Pocket-Hydro Turbine into Capsule Hydro Turbine

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1. Abstract

The capsule hydro turbine (CaHT) is a continuous power machine in which a wheel or rotor typically filted whereas produce electricity. It is designed like a capsule shape which has two twin turbines on both output to generate energy as an alternative power supply. The devide is capable of producing output of 12v to power up electrical applicances. The device consist of dynamos, turbines, charging circuit, battery, inverter, and wire cables. The result of the capsule hydro turbine (CaHT) field is presented in three types of graphs as in this paper. The optimum voltage of battery was 6.97v. By using these terms, the research project has successfully improvised the pocket hydro turbine (PHT) into capsule hydro turbine (CaHT).

Keywords: PHT concept, produce electricity, portable power supply, water flow

2. Introduction

Electricity is the most versatile and widely used form of energy. The global demand for electricity is growing rapidly. Availability of usable energy in the form of electricity has gradually assumed an essential component in daily activities. World trend shows that the need for electrical energy particularly in developing countries normally grows at faster rate than the rate at which generation can be expanded. In the world today, the need for electricity has increased as the demand for electric appliances such as smart phones, laptops and portable devices has been increasing over time.

Turbine is a machine for producing continuous power in which a wheel or rotor system is typically fitted with vanes to be revolve by a fast-moving flow of water, steam, gas or air. A hydro turbine is a rotary mechanical device with at least one moving part called rotor assembly which is a shaft or drum with blades attached. It obtains energy by converting kinetic energy from a fluid flow into electricity. This research is to develop a capsule hydro twin turbine to generate electricity for electrical appliances.

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3. Improvising Pocket Hydro Turbine to Capsule Hydro Twin-Turbine.

The existing pocket-hydro turbine is not able to produce the minimum voltage (5-12v) to power up most of the portable electrical devices. This motivates the development of Capsule Hydro Twin-Turbine (CaHT).

The CaHT is a type of impulse turbine. Both model are efficient as it carry less space. But, we rebrand the old model by changing the original shape into a more conventional and eco-friendly device. We also added a calculative metre which help campers to know the amount of voltage produce by the turbine, duo dynamo which can produce about 5.5-6.5 V each, a charging circuit which stabilize the electricity produce by the dynamo and twin turbines. Having twin turbine is to distribute the same amount of load taken on the turbine other than to produce more electricity on the dynamo.

4. Methodology

The materials use was specified as shown below followed by the methods used to complete the project model. The materials are:

1. Dynamo
2. Turbines
3. Inverter
4. Charging Circuit (Stabilizer)
5. Reading Meter.
6. Battery 12v.
7. Multimeter

The Capsule Hydro Twin-Turbine (CaHT) is a device where suitable for campers, surveyors and researchers who need to be in the jungle for a very long time in which need the supply of electricity. The steps to install the CaHT are:
Step 1: Find a suitable place to install the hydro turbine such as at the waterfall or rapids. Then place twin PVC pipe at the rapids to get concentrated water flow.

Step 2: Unmounted the hydro turbine components from the toolbox and install the components as shown in the instructions manual.

Step 3: Place the ready-installed CaHT on a solid surface (ex: rock surface) and put the end of the PVC pipe to the top hole of the CaHT. This is due to the concept of Pelton turbine which use high head to spin the propeller. Then the output charge will be produce into the

inverter and ready to be used. The table below illustrated the electrical appliances that can be use by campers.

Table 1: List of Electrical Appliances can be used by Campers/Researchers/Surveyors.

Electrical Appliances	Time taken to Fully Charge (hour)	Lifetime (hour)
Laptop	12.2	18
Handphone	8.5	4
Powerbank	14.4	48
LED Lamp	- (no batteries)	- (no batteries)
Small Fan	6	48
Spare Battery	17	36

The lifetime (hour) of the electrical appliances are all depending on the usage. The calculation of data in the table above was used by using the following equation (1).

