

HYBRID SOURCE CHARGING STATION USING SUPERCAPACITOR

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INTRODUCTION

Electricity has been part of the needs of the people, as they said "No Power, No Life." These days, an electric bike and an electronic gadget are very well known due to modernization and expensive fuel. However, they often have drawbacks. One of the most pressing issues these are power. In fact, they can drain a standard battery from a full charge in a matter of a couple hours and it takes a long hour to charge the battery. So, this team is proposing a Hybrid Source Charging Station Using Supercapacitor.

A universal trend towards the progressive development of environmentally sustainable society has brought about a substantial demand for innovative, energy-efficient technology. As these new technologies are developed, they must be evaluated and compared to existing products

in order to determine whether the new technology will be more suitable to serve its intended purpose. This evaluation must consider number of factors including, but not limited to, energy-efficiency.

We all know that some of the rural areas in the Philippines, electricity is a major challenge. The fuel is generally of poor quality, expensive, and energy is used inefficiently, the power supply is unreliable, and access to it is limited. As of now, millions of people in rural areas are still unable to benefit from modern energy services. Due to expensive fuel, transportation has become one of the major problems in our country, so Electric Bicycle was introduced. As of now, electricity cost is high due to expensive fuel but some existing public charging stations for E-bike, and other electronic devices are used directly from electric power source.

The HYSCAP Charging Station or the (HYBRID SOURCE CHARGING STATION USING SUPERCAPACITOR) is an alternative for electricity. This eco-friendly Charging Station uses renewable sources of electricity coming from solar and wind energy. These are converted into electricity for charging purposes and it has fast charging capability by means of Supercapacitor. HYSCAP Charging Station used the Supercapacitor which is the hottest and most advanced technology invention and also called the fuel tank of tomorrow for a brighter future. It can accept and deliver charge much faster than batteries. It is also used in applications requiring rapid charge/discharge cycles and can quickly store and release energy over long times with a high cycle rate.

In this project, the researchers came up with the design of a modular system which can be stacked or rearranged in different formations, easy to move, and reassembled for flexibility. Allow the module to be transported, move around to a place where it is needed to attain an access of this eco-friendly Charging Station using renewable source of electricity.

GENERAL OBJECTIVE

The main objective of this project was to design and innovate a modular type of charging station

and hybrid source of electricity with fast charging capability.

STATEMENT OF THE PROBLEM

This project aimed to build a proposed Hybrid Source Charging Station using Supercapacitor. It sought to answer the following research questions:

1. Who is the beneficiary of this project?
2. How can it help in transportation?
3. What source of electricity is going to be used?
4. What is the assessment of two groups of respondents namely: Students and E-bikers in terms of the following criteria? Is there any significant difference?
 - A. Functionality
 - B. Usability
 - C. Reliability
 - D. Efficiency
 - E. Maintainability
5. What claims can be derived from the developed invention?

METHODOLOGY

The research used the developmental type of research which has been defined as the systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet Criteria of internal consistency and effectiveness. Developmental research is particularly important in the field of instructional

technology. The most common types of developmental research involve situations in which the product-development process is analyzed and described, and the final product is evaluated. A second type of developmental research focuses more on the impact of the product on the learner or the organization. A third type of study is oriented toward a general analysis of design development or evaluation processes as a whole or as components. A fundamental distinction should be made between reports of actual developmental research (practice) and descriptions of design and development procedural models (theory). Although it has frequently been misunderstood, developmental research has contributed much to the growth of the field as a whole, often serving as a basis for model construction and theorizing (Richey, 1994).

The method of sampling is purposively in nature. The purposive sampling technique is a type of non-probability sampling that is most effective when one needs to study a certain cultural domain with knowledgeable experts within. Purposive sampling may also be used with both qualitative and quantitative research techniques. The inherent bias of the method contributes to its efficiency, and the method stays robust even when tested against

random probability sampling. Choosing the purposive sample is fundamental to the quality of data gathered; thus, reliability and competence of the informant must be ensured (Tongco, 2007).

Evaluation

The project was evaluated on the following criteria namely:

- Functionality
- Usability
- Reliability
- Efficiency
- Maintainability

Statistical Treatment

The mean was used as the tool for evaluating the project.

The formula is:

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$$\bar{X} = \frac{\sum X}{N}$$

Where,

\sum , represents the summation

X , represents scores

N , represents number of scores

The Likert Scale was used for descriptive ratings.

Table 1: Likert Scale for descriptive ratings.

NUMERICAL SCALE	AVERAGE RESPONSE	DESCRIPTIVE RATING	VERBAL INTERPRETATION
5	4.20-5.00	Excellent	E
4	3.40-4.19	Very Good	VG
3	2.60-3.39	Good	G
2	1.80-2.59	Fair	F
1	1.00-1.79	Poor	P

Equal Variance Not Assumed

When the two independent samples are assumed to be drawn from the populations with equal variances (i.e., $\sigma_1^2 = \sigma_2^2$), the test statistic t is computed where:

\bar{x}_1 = Mean of the first sample

\bar{x}_2 = Mean of the second sample

n_1 = Sample size (i.e., number of observations) of first sample

n_2 = Sample size (i.e., number of observations) of second Sample

s_1 = Standard deviation of first sample

s_2 = Standard deviation of second sample

The calculated t value is then compared to the critical t value from the t distribution table with degree of freedom.

