

Available online at: <http://ajceet.ft.unand.ac.id/>

Andalas Journal of Electrical and Electronic Engineering Technology

ISSN 2777-0079

Portable Pico Hydro Power Plant with Cross Flow Turbine by Water Springs Flow in Limau Manis Padang

Zulka Hendri, Yudia Meka Seftiani, Akbar Abadi, Wiwik Wiharti, Fandi Ahmad

Politeknik Negeri Padang, Jl. Kampus, Limau Manis, Kec. Pauh, Kota Padang, Indonesia 25164

ARTICLE INFORMATION

Received: August 22, 2024
 Revised: November 6, 2024
 Revised: November 37, 2024
 Available online: November 30, 2024

KEYWORDS

Pico Hydro, Cross Flow, Water Springs

CORRESPONDENCE

E-mail: zulka.hendri04@gmail.com

A B S T R A C T

This research examines the design and implementation of a Portable Pico Hydro Power Plant (PHPP) featuring a cross-flow turbine with a capacity of 300 watts. Pico hydro is a compact and efficient form of hydropower generation tailored to meet the energy requirements of remote plantation areas. The primary aim of this study is to optimize the use of low-flow water sources and low-head conditions. The research encompasses a comprehensive evaluation of several critical factors, including the assessment of water source conditions, the selection of suitable turbine and generator designs, the configuration of the system, and a thorough performance evaluation. By employing a cross-flow turbine, the Pico Hydro system is designed to convert the kinetic energy generated by flowing water into mechanical energy, which is then transformed into electrical energy. The findings of this study reveal that the portable PHPP provides a stable and sustainable energy supply for off-grid locations. This system holds considerable promise for improving energy accessibility in rural and remote regions, positioning it as a viable solution for renewable energy applications.

INTRODUCTION

Indonesia possesses unique geographical and geological factors, making it rich in natural resources as it is located in the tropical region between the Indian and Pacific Oceans [1]. The potential for renewable energy sources such as geothermal, wind, and water [2] indicates that Indonesia has significant clean energy potential [3]. High rainfall, particularly in Sumatra, Kalimantan, and Papua, supports hydropower potential by providing abundant water for hydroelectric power generation [4,5]. However, the utilization of hydropower remains suboptimal, requiring more significant efforts to support national energy sustainability [6].

This research involves the development of pico hydro systems in plantation areas, aiming to provide a stable and affordable local electricity supply. Plantations are often situated in remote areas far from the primary power grid due to infrastructure limitations or the high costs of extending the power grid. Some plantations connected to the main power grid face issues related to dependency on unstable or intermittent external electricity supplies, especially in regions with extreme weather or frequent power outages. Electricity costs can significantly burden plantations, particularly if they rely on gasoline or diesel generators to meet their needs.

The fluctuating prices of fossil fuels can lead to unstable operational costs. Uncertainty in electricity supply can hinder the planning and operations of plantations, disrupting production and

distribution activities. Plantations have various energy needs, ranging from operational requirements such as lighting and the use of agricultural machinery to workers' demands. Given these issues, this research aims to design a portable Pico hydropower plant system utilizing local natural resources. Pico hydro systems use moving water, such as river flows, to generate electricity. Thus, the design and construction of portable pico hydro systems can address the energy challenges plantations face.

A pico hydro power plant is a technology that uses water to generate electricity on a small scale [10,15]. This power plant is environmentally friendly, does not have negative effects [19], and is a sustainable solution for producing electrical energy in areas far from electricity infrastructure and with adequate access to water sources [11,12]. It uses renewable energy through water flow, naturally replenished by the hydrological cycle [13]. This differs from conventional power plants that use limited fossil fuels and contribute to greenhouse gas emissions. Pico hydropower plants do not produce carbon emissions or other air pollutants during normal operation [14]. This power plant utilizes rivers, springs, and lakes [19] to generate electricity while maintaining ecological and social sustainability. Newton's principles of fluid motion are applied in these plants to convert the kinetic energy of water into mechanical energy through turbines or water wheels [15].

The efficiency of turbines is influenced by their design, size, and water flow conditions. Bernoulli's and Archimedes' principles

also play roles in pico hydropower plants, ensuring optimal turbine performance to generate electricity on a small scale. A pico hydro system consists of three main components: water energy as the source, water turbines for energy conversion, and generators to convert mechanical energy into electric energy. The components needed to design a pico hydro power plant are the turbine, generators, dam, and conduit pipe.