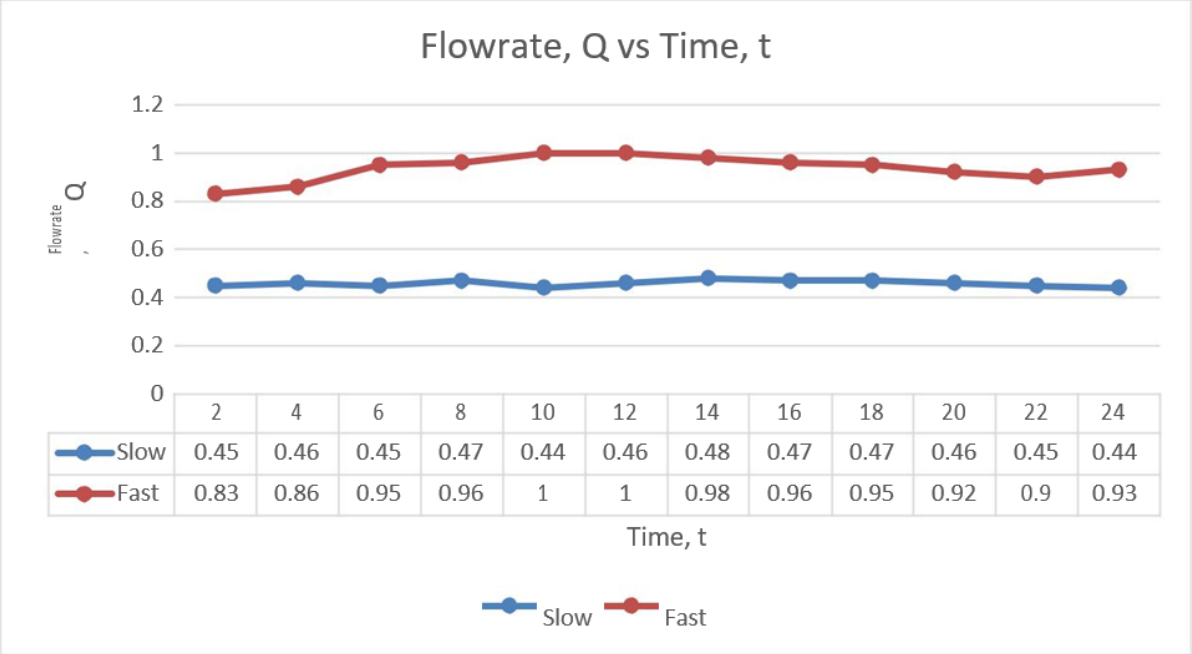
$$AH = h'a' \tag{1}$$

where:
A=Ampere of Battery/1.2 (constant)
H=time taken for battery
a'=Ampere of electrical appliances
h'=time taken for electrical appliances

Figure 1.0: The Capsule Hydro Twin-Turbine (CaHT) and The CaHT on display

5. Results and Discussion

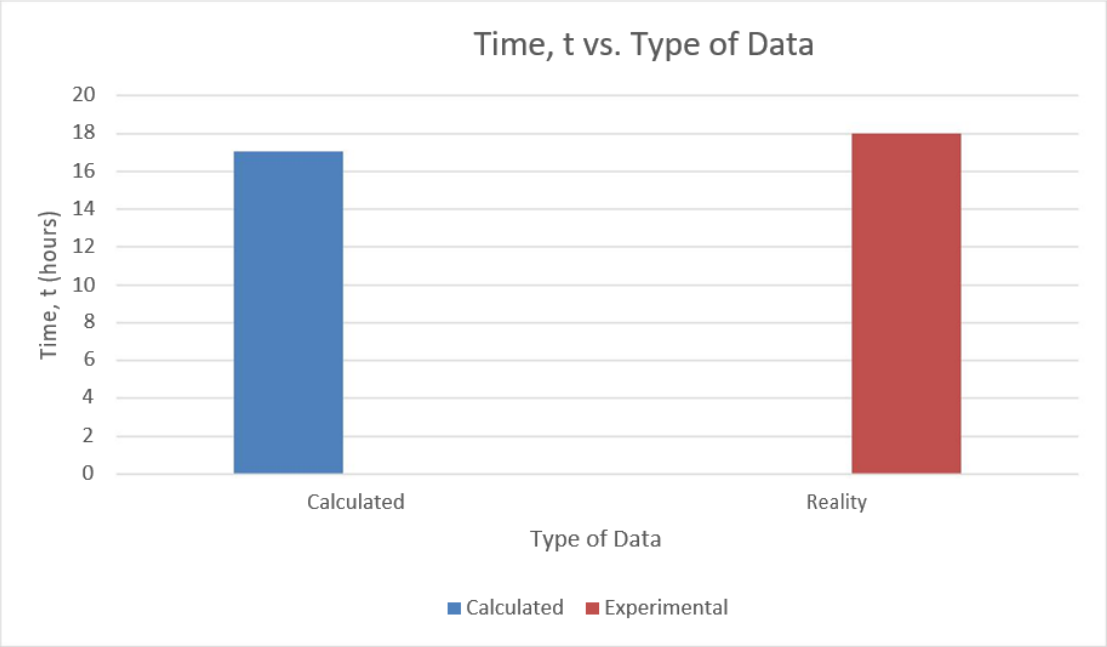
The result of the project was recorded within 24 hours at Taman Rekreasi Gunung Ledang. The results were illustrated into graphs as shown below.



	2	4	6	8	10	12	14	16	18	20	22	24
Slow	0.45	0.46	0.45	0.47	0.44	0.46	0.48	0.47	0.47	0.46	0.45	0.44
Fast	0.83	0.86	0.95	0.96	1	1	0.98	0.96	0.95	0.92	0.9	0.93

Figure 2. Flowrate recorded for 24 hours Time, t.

The calculation of data in the table was by using the formula (Q=Av). The collected data were calculated by referring to the recorded data during our camping field test for 24 hours. The graph also shows that the flowrate, Q is constant as the time of data recorded increase. The average of flow rate for slow water flow was 0.23 m^3/s as for the fast flow is 0.51 m^3/s.



The graph above shows the difference between calculated time taken for battery to fully charge and the time taken on field test.

From the graph 2.0, the field test was carried out for over 17 hours because in the progress of the battery to fully charge there were minor losses of electricity due to resistance in the wire cables. The time taken for the battery to fully charge was 17 hours and 30 minutes due to the minor losses of electricity in the battery. At the 18-24 hours, the voltage recorded were 12v. It is because the charged battery had reach the limiting capacity and the optimum voltage.

As for the graph 3.0 shows the difference between the calculated time taken for the battery to fully charged(formula) and the reality which is the recorded time taken during the field test.

6. Conclusion

In the nutshell, the hydro turbine obviously will help most campers to have electricity to do most works in the isolated places such as in the forest or having a research. The hydro turbine have the advantage of users as it is improve lighting for researcher studies, less air pollution

of no kerosene lamps, less money spent on battery and eco-friendly; non-conventional energy. By improvising the pocket hydro turbine (PHT) into a capsule hydro twin-turbine (CaHT), we as a group concluded that it is a wise idea as the project improve from a less productive into more efficiency. The CaHT produce more voltage and mechanical energy rather than the PHT as it has twin turbine and two dynamo motors.

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