International Journal of Engineering Research and Development
e- ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com
Volume 22, Issue 2 (February 2026), PP 01-04

Optimization of Clean Water Distribution in the Main Distribution Network of PDAMLematangEnim, TanjungEnim, South Sumatra

Achmad Syarifudin[1*]; Sella Marchel Morisca[2]
[1]*Post Graduate of Civil Engineering, Faculty of Engineering, Universitas Bina Darma, Indonesia*
[2]*Post Graduate of Civil Engineering, Faculty of Engineering, Universtas Bina Darma, Indonesia*
**Corresponding Author*

Abstract
This research aims to optimize the clean water distribution system at PDAM LematangEnimTanjungEnim Branch, which faces the main problem in the form of lack of efficiency in water distribution. With the population continuing to increase, the need for clean water in LawangKidul District is also increasingly urgent, reaching 10,722 house connections in 2023. This study uses a quantitative analysis approach and hydraulic simulation method with EPANET software to calculate water discharge needs, pipeline design, and evaluation of existing distribution systems.
The results of the study show that the optimal pipe diameter needed to meet clean water needs is 220 mm. The maximum water discharge required was estimated at 39,098 litres per second during peak hours, while hydraulic simulations showed fluctuations in water distribution, with some areas experiencing supply shortages due to systems not functioning optimally.
The conclusion of this study is that optimizing the water distribution system is indispensable to improve the quality, quantity, and continuity of clean water supply. The suggestions included the need to rejuvenate aging pipelines, increase production capacity through infrastructure upgrades, and the implementation of better monitoring technologies to reduce leaks and improve distribution efficiency. In addition, it is important to conduct adaptive planning based on projected population growth and climate change. With these steps, it is hoped that PDAM LematangEnim can improve services to the community and meet clean water needs equally, as well as reduce the negative impact of the water crisis.
Keywords*: clean water distribution, epanet, clean water, water quality, water quantity.*

Date of Submission: 24-01-2026 Date of acceptance: 06-02-2026

I. INTRODUCTION

Water is a basic human need for survival. Therefore, without it, no one can survive. Water is crucial not only for humans but also for all living things, including animals and plants. With the ever-increasing population, the need for clean water will also increase. Water resource management policies and their impact on water demand are discussed. The results show that effective policies can help improve water use efficiency and reduce waste (Sharma &Anggarwal, 2020).

TanjungEnim is a sub-district in the LawangKidul district. One of the providers of drinking water in TanjungEnim is the LematangEnim Regional Water Company (PDAM), TanjungEnim Branch Office. According to data from the Central Statistics Agency (BPS), LawangKidul District had a population of 76,100 people by 2024. The drinking water demand managed by PDAM LematangEnim, TanjungEnim Branch, in 2023 was 10,499 households (SR). One of the challenges encountered at the TanjungEnim Branch of PDAM is the lack of an optimal distribution system, due to an underdeveloped distribution system. One way to maximize the availability of clean water for customers is by optimizing the clean water distribution system. This ensures that water needs are met in terms of quality, quantity, and continuity. Therefore, research is needed to optimize clean water distribution in the main distribution network of the TanjungEnim Branch of PDAM LematangEnim.

Problems that often occur in clean water distribution pipe networks are pressure loss and low flow rates in the network. This causes the flow of clean water to the community to be less than optimal. This study aims to determine and evaluate the condition of the existing clean water distribution pipe network at PDAM LematangEnim, Muara Enim Regency. Furthermore, this study can be used as a way to identify problems so that appropriate solutions can be formulated to achieve improved service for the community. This study was conducted using EPANET 2.0 software to simulate the clean water distribution network at PDAM

LematangEnim, Muara Enim Regency. In addition, direct measurements were also carried out, in the form of pressure and velocity values. There are several measurement locations in the PDAM LematangEnim area, to compare the simulation results with field conditions. The simulation results were then evaluated by looking at the pressure and velocity values according to the criteria in the Regulation of the Minister of Public Works No. 18/PRT/M/2007.