The turbines used in pico hydropower plants are designed to harness the kinetic energy of flowing water and convert it into mechanical energy to drive an electrical generator. A turbine is a mechanical device that rotates when water flows through it, utilizing the hydrodynamic forces exerted by the water flow. Pico hydropower plants use specific types of turbines depending on the characteristics of the available water flow.

Commonly used turbines include the Pelton turbine, Francis turbine, and cross-flow turbine. The cross-flow turbine has a horizontal rotor with open blades, allowing water to flow through the rotor from both directions horizontally. This design makes the cross-flow turbine suitable for water flows with low discharge and moderate head heights. The cross-flow turbine construction is shown in Figure 1.

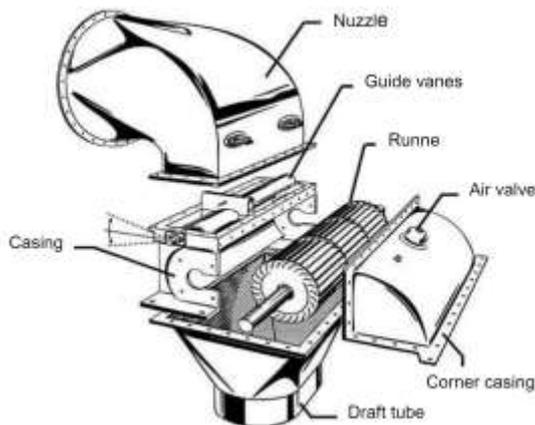


Figure 1. Cross-Flow Turbin Construction [16, 17]

An electrical generator is a component of an electric machine that converts mechanical energy (rotation) into electrical energy through electromagnetic induction. When the generator's rotor spins within a stationary magnetic field, the changing magnetic field induces an electric current in the stator coils. In pico hydropower plants, the generators typically used are alternating current (AC) generators, either synchronous or asynchronous (induction) types, modified to meet the needs of small-scale power generation.

The dam is another component in the design of a pico hydro power plant. A dam is a structural building used to hold back or redirect the flow of water from a natural source into a pipeline leading to the power plant turbines. Several factors must be considered when designing a dam, including location, construction materials, dimensions and capacity of the dam, connection to the diversion channel, incorporation of a water flow regulation system, ease of maintenance and upkeep, and consideration of environmental impacts.

The conduit pipe controls and directs water flow efficiently towards the turbine to generate mechanical energy. The conduit helps channel the water flow with the appropriate pressure to the turbine. With the correct pressure, the turbine can operate under optimal conditions. This pipe can be made from various materials suitable for the local environmental conditions, such as PVC (polyvinyl chloride), steel, or concrete.

METHOD

This research focuses on the Portable Pico Hydro Power Plant (PHPP) with a 300-Watt Cross-Flow Turbine." The research methods include site surveys, design of the PHPP model, model testing through simulations, collection of equipment and materials, construction of the portable PHPP, and testing of the equipment. The design and implementation of this pico hydro power plant are applied to plantation areas located far from the PLN (State Electricity Company) power grid.

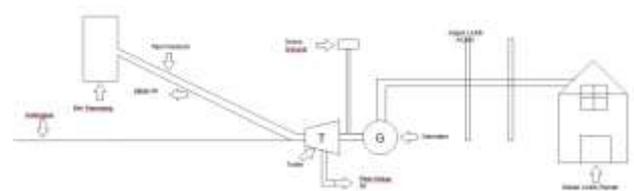


Figure 2. Design of the Pico Hydro Power Plant [18]

Pico hydro is a micropower generation system that uses water energy to produce electricity. The process begins with water flowing into the turbine, which converts the kinetic energy of the water into mechanical energy. The turbine then drives a generator to produce electricity. During this process, the potential energy of the water decreases as it flows through the turbine, while its kinetic energy is transformed into electrical energy. Thus, the potential energy of the water is converted into usable electrical energy to supply local electricity needs.

The image above shows the construction of a pico hydro system using a portable design, allowing for easy relocation if needed. To determine the characteristics of the turbine, including variations in rotational power and turbine efficiency, water flow is used to drive the turbine. The turbine's rotation is connected to the generator via a shaft, transmitting the rotational energy to the generator. Subsequently, the electrical energy produced by the generator is delivered to the load.

