parameters: pH, residual chlorine, and turbidity. These parameters represent chemical, biological, and physical aspects of water quality, respectively. For example, manually treated water from the facility typically shows a pH level of 6.7, residual chlorine concentration of 0.3 mg/l, and turbidity of 4.12 NTU—all of which indicate that the treated water meets potable standards.

The water treatment process at Perumda Tirta Mayang generally follows conventional stages, including coagulation, flocculation, sedimentation, filtration, and disinfection. Coagulation involves the addition of chemical agents such as alum or PAC to aggregate fine particles into flocs. Flocculation facilitates the slow mixing of these flocs to ensure stability. In the sedimentation phase, flocs settle at the bottom of the tank by gravity. The water is then filtered to remove fine suspended matter not eliminated in prior stages. Finally, disinfection—typically using chlorine—is conducted to eliminate any remaining microorganisms.

These steps were consistently described during interviews with company personnel. The Technical Director provided a detailed explanation of the treatment sequence, noting that raw water undergoes initial screening before entering the coagulation-flocculation unit, followed by sedimentation, filtration, and disinfection. Staff members from the production and treatment divisions also emphasized that each stage serves a specific technical purpose, and that chemical compositions vary between phases.

Despite the effective treatment processes, several internal and external challenges remain. These include the declining quality of raw water from the Batanghari River and issues related to infrastructure, such as damaged or leaking pipes. This study was conducted to assess whether Perumda Tirta Mayang's water treatment processes are functioning as intended and to evaluate how the utility addresses challenges arising during operations, with the broader goal of ensuring safe and reliable Water supply for the residents of Kota Jambi.

Discussion

Raw Water Source and Water Treatment Process at Perumda Tirta Mayang Kota Jambi

One of the most essential components in water treatment is the availability of raw water itself. In the water treatment process carried out by Perusahaan Umum Daerah Air Minum (Perumda) Tirta Mayang Kota Jambi, the main raw water source used is the Batanghari River. This river remains the primary water source for the company's Water Treatment Plant (WTP) operations. However, the condition of the Batanghari River has significantly declined over the past five years, prompting the need for additional chemical inputs in the treatment process. This information is in line with statements

from the company's Technical Director and Managing Director, who confirmed that the Batanghari River remains the main source of raw water. They also stated that the company is currently seeking alternative water sources to reduce dependency on the Batanghari River, which has become increasingly polluted due to both intentional and unintentional waste discharge.

The unstable quality of the Batanghari River has led to increased treatment efforts, with water purification activities now requiring nearly twice the effort as before. Despite these challenges, Perumda Tirta Mayang has managed to maintain control over the situation and continues to seek alternative raw water sources as a precautionary step.

The first stage in the treatment process is coagulation, which involves rapid mixing of coagulants into the raw water to destabilize colloidal particles and suspended solids. According to Reynolds (1996), coagulation aims to neutralize the electrical charges of colloids, making them easier to aggregate. Syaiful (2014) further notes that this process helps in removing pathogens like bacteria and viruses. Alvin et al. (2018) emphasized that particles smaller than 0.06 mm cannot settle within typical sedimentation tanks and must undergo coagulation for effective removal. Coagulants such as alum (aluminium sulfate) and PAC (polyaluminium chloride) are commonly used to facilitate this process.

The next phase is flocculation, where slow mixing allows the coagulated particles to aggregate into larger flocs. According to Trijiko (2010), flocculation follows coagulation and is essential for promoting the formation of settleable flocs. Factors such as raw water quality, operational targets, site conditions, cost, and available infrastructure influence the flocculation design. Interview findings indicate that after coagulation, Perumda Tirta Mayang performs slow mixing to enhance floc formation before sedimentation.

Sedimentation follows flocculation. In this stage, flocs are allowed to settle under gravity in sedimentation tanks. Larger and denser particles settle more quickly, forming sludge at the bottom of the tank, which is removed regularly. The clarified water from the top proceeds to the next treatment phase. Tri Joko (2010) noted that sedimentation removes coagulated particles such as turbidity, color, and hardness-causing compounds like calcium carbonate, iron, and manganese.