Previous research conducted by (JuliArinansah, 2020) written in a journal entitled "Analysis of Clean Water Needs and Availability in Sumber Makmur Village, Nibung District, North Musirawas Regency" this study aims to be able to analyze the large need and availability of clean water in Sumber Makmur Village in 2025 and to determine the comparison between the availability and need of water in Sumber Makmur Village. The calculations carried out include population growth analysis, population projection analysis, domestic needs analysis, non-domestic water needs analysis, clean water loss analysis, total clean water needs analysis, and clean water availability analysis. Water as a basic human need is one of the requirements that must be met in realizing livable settlements. Fluctuations in clean water needs in urban areas due to seasonal changes and population increases. This study uses historical data to predict future clean water needs, with an emphasis on the importance of adaptive planning (Kusumastuti&Khoiron, 2019).

II. MATERIAL AND METHODS

The location of this research was conducted at PDAM LematangEnimTanjungEnim Branch, Muara EnimRegency..

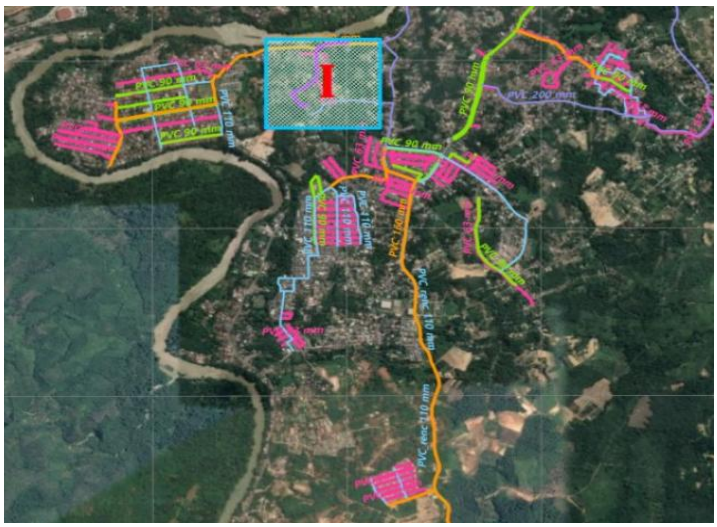

Figure 1: Research location

2.1. Step of the Research

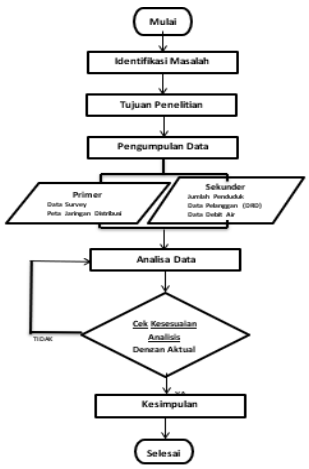

Figure 2: Step of the research

III. RESULTSAND DISCUSSION

3.1. Residential Area Served

The LematangEnim Water Company (PDAM) serves the clean water needs of Muara Enim Regency. PDAM LematangEnim has five branches: Muara Enim, TanjungEnim, Ujanmas, TelukLubuk, and Gelumbang. PDAM LematangEnim'sTanjungEnim branch serves the LawangKidul District.

3. 2. Flow Productivity

Table 4.2 Flow System and Reservoir Volume of the TanjungEnim Branch

No.	Branch Name	Reservoir Name	Number of Reservoirs (Units)	Reservoir Dimensions/Volume L x W x H / M3	Water Flow System
1.	TanjungEnim	TalangGabus 1	1	360	Pumps
		Talang Gabus 2	1	500	Pumps
		KarangAsam	1		
		Booster Water Paku	1		

Determination of water needs for each unit served by the TanjungEnim spring is divided into two parts, namely domestic water needs and non-domestic water needs. Domestic water needs are water needs for household needs (piped and non-piped facilities), while non-domestic water needs are water needs for industrial and commercial needs (offices, factories, shops/trade centers) and public facility needs (schools, places of worship, government agencies, hospitals, TNI and fire departments). According to the Public Works and Human Settlements Agency in the Preparation of Integrated City Infrastructure Development (P3KT) regarding domestic and non-domestic water needs.