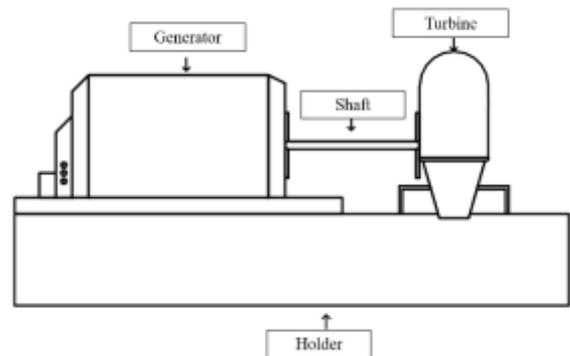


Figure 3. Design of Turbin and Generator Pico Hydro Power Plant

Determines available power

The best way to calculate the available power is to estimate the energy. Energy estimates can be calculated with the formula [19];

$$P_{hp} = Q \times g \times H_{net} \tag{1}$$

$$P_g = Q \times g \times H_{net} \times \eta \tag{2}$$

$$Q = A \times V \times \text{correction factor} \tag{3}$$

For small hydro systems, turbine efficiency is 85%, drive efficiency 95%, and generator efficiency 93%. Thus, the system's overall efficiency becomes = 75,1 % [21].

Determine the turbine type

Each region has unique PHPP characteristics; therefore, it is very important to determine the most suitable turbine type. One method for determining the type of turbine is to consider the height of the waterfall and the flow rate [20], as shown in Figure 4.

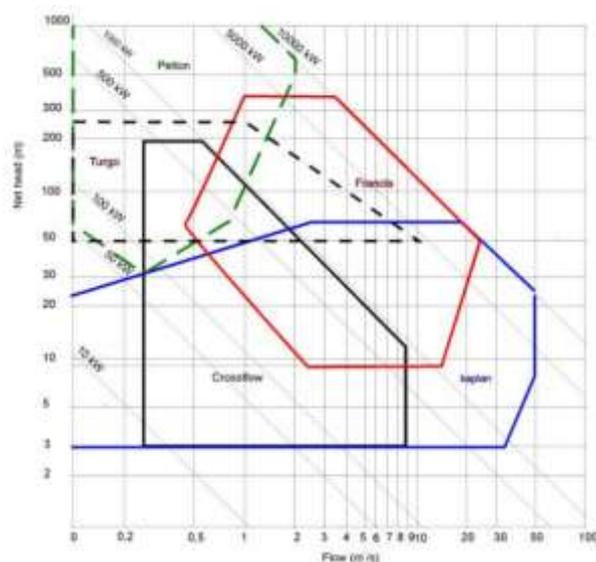


Figure 4. Turbine selection based on height and flow rate [20].

The design of a cross-flow type hydroelectric power system is suited for utilizing river flows with relatively low flow rates and low heads. The cross-flow turbine is the pico hydro scale water turbine that can be used for river flows with relatively small rates and a head below 5 meters. This is a low-pressure turbine with a tangential water injection into the runner with a horizontal axis.

The PHPP installation location is 4.1 kilometers from Politeknik Negeri Padang and 1.5 kilometers from the PLN (State Electricity Company) power grid. Given the distance, connecting to the PLN grid would be challenging and costly. The development of hydroelectric power plants can be utilized in durian plantation areas located on hilltops. The installation location is shown in Figure 5.



Figure 5. Installation Location for the Pico Hydro

This Pico hydro utilizes spring water as a potential energy source, which will later be converted into electrical energy. This spring produces relatively constant water throughout the year. This Pico Hydro is equipped with a dam volume of 0.251 m³. Pico Hydro uses a 6-inch PVC pipe as a rapid pipe. The appropriate pipe size for the nozzle is a 3-inch pipe; to connect these two types of pipe, a 4-inch pipe is used. The length of the rapid pipe is 23.8 m, with a slope of 7.11 degrees and a waterfall height of 3 m. The water flow to the turbine can be regulated by turning the lever on the nozzle. The range of settings can be made is 0 – 2 ¼ rotations. The turbine diameter is 10cm, while the shaft is 5cm. The turbine is 12.5 cm long with 14 blades. NYM 2 x 2.5 cable is used to transmit electrical energy from the generator to the load with a length of 75 meters. The planned fixed load is 39 Watts with details: 12-watt terrace light, 15-watt living room light, 12-watt side light, and two variable loads in the form of sockets. Electrical installations on generator loads are shown in Figure 6.

