DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF WATER WHEEL TURBINE FOR IRRIGATION CANAL USE FOR BATTERY CHARGING

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An Undergraduate Thesis Submitted to the Faculty of the Department of Agricultural and Biosystems Engineering, College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines
in Partial Fulfillment of the Requirements
for the Degree of

BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING
(Agricultural Mechanization and Renewable Energy)

JUNE 2019

ACCEPTANCE SHEET

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BIOGRAPHICAL SKETCH

Jannah Marie Althea Cortez was born on December 25, 1998 in Guimba, Nueva Ecija. She is the eldest out of the three children of Mr. Almario A. Cortez and Mrs. Teresa R. Cortez.

She started her elementary education when she was 5 years old in Eulogio R. Dizon College of Nueva Ecija and graduated in the same school in 2010. She graduated in Bartolome Sangalang National High School in 2014 as a part of the Special Science Curriculum.

In 2014, she entered Central Luzon State University and took up Bachelor of Science in Agricultural Engineering which was then later changed to Bachelor of Science in Agricultural and Biosystems Engineering in 2015 and majored in Agricultural Mechanization and Renewable Energy. In 2016, she passed the Department of Science and Technology - Junior Level Science Scholarship (DOST-JLSS) examination and was signed as one of the DOST scholars in 2017. She also attended seminars such as: Startup: "Innovation", "Technology" and Entrepreneurship Forum in RET Amphitheater in Central Luzon State University.

ACKNOWLEDGMENT

The author would like to express her deepest gratitude to the people who contributed and extended their help for the completion of the study, specifically to:

Engr. Marlon T. Delos Santos, chairman of the advisory committee, for his time and commitment, full support in supervision, and inavaluable efforts from planning and fabrication up to the final conduct of the study.

Dr. Helen B. Gavino and Engr. Carolyn Grace G. Somera, members of the advisory committee, for their constructive comments and suggestions for the improvement of the study as well as for patiently checking the author's thesis paper.

Dr. Victorino T. Taylan for lending the author materials needed for her study as well as his invaluable comments and suggestions to improve the study.

Engr. Marlon N. Galad for sharing his knowledge and giving suggestions for the improvement of the study and Dr. Emmanuel V. Sicat for lending the author equipments needed for her study.

Staff of the CLSU-AREC Mr. Renato Domingo and Agricultural Mechanics students for their invaluable help and contribution in the fabrication and evaluation of the study.

The author's friends, Joy, Cherrie, Jairies, Monette, Joana, Michelle, Jhenesis, Hannah, Ana May, Aira, David, Mapatac, Lenard, Klark and Arvin for extending their time and help in conducting the study, sharing their knowledge with regards to writing the manuscript, offering words of comfort and emotional support, for the unforgettable laughter and memories shared making the college life of the author joyous and memorable, and for being the great friends that they are.

The author's siblings, Jared, for always reminding the author to finish her study and giving words of support, and Jaira for her prayers and support for the author. Ate mikka and ate Arvi for their words of encouragement for the author and advices for the improvement and completion of the study. Mammi, Tita Cathy, Ate Daisy, Ate Phane, Kuya Yoyong, Kuya Sonny, and Kuya Rudy for their help in conducting the study and words of encouragement for the author.

The author's parents, Mama and Papa for not only providing financial support for the study but also for their unconditional love and support for the author, for patiently listening to the author's concerns, and for always being ready to go and help the author in conducting her thesis despite of their busy schedules.

And above all, to her Heavenly Father who provided strength and wisdom for the author, gave her a sense of comfort and security, for all the answered prayers, and for His guidance and love for all His children.

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ABSTRACT

CORTEZ, JANNAH MARIE ALTHEA R. Department of Agricultural and Biosystems Engineering., College of Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, **June 2019, DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF WATER WHEEL TURBINE FOR IRRIGATION CANAL USE FOR BATTERY CHARGING**

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This study was conceptualized to develop a water wheel turbine which is suitable in harnessing the kinetic energy of flowing water in irrigation canals for battery charging.

The objectives of the study were to design a waterwheel turbine for irrigation canal use and battery charging, fabricate a waterwheel turbine using locally available materials, evaluate the performance of the waterwheel turbine in terms of turbine power and turbine efficiency, and perform a cost analysis. The fabrication of the study took place in the College of Engineering, Central Luzon State University. Testing and evaluation was held at the National Irrigation Administration (NIA) lateral canal within the CLSU compound, Science City of Muñoz, Nueva Ecija.

The performance characteristics of the waterwheel turbine were evaluated in terms of turbine power and turbine efficiency. The treatments used in the study were the different depths at which the paddle of the waterwheel turbine was submerged. The experimental design was Completely Randomized Design (CRD) and data were analyzed using Analysis of Variance (ANOVA). Comparison among means was tested at 5% difference using Least Significant Difference (LSD).

Results showed that the highest turbine power was attained at 30 cm depth wherein the paddle was submerged with a value of 506.26 watts and the highest turbine efficiency

was recorded at 96.33% at 10 cm depth wherein the paddle was submerged. The result also showed that the waterwheel turbine has an output of watts 149.6 watts using a 220 V AC synchronous generator at a natural stream velocity of 1.4 m/s. Cost analysis showed that the water wheel turbine has an initial cost of Php 25,850.20. Its annual operational cost is Php 5,156.44 which includes the fixed and variable cost. It has an operating cost of Php 5.98/kWh. Based on the capacity of the water wheel turbine at 861.70 kWh/yr and the charged rate of electricity consumption which is at Php 12/ kWh, the break-even point is at 377.03 kWh. The payback period is 4.99 years.

Keywords: water wheel turbine; irrigation canal use; battery charging

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