

PERFORMANCE EVALUATION STUDY OF THE UNIT 3 MICRO-HYDRO POWER PLANT IN ANDUNGBIRU VILLAGE, PROBOLINGGO REGENCY

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ABSTRACT

PLTMH Andungbiru Unit 3 in Andungbiru Village, Probolinggo Regency, has been operating for approximately 8 years as the main electricity source for the local community, yet no comprehensive performance evaluation has ever been conducted. This study aims to evaluate the operational performance of the PLTMH, the effect of load variation on electrical parameters, and the performance of the electricity distribution system to consumers. The research method included measuring flow discharge and head to determine the hydraulic power potential, measuring electrical parameters using a power logger over two observation periods, conducting a distribution system survey with voltage measurements, and evaluating the physical condition of the PLTMH components. The results show that the potential power of the PLTMH is 12.2 kW, while the actual measured power output was only 1,484.70 watts and 546.33 watts during the two measurement periods, accompanied by an unstable system frequency below the 50 Hz $\pm$ 1% standard. Load variation significantly affected frequency stability, while voltage remained relatively stable. The distribution performance showed an increasing voltage drop with distance from the powerhouse, exceeding the SPLN tolerance limit at the farthest customer, indicated to be caused by non-standard consumer-side wiring installations. Component evaluation revealed leakage in the penstock, an inadequate powerhouse condition, and a non-functioning ballast load, with no major damage found in the turbine, generator, or control panel. This study recommends component repairs, governor and ballast recalibration, and distribution installation improvements to enhance the reliability of the PLTMH operation.

Keywords: micro-hydro power plant, operational performance, load variation, electricity distribution, evaluation