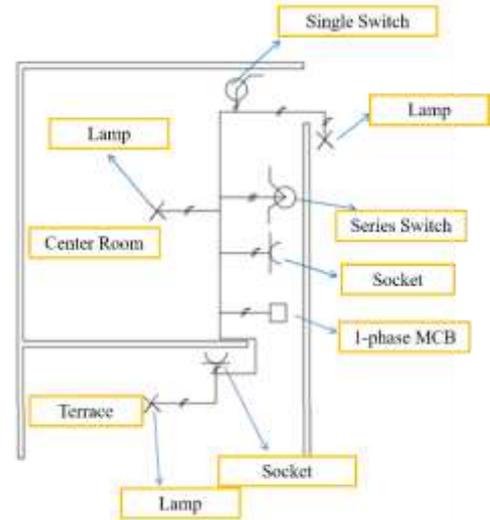


Figure 6. Generator load installation

RESULTS AND DISCUSSION

Based on measurements, it was found that the height of the waterfall was 2.95 m. The length of the rapid pipe is 23.83 m, the water flow rate in the rapid pipe is 0.04196 m³/s, and the dam volume is 0.256 M3. Photos of the PHPP construction are shown in Figure 7.



Figure 7. PPHP construction

Nozzle Opening, RPM Turbine, Load and Voltage

The larger the nozzle opening, the greater the water flow speed and mass. The greater the mass (m) and flow acceleration (a), the greater the water pressure (P) on the turbine. This corresponds to the following power formula;

$$P = \frac{F}{A} = \frac{m \times a}{A} \tag{3}$$

The larger the nozzle opening, the higher the water pressure and turbine RPM. The load connected to the generator affects the turbine RPM. The greater the load connected, the lower the turbine RPM will be. The graph of the relationship between nozzle opening, load variations, and turbine RPM is shown in Figure 8.

The voltage generated by the generator tends to increase as the nozzle opening size increases. This indicates a positive relationship between the nozzle opening size and the output voltage, which can be explained by the greater fluid flow, which converts more kinetic energy into electrical energy. A study on pico-hydro systems showed that adjustments in flow rate significantly affect the generator's performance, highlighting that the generator voltage correlates with the rotational speed of the water turbine and the excitation voltage applied to the system [21].

Another study shows that the output voltage of a pico-hydro generator is influenced by the turbine's rotational speed and the excitation current, with higher speeds producing higher voltages [23]. The generator's output voltage is also affected by the load being supplied. The voltage drop is directly proportional to the load size: the larger the connected load, the more significant the voltage drop. This analysis is consistent with the basic principles of power distribution, where an increase in load causes more current to flow, ultimately leading to a more significant voltage drop due to the generator's internal resistance. These results align with previous research, which indicates that large current

variations or increased loads can lead to significant voltage drops [22], [23]. However, this study demonstrates that the voltage increase caused by nozzle opening variations can provide additional flexibility in load management and power efficiency. The graph of the relationship between nozzle opening, load variations, and generator voltage is shown in Figure 9.

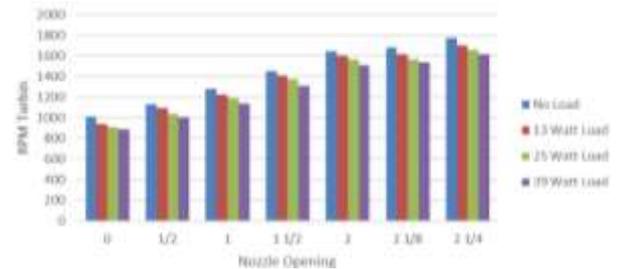


Figure 8. Relation nozzle opening, load, and turbine's RPM.

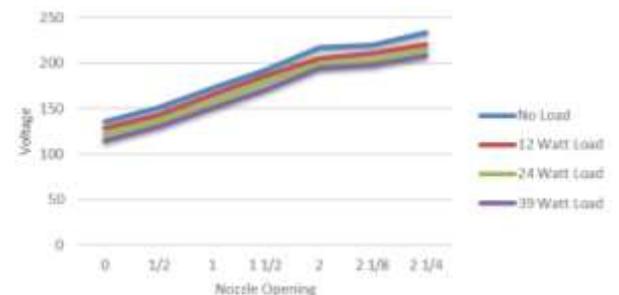


Figure 9. Relation nozzle opening, load, and generator voltage.

