**PROCEEDINGS**
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# ANALYSIS OF ELECTRICITY ENERGY POTENTIAL OF TABANG RIVER, SAWITTO VILLAGE, BUANGIN DISTRICT, ENREKANG REGENCY

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**Abstract**

The objective of the research was to determine the average of flow rapidity, flow rate of water, cross-sectional area of the river, as well as electricity energy potential of Tabang River, located in Nating, Sawitto Village, Buangin District, Enrekang. Sawitto Village, Buangin District has a mountainous topography and has many great potential energy sources for electricity generator. By considering the resources potential for electrical generator, it needs one study about flow potential of river water that can be used for electricity power and planning of electricity generator system to make the production of electricity energy maximum. Based on the result of data analysis, it found that electricity Energy potential of Tabang River flow was 2,07 MW. Then, the generator eficiency was 2029,805 KW or 2,02 MW, and the turbine eficiency was 93% and the turbine energy output was 1926,243 KW or 1,92 MW.

**Keywords**: *flow rapidity (v), flow rate of water (Q), cross-sectional area (A) dan electricity energy (P)*

## Background

Nowadays, electricity is very important for human needs. It has become a basic need for people. Almost all equipments people used today need electricity. There are many natural resources which can be used to produce electricity. At this time, energy which is most used comes from fossil, namely oil, gas, and coal. However, with the more expensive and scarce those fossils, as a consequence, people need an alternative as energy reserves.

Enrekang is situated in the center of South Sulawesi. Mountains Latimojong that extends from the North to the South of average height ± 3000 meters above sea level, fence in Enrekang in east side while on the western there is Saddang River which stretches from north to south. Its water control determines the irrigation located in the Pinrang territory with the flow of water until to Sidrap.

Enrekang is located between 3º 14'36 "latitude and 119º40'53" BT. The distance from the provincial capital of South Sulawesi (Makassar) to Enrekang city by road along the 235 Km. Sawitto village in sub-district Bungin has mountainous topography and hilly areas with high rainfall and average temperatures ranging up to $25^0$C $18^0$C. Beside that, it has a sufficient water source, therefore It also has potential area for the development of agriculture commodities in addition to the potential of renewable energy sources which is utilized to create a power source through the Micro Hydro Power (PLTMH). Furthermore, the network of electricity from PLN has not reached the Sawitto Village, so the only source of electricity for residents is the PLMTH, this condition causes Sawitto village called the region as a potential Energy Independent Village.

Based on the things above we take the hypothesis that the sub-districts Bungin, Enrekang have the potential development of the construction of very large hydroelectric plants.

**Method**

This research method is quantitative research that emphasizes the numerical data (numbers) are processed with statistical methods (Anwar, 2007: 5). With an emphasis on the analysis of field survey data to determine the level of the electrical needs of the villagers Sawitto District of Bungin Enrekang. Besides, this study also collecting data to determine the availability of water discharge electrical energy from the potential of water in the river tabang Sawitto Village District of Bungin.

**Results and Discussion**

**Water Discharge Measurement**

The measurement method using a water discharge Velocity area methods, using the formula

$$\text{with formula : } Q = \sum_{i=1}^{n} ( Vi \, . \, Ai )$$

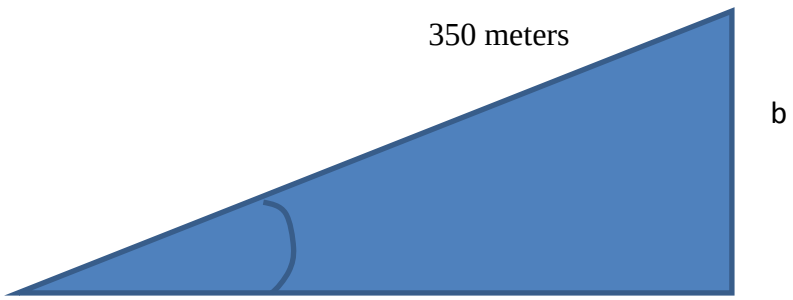
With : Q = Water discharge
Vi = Speed on each PIAs
Ai = area of cross-section of each PIAs
n = Number of PIAs in a cross section