Table 4.3 Installed Capacity and Utilized Capacity

No	Branch/Unit Name	Name of Water Treatment Plant	Operating Hours (hours)	Water Flow System	Installed capacity		Capacity Utilized	
					liter/sec	m^3/year	liter/sec	m^3/year
1	TanjungEnim Branch	IPA TanjungEnimTalangGabus	24	Pump	20	630.720	20	630.720
		IPA TanjungEnimTalangGabus		Pump	20	630.720	20	630.720
		IPA TanjungEnimBuluran		Pump	40	1.261.440	40	1.261.440
		IPA TanjungEnimBuluran		Pump	100	3.153.600	100	3.153.600
2	Tanjung Agung IKK Unit	IPA Tanjung Agung	8	Pump	10	315.360	10	315.360
3	PulauPanggung IKK unit	IPA PulauPanggung	24	Gravity	10	315.360	10	315.360
4	Bedegung Village Unit	IPA Bedegung	24	Gravity	10	315.360	10	315.360

IV. CONCLUSION

Based on the data analysis and discussion, the conclusions of this study are as follows:

1. The final results of the analysis of the distribution hours required by the distribution system to meet the clean water needs of PDAM LematangEnim are divided into flow zones for optimal distribution.
2. The estimated flow rate required per zone by the distribution system is up to 40 L/d to meet the clean water needs of PDAM LematangEnim.

3. After evaluation through simulation using Epanet, the main distribution system design for optimal clean water distribution of PDAM LematangEnim was obtained, taking into account several factors within the divided zones, including the number of active household connections per zone, pump capacity, distribution flow rate, flow pressure, and elevation distance from the water treatment plant.

REFERENCES

[1]. Arifuddin, Parung Herman, & Thaha Arsyad. (2018). Analisis Kapasitas dan Penambahan Jaringan Pipa Distribusi PDAM di Wilayah Pesisir Kecamatan Tallo Kota Makassar .

[2]. Ibrahim Mochammad, Masrevaniah Aniek, & Dermawan Very. (2012). Analisa Hidrolis Pada Komponen Sistem Distribusi Air Bersih Dengan Waternet dan Watercad Versi 8 (Studi Kasus Kampung Digiouwa, Kampung Mawa dan Kampung Ikebo, Distrik Kamu, Kabupaten Dogiyai). Fakultas Teknik Universitas Brawijaya.

[3]. Juli Arinansah. (2020). Analisa Kebutuhan dan Ketersediaan Air Bersih di Desa Sumber Makmur Kecamatan Nibung Kabupaten Musi Rawas Utara. Bina Darma Conference on Engineering Science , 234–239.

[4]. Kalensun. (2016). Perencanaansistem Jaringan distribusi air bersih di Kelurahan Pangolombian Kecamatan Tomohon Selatan. Jurnal Sipil Statik, 4(2).

[5]. Kusumastuti, A., & Khoiron, A. M. (2019). Metode Penelitian Kualitatif (Karanggawang Barat). Lembaga Pendidikan Sukarno Pressindo.

[6]. Mays, L. W. (2004). Hydraulic Desiign Handbook. The McGraw- Hill Companies.

[7]. Pahlavan, S., Jahangiri, M., Shamsabad, A. A., & Baharizadeh, A. (2020). Assessing the Current Status of Renewable Energies and Their Limitations in Iran. Int. Journal of Renewable Energy Development (IJRED), 9(1), 97–105.

[8]. Setiawan Agung, Riyanto Eko, & Prayogo Among. (2020). Analisa Sistem Distribusi Air Bersih PDAM Purwodadi, Purworejo. Universitas Muhammadiyah Purworejo.

[9]. Sharma, R., & Annggarwal, P. (2020). Advancements in irrigation technologies forclimate-smart agriculture. . Journal of Irrigation and Drainage Engineering, 146(6).