The load variations supplied to the generator include increments of 0 Watts, 12 Watts, 24 Watts, 39 Watts, and 61 Watts, each influencing the generator's output voltage (as shown in Table 1). These variations are crucial to understanding the system's performance under different electrical demands. As the load increases, fluctuations in the output voltage become apparent. A voltage regulator mitigates these fluctuations and ensures the system's stability. This device plays a vital role in maintaining a steady output voltage of 220 V, effectively compensating for changes in load up to a maximum of 39 Watts, as demonstrated in Table 2. The voltage regulator's capacity to stabilize voltage despite load shifts is essential for protecting sensitive electrical components and ensuring efficient energy distribution. The effect of using a voltage regulator on improving generator voltage output is shown in Figure 10.



Figure 10. Influence of the voltage regulator on the PPHP output voltage

Previous research examined how load variations influence the voltage output of generators and analyzed the role of voltage regulators in maintaining stability. One study utilized a heuristic method to analyze the optimization of distributed generation in a

33-bus radial distribution system, highlighting that load variations significantly affect voltage levels and power losses. The findings emphasize the importance of voltage regulators in keeping the output voltage within safe limits under fluctuating load conditions, with simulations showing the efficiency of optimization techniques like PSO and IGSA in minimizing voltage deviation and maintaining system stability [24],[25].

Table 1. Effect of load on generator current, voltage, power, RPM and frequency.

No	Load (Watt)	Voltage (V)	Current (I)	Power (W)	RPM	Freq (Hz)
1	0	220	0	0	1695	80
2	15	216	0,07	15	1681	77,1
3	30	211	0,14	31	1661	74,2
4	45	209	0,2	43	1623	71,2
5	60	201	0,26	53	1581	65,8
6	85	196	0,3	66	1521	62
7	110	176	0,47	77	1470	50

Table 2. Impact of Adding a Voltage Regulator on Generator Loading

No	Load (Watt)	Vout Gen.	Vout Regulator	Freq (Hz)	RPM	Current (I)
1	0 Watt	220	220	80	1696	0
2	12 Watt	211	220	77	1680	0,14
3	24 Watt	201	220	74	1630	0,17
4	39 Watt	188	220	71	1610	0,22
5	61 Watt	180	211	65	1470	0,26

CONCLUSIONS

In this study, we developed and analyzed a PHPP utilizing a 300-watt Cross-Flow Turbine. The research encompassed comprehensive methodologies, including site surveys, the design and modeling of the PHPP, simulations to test the model, procurement of necessary equipment and materials, construction of the portable system, and subsequent performance testing. The results highlight the effectiveness and potential of the designed PHPP in harnessing renewable energy in remote or off-grid locations, paving the way for further advancements and optimizations in small-scale hydropower applications.

The findings of this research indicate that increasing the nozzle opening results in a significant rise in water flow speed and mass. As the nozzle size enlarges, water pressure and turbine RPM also increase, demonstrating a direct relationship between nozzle size and turbine performance. Moreover, the integration of a voltage regulator effectively maintained a stable output voltage of 220 V, even when subjected to varying loads up to 39 Watts. This highlights the critical role of nozzle size and voltage regulation in optimizing the efficiency and stability of small-scale hydropower systems.

ACKNOWLEDGMENT

We want to express our sincere thanks to P3M Politeknik Negeri Padang, which has facilitated the funding of this research through the PTU research scheme, which is funded through PNP DIPA funds. We also thank the PNP electrical engineering study program for being willing to lend measuring equipment for carrying out this research.