The clarified water is then subjected to filtration. This step physically and chemically removes any remaining fine particles that were not removed during sedimentation. Filtration media commonly include silica sand, gravel, and anthracite. Aliza et al. (2020) explained that filtration can be carried out using rapid or slow sand filters, as well as through gravity or pressure systems. The goal is to reduce turbidity, taste, odor, and microbial contaminants to meet drinking water quality standards.

After filtration, the water undergoes disinfection, a critical step to eliminate pathogenic microorganisms such as bacteria, viruses, and protozoa. Perumda Tirta Mayang typically uses chlorine in gas or liquid form for this purpose. The chlorine dosage is adjusted to be both effective and safe. Additional chemicals may also be added to adjust pH, reduce hardness, or reintroduce essential minerals, depending on the initial water quality and national drinking water standards (Ministry of Health Regulation No. 2 of 2023).

The treated water is then stored in reservoirs and distributed to consumers through a pipe network. Residual disinfectant levels, such as free chlorine, are maintained to prevent recontamination during distribution. Based on interviews, it can be concluded that the water treatment process at Perumda Tirta Mayang follows applicable standards and produces water that is safe and suitable for public consumption after boiling.

Water Quality Parameters

According to Kusnaedi (2010), the physical characteristics of water can be analyzed visually through senses—turbidity, color, odor, and taste. The Ministry of Health Regulation No. 492/Menkes/PER/IV/2010 outlines physical, chemical, and bacteriological requirements for potable water. Saputri (2011) classifies these parameters into three categories²⁴:

1. Physical Parameters: Water should be clear, colorless, odorless, and tasteless. Turbidity is caused by suspended solids, including organic matter and microorganisms. Color can result from

- decomposed organic matter and iron. Odor and taste are usually due to microbial activity and organic pollutants. Temperature should be close to ambient conditions, around 25°C.
2. Chemical Parameters: Water should be free from harmful chemicals. Acceptable pH ranges ensure water is neither corrosive nor scale-forming. Iron and manganese, often found in natural sources, must be within acceptable limits to prevent aesthetic and operational issues. Organic substances such as those measured by KMnO_4 must be minimized to avoid taste and odor problems and pipe corrosion.
 3. Bacteriological Parameters: Drinking water must not contain pathogenic or parasitic bacteria, such as *E. coli*. The presence of *E. coli* indicates fecal contamination. According to regulations, total coliforms should be 0 colonies per 100 ml of water.

Challenges Encountered

As a regional water utility company, Perumda Tirta Mayang aims to meet the increasing demand for clean water in Kota Jambi, driven by population and urban growth. One of the main challenges faced is the declining quality of the Batanghari River. As revealed through interviews and secondary data analysis, raw water quality has deteriorated, requiring more intensive treatment efforts.

Another significant issue is pipeline damage or leakage, which disrupts water delivery and causes customer dissatisfaction. The public service provided by Perumda Tirta Mayang has not fully met community expectations. To improve service quality, the company is taking proactive measures, including searching for alternative water sources to reduce reliance on the Batanghari River and conducting regular maintenance and prompt repairs on infrastructure.

CONCLUSION

Based on the results and discussion of the research on drinking water treatment analysis at the Regional Drinking Water Company (Perusahaan Umum Daerah Air Minum/Perumda) Tirta Mayang of Jambi City, the following conclusions can be drawn:

1. The condition of the Batanghari River, which serves as the primary raw water source, has significantly deteriorated over the past five years due to pollution. Despite this, the Batanghari River remains the main source of raw water for Perumda Tirta Mayang of Jambi City.
2. The water treatment process at Perumda Tirta Mayang of Jambi City is carried out through several stages, including the intake of raw water from the Batanghari River, coagulation, flocculation, sedimentation, filtration, and disinfection. These processes have been implemented in accordance with established technical standards for potable water treatment.
3. The quality of water produced by Perumda Tirta Mayang of Jambi City has met the standards stipulated in Minister of Health Regulation No. 492/MENKES/PER/IV/2010 regarding drinking water quality requirements.

The most common challenges encountered include frequent pipe damage and leakage, which disrupt water distribution and result in public complaints. Additionally, the fluctuating quality of water in the Batanghari River increases the workload for the company

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