DATA GATHERING PROCEDURE

1. Deciding the title of the thesis "Hybrid Source Charging Station Using SuperCapacitor."

2. Gathering data through research.

3. Presentation of the proposed title.

4. Designing the project's structure and circuitry.

5. Deciding on where the researchers will construct their design project.

6. Collection of materials and equipment that would be used for the whole project.

7. Construction and wiring the project.

8. Testing and trial of the output.

9. Writing the final report of the thesis.

10. Final defense of the study.

11. Final checking of the output.

12. Submission of the final report.

SUMMARY OF FINDINGS

SOP 1. Who is the beneficiary of this project?

- People from rural areas are the number one benefactor of this research project where electricity is still a major problem. Mother Nature will also benefit from this project because this is an eco-friendly charging station which uses renewable sources of electricity from solar and wind energy.

SOP 2. How can it help in transportation?

- HYSCAP is a charging station that can be used not just for gadgets and other light loads but also in charging of electric vehicles such as e-bikes which is good alternative in modern vehicles that uses fuels.

SOP 3. What sources of electricity are going to be used?

- The main source of electricity of HYSCAP is from renewable sources of energy which is wind power and solar.

SOP 4. What is the assessment of two groups of respondents namely; Students and E-bike Users in terms of the following criteria? Are there any significant differences?

- The following criteria were assessed by the two groups of respondents both students and e-bikers.

Table 2: Overall Assessment of Two Groups of Respondents

Variables	Students		E-bike Users		t-value	t-critical	Int	Decision
	Variance	WM	Variance	WM				
1 Functionality	4.58	0.01	4.22	0.02	3.58	2.78	NS	Reject
2 Usability	4.40	0.08	4.20	0.01	0.95	4.30	NS	Failed to Reject
3 Reliability	4.33	0.01	4.23	0.00	1.34	4.30	NS	Failed to Reject
4 Efficiency	4.29	0.01	4.16	0.00	2.12	2.78	NS	Failed to Reject
5 Maintainability	4.44	0.01	4.18	0.01	3.62	2.78	NS	Failed to Reject

Df = 28, Level of Significance = 0.5, two tailed

Table 2 shows the summary on the significant difference on the respondent's assessment on the aboved cited criteria.

On the criteria "Functionality", the computed t-value of 3.58 is less than the t-critical of 2.78. The hypothesis is rejected; therefore, there is significant difference in the assessment of the two groups of respondents.

Furthermore, on the criteria "Reliability", the computed t-value of 1.34 is less than the t-critical of 4.30 the hypothesis is failed to reject; therefore, there is no significant difference in the assessment of the two groups of respondents. In addition, on the criteria "Efficiency", the computed t-value of 2.12 is less than the t-critical of 2.78. The hypothesis is failed to reject; therefore, there is no significant difference in the assessment of the two groups of respondents.

Likewise, on the criteria "Maintainability", the computed t-value of 3.62 is less than the t-Critical of 2.78. The hypothesis is rejected; therefore, there is significant difference in the assessment of the two groups of respondents.

SOP 5. What devices can be proposed to improve the existing project?

- This project must focus on storage devices so Huge Storage bank devices can be proposed to improve and convert more chemical energy

from storage banks (Battery and supercapacitor) into electrical energy for charging purposes. But in this aspect, you are required to expand The Energy Source (renewable source of energy) Larger windmill output, and additional Photovoltaic Solar panel, a hybrid source must be

sufficient to supply the larger Storages bank, so more energy can be provided to supply other devices for a higher demand.

CONCLUSION

Based on the findings of the study, the following conclusions are drawn:

A. According to the evaluation result of the functionality of the system, the degree to which the sets functional appropriateness were Correctness, Completeness, and Or Highly Acceptable" by the interpreted as "Excellent the functionality of HYSCAP respondents , which means that they provided the specific tasks and user objectives, correctness of results With the needed degree of precision, and of specified tasks and accomplishments the facilitated objectives.

B. According to the evaluation result of the usability of the to which the sets operability and the degree system, Highly "Excellent

or interpreted as accessibility were which means that the usability Accepted" by the respondent s, which me of HYSCAP had an attributes that make it easy to operate and with widest of used by people with Control and can be range to achieve a specified capabilities characteristics and context of use.

C. According to the evaluation result of the reliability of the system, the degree to which the sets maturity and availability interpreted as "Excellent were or Highly Accepted" by the correspondents, which means that the reliability of HYSCAP has met the needs for reliability under normal operation and it was operational and was aCcessible when required for use.

D. According to the evaluation result of the efficiency of the system, the degree to which the sets time behavior, resource utilization and capacity were interpreted as "Excellent or Highly Accepted" by the respondents, which means that the efficiency of HYSCAP met the requirements of performing its functions.

E. According to the evaluation result of the maintainability of the System, the degree to which the sets modularity, modifiability were interpreted as "Excellent

reusability and or Highly Accepted" by the respondents, which means that the maintainability of HYSCAP was composed of discrete components such that a change to one Component had minimal impact On other Components an asset can be used in more than one or in building other assetS and Can be effectively system, and efficiently modified without introducing defects Or degrading existing system quality.