REFERENCES

- [1] Adi, D. P., & Kamilia, N. D. (2023). Analysis of Indonesia's Geographic Location on the Economic Well-being of the Society. *LANGGAR: Journal of Social, Humanities, and Islamic Study*, 2(1), 15–27. Retrieved from <https://langgar.amiin.or.id/index.php/langgar/article/view/22>
- [2] Ardiansyah, H. (2022). Hydropower technology: Potential, challenges, and the future. In H. Ardiansyah, & P. Ekadewi (Eds.), *Indonesia post-pandemic outlook: Strategy towards net-zero emissions by 2060 from the renewables and carbon-neutral energy perspectives* (89–107). BRIN Publishing. DOI: 10.55981/brin.562.c6 ISBN: 978-623-7425-83-0 E-ISBN: 978-623-7425-87-8
- [3] Pambudi, N., Firdaus, R. A., Rizkiana, R., & Sukatiman, S. (2023). Renewable Energy in Indonesia: Current Status, Potential, and Future Development. *Sustainability*, 15, 2342. 10.3390/su15032342.
- [4] Lee, H. S. (2015). General rainfall patterns in indonesia and the potential impacts of local seas on rainfall intensity. *Water*, 7(4), 1751–1768. <https://doi.org/10.3390/w7041751>
- [5] Ramadhan, R., Marzuki, M., Suryanto, W., Sholihun, S., Yusnaini, H., & Muharsyah, R. (2024). Rainfall variability in Indonesia new capital associated with the Madden-Julian Oscillation and its contribution to flood events. *Quaternary Science Advances*, 13, 100163. <https://doi.org/10.1016/j.qsa.2024.100163>
- [6] Widodo Pudji Muljanto, Rinaldy Dalimi, "SeCondary Voltage Control Of Single Phase Induction Generator Operated In Small Scale Picohydro Power Plant At Off-Grid Area", ©2017 IEEE.
- [7] Loots, I., Van Dijk, M., Barta, B., Van Vuuren, S. J., & Bhagwan, J. N. (2015). A review of low head hydropower technologies and applications in a South African context. *Renewable and Sustainable Energy Reviews*, 50, 1254-1268.
- [8] Nelson, Vaughn. 2011. *Introduction to Renewable Energy*. United Kingdom: CRC Press.
- [9] Patro, S. K. (2016, May 20). Technical and economic feasibility of Pico hydro power plants integrated to Green buildings. Unknown. <https://www.researchgate.net/publication/329058781>
- [10] R.Ismu Tribowo dan Aidil Haryanto, "Analysis of Water Source Availability Estimation for Picohydro Electric Generator," 2014 2nd International Conference on Technology, Informatics, Management, Engineering & Environment Bandung, Indonesia August 19-21, 2014.
- [11] Ahmad Rofiq, Augie Widyotriatmo, Estiyanti Ekawati, "Predictive Control of Combined Renewable Energy

- Sources” 2015 International Conference on Technology, Informatics, Management, Engineering & Environment (TIME-E) Samosir Island, North Sumatra, Indonesia, September 7-9, 2015. 978-1-4673-7411-8/15/\$31.00© 2015 IEEE.
- [12] H. Zainuddin, A. Khamis, M.S Yahaya, M.F.M Basar, J.M. Lazi and Z.Ibrahim, “Investigation on the Performance of Pico-hydro Generation System Using Consuming Water Distributed to Houses” Faculty of Electrical Engineering, Universiti Teknikal Malaysia Melaka (UTeM), Melaka, Malaysia. 2009.
- [13] Shrikant S.Katre, Vishram N. Bapat, “Induction Generator for Pico-hydro generation as a renewable energy source” 2015 International Conference on Energy System and Applications ICESA 2015) Dr. D. Y. Patil Institute of Engineering and Technology, pune, India 30 Oct-01 Nov,2015.
- [14] Loic Andolfatto, Charly Euzenat, Elena Vagnoni, Cecile Munch-Alligne, Francois Avellan, “A mixed Standard/Custom Design Strategy to Minimize Cost and Maximize Efficiency for Picohydro Power Potential Harvesting” 978-14673-7172-8/15/\$31.00 © 2015 IEEE.
- [15] Henny Sudiby, Ridwan Arief Subekti, Anjar Susatyo. Research Center for Electrical Power and mechatronics Indonesia Institute of Sciences (LIPI) ”Characteristics of 250 Watt Picohydro Turbine Based on Laboratory Testing Result” 2019 International Conference on Sustainable Energy Engineering and Application (ICSEEA)
- [16] Yassen, S. R. 2014. Optimization of the Performance of Micro Hydro-Turbines for Electricity Generation. School of Engineering & Technology, University of Hertfordshire, Hatfield, UK
- [17] C.C. WARNICK, Hydropower Engineering, Prentice Hall Inc, Englewood Cliffs, New Jersey 1984.
- [18] A. Desai, I. Mukhopadhyay and A. Ray, "Theoretical analysis of a Pico-hydro power system for energy generation in rural or isolated area," 2014 IEEE PES Asia-Pacific Power and Energy Engineering Conference (APPEEC), Hong Kong, China, 2014, pp. 1-4, doi: 10.1109/APPEEC.2014.7066043..
- [19] Yilmaz Aslan, Oguz Arslan, Celal Yasar, A sensitivity analysis for the design of small-scale hydropower plant: Kayabogazi case study, Renewable Energy, Volume 33, Issue 4, 2008, Pages 791-801, ISSN 0960-1481, <https://doi.org/10.1016/j.renene.2007.04.011>.
- [20] Performance and financial analysis. (2023). Renewables First - The Renewable Energy Company. <https://renewablesfirst.co.uk/renewable-energy-technologies/hydropower/hydropower-learning-centre/performance-and-financial-analysis/>
- [21] Azhar, Kamal, Muhammad., Subhan. The Effect of Loading on The Generator Voltage on The Pico-Hydro Power Plant: Experimental Study. WMA-1 2018, January 20-21, Indonesia.
- [22] A. Matthee, N. Moonen, I. Sulaeman and F. Leferink, "Transient Response of Generator- and Inverter-Based Microgrids to Rapid Load Changes," in IEEE Transactions on Electromagnetic Compatibility, vol. 66, no. 5, pp. 1646-1654, Oct. 2024, doi: 10.1109/TEMC.2024.3435732.
- [23] Sayem, A., Sayed, A., Al Amin, M., Rana, Masum., Nahar, Tajmin., Voltage Drop. International Journal of Research in Advanced Engineering and Technology. Volume 6; Issue 1; January 2020; Page No. 01-04. ISSN: 2455-0876;
- [24] Aida Fazliana Abdul Kadir, Mohamad Fani Sulaima, Noor Ropidah Bujal, Mohd Nazri Bin Abd Halim, Elia Erwani Hassan. Analysis of Load Variation Consideration for Optimal Distributed Generation Placement. (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 12, No. 4, 2021
- [25] Aibangbee, J. O. Voltages and Reactive Power Controls in Power System Network Using Automatic Voltage Regulator (Avr) and Static Var Compensator Methods. IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676, p-ISSN: 2320-3331, Volume 11, Issue 1 Ver. II (Jan. – Feb. 2016), PP 29-34. www.iosrjournals.org