With an average speed formula based on the table:

**Table 1** *: Table Assessment Measurement with Curren Air Speed Meter*

| Type | Water depth (d) | Observation point of Surfaces | Average Speed On Vertical |
|---|---|---|---|
| One point | 0,3 – 0,6 m | 0,6 | v = v |
| Two points | 0,6 – 3 m | 0,2 and 0,8 d | v = ½ ($v_2$ + $v_8$) |
| Three point | 3 – 6 m | 0,2 ; 0,6 and 0,8 d | v = ¼ ($v_2$ + 2$v_6$ + $v_8$) |
| Five points | >6 m | 0,2 ; 0,6 ; 0,8 ; and b | v = 1/10 (vs+3$v_2$ +2$v_6$+3$v_8$+vb) |

At the head calculation menggnakan trigonometric formulas to the data within the planning dam and power house that is 350 meters and the tilt angle was measured by using a bow then obtained 90.



$Sin \propto = \frac{front}{tilt}$

$= \frac{b}{c}$

$Cos \propto = \frac{side}{tilt}$

$= \frac{a}{c}$

$Tan \propto = \frac{front}{side}$

$= \frac{b}{a}$ atau

$Tan \propto = \frac{Sin \propto}{Cos \propto}$

Is known :
Hypotenuse (c) is the distance between the dot is x '(planning the dam) to the point x' '(planning power house) is 350 meters and a slope angle of 90, then:

# $Sin \propto = \frac{b}{c}$

$Sin\ 9^0 = \frac{b}{350}$

b = $Sin\ 9^0$ . 350 m
= 1,15 . 350
= 52,5 meters

# $Cos \propto = \frac{a}{c}$

$Cos\ 9^0 = \frac{a}{350}$

a = $Cos\ 9^0$ . 350 m
= 0,98 . 350
= 344 meters

# $Tan \propto = \frac{b}{a}$

$Tan\ 9^0 = \frac{52,5}{344}$ . 100 %

= 15,2 % (Slope)
So the difference is 52.5 meters high.

**Measuring Head**

The results of observations of the height difference (head) are measured at the dam planning area using GPS is 839.57 MPL and measured at planning power house of 791.22 from the MPL. Then head between the point of planning the dam with power house planning point is 839.57 m - 791.22 meter = 48.35 meters.

So the average height is = $\frac{\text{Head trigonometric formula + Head GPS}}{2}$

$= \frac{52,5+48,35}{2}$

= 50,425 meter

= Rounded to 50 meters

**Hydraulic Calculation of Potential**

The main parameter in determining the hydraulic potential (ph) is a large river discharge (Q) and Beda High (h). Assuming the density (density) of water 1000 kg / m and earth gravity 9.8 m / s, it is simply huge hydraulic potential can be calculated by the following equation:

$$P_n = g \times Q \times h$$

Where : Ph = Hydraulic potential
Q = Water discharge
h = Height difference (head) in the form of units of meters (m)

Pn = Q . g . h
= 4,227 . 9,8 . 50
= 2071,23 Kw
= 2,07 MW

Results of measuring, testing, and analyzing of data, it is obtained tabang river discharge is 4227 $m^3$ / s, with speed rate of flow of the river is 1409 m / s, sectional area of the river is 3,00 $m^2$. availability of water with rainfall monthly average is 189 mm / month. And precipitation annual average is 1748.22 mm / year, area locations have the potential head 50 m. From the analysis, tabang river discharge is potential to generate electrical energy for 2,07 MW. Moreover, the generator efficiency of 98% with a power generator output amounted to 2029.805 Kw or 2,02 MW, and turbine efficiency of 93% with a power output of the turbine is 1926.243 Kw or 1,92 MW.

**Conclusion**

There are 2 conclusions of this study, namely:

1. The power plant can be applied in the area based on the reviews of topography, geology, hydrology, demographic and socio-economic conditions of society in nating, Sawitto village, Enrekang

2. Availability of electrical energy generation capacity with a head of 50 meters of 2.07 MW so that the model in the classification hydropower plants classified as PLTM.

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