NOMENCLATURE

The symbols used in this article are;

P_{hp}	; Hidro power
P_{gen}	; Generator Power
Q	; Water flow rate (L/s)
H_{net}	; Net Head (meter)
g	; gravity (9,81 m/s ²)
η	; efficiency
A	; Cross section area (average, m ²)
V	; flow speed
F	; the force.

AUTHORS BIOGRAPHY

Zulka Hendri



He is an alumnus of Universitas Andalas and holds a bachelor's and master's degree in electrical engineering. Currently, Hendri is a lecturer in the electrical engineering department of Politeknik Negeri Padang. In his teaching role, he covered a range of courses, including Electric Circuit 1, Electric Circuit 2, Basic Electricity and

Instrumentation Laboratory, Basic Electronics, Basic Electronics Laboratory, and Microcontrollers. Beyond his teaching responsibilities, Hendri was actively involved in the planning team for the development of the D3 Electrical Engineering Study Program.



Yudia Meka Seftiani

She was born on September 1, 1996, in Padang, Indonesia. She completed her Master's degree in Electrical Engineering at Andalas University. During her studies, Yudia was actively involved as a laboratory assistant in high voltage engineering. Her dedication and expertise led her to become the youngest lecturer at Politeknik Negeri Padang upon entering

the academic field. Her career reflects a commitment to both her educational pursuits and contributions to the field of electrical engineering



Akbar Abadi

He was born in Padang in 1984 and completed his postgraduate education in the Electrical Engineering department at Andalas University in 2015. Now, he is active as a lecturer in the Electrical Engineering study program at Padang State Polytechnic Department of Electrical Engineering. In his teaching role, he covered a range of courses, including electrical machines, power plants, and transformers.



Wiwik Wiharti

His research focus is in the field of Computers and Control. Formal education is a Bachelor's degree in Engineering Physics, ITS. Then, he continued his Master's degree in Computer and Control at ITS. As a lecturer, he handles daily subjects: Applied Physics, Computer Programming Languages, Control Systems Practicum, and Control Systems. As a student, the thesis related to applications in control equipment control systems.



Fandi Ahmad

Fandi Ahmad was born in 2002. He studied at SD 144 Pekanbaru in 2009-2015, SMP 36 Pekanbaru in 2015-2018, and SMA 1 2X11 Kayutanam in 2018-2021. Fandi is a final year student majoring in Electrical Engineering in the Electrical Engineering Associate's Degree study program at Politeknik Negeri Padang.