

**COMPREHENSIVE SEMESTRAL REPORT ON FIELD PRACTICE AT THE CENTRAL
LUZON STATE UNIVERSITY - CENTER FOR RENEWABLE ENERGY AND
TECHNOLOGY (CLSU-CREaTe)**

CHRISTIAN C. RUBIANES

An Undergraduate Field Practice Manuscript 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 in Partial Fulfillment of
the Requirements for the Degree of

**BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS
ENGINEERING
(Agricultural Power, Energy and Machinery Engineering)**

JUNE 2023

TABLE OF CONTENTS

	PAGE
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF APPENDIX FIGURES	ix
BIOGRAPHICAL SKETCH	x
ACKNKOWLEDGEMENT	xi
ABSTRACT	xiii
INTRODUCTION	1
Background of the Field Practice	1
Objective of the Field Practice Program	2
Significance of the Filed Practice Study	2
Scope and Limitation of the Field Practice	3
Timed and Place of the Field Practice	3
REVIEW OF RELATED LITERATURE	4
Definition of gravitational water vortex power plant	4
Gravitational water vortex hydraulic turbine	5
Hydrokinetic System	5
Challenges for Development of GWVHT	7
Micro-Hydropower system	8
How Micro hydropower Works	9
System Components of Micro Hydropower	9
Low Head Water	10
Renewable Energy	11
Agricultural Mechanization	12
METHODOLOGY	13
Conceptualization of the Field Practice	14
Field Practice Area	16
Activity 1. Design and fabricate a vortex-type turbine for irrigation canal using commercially available materials	17
Design Considerations	18

Hydropower computation	19
Principle of Operation	20
Fabrication of Water Vortex Turbine	21
Activity 2. Performing other related tasks	21
As assigned by the Director or Immediate Supervisor	21
Activity 2a. Repair and Maintenance of Farm Machinery/Equipment available at CREaTe	22
RESULTS AND DISCUSSION	23
Activity 1. Design and fabrication of vortex-type turbine for irrigation canal using commercially available materials	23
Objectives	24
Description of the Vortex-Type Turbine	24
Turbine	25
Structural Frame	25
Mechanical Power Transmission System	25
Generator	26
Vortex-Type Turbine Designs	36
Fabrication of Vortex type Turbine	28
Fabrication Process	29
1. Measuring and Cutting	29
2. Welding and Assembling of Frame	30
3. fabricating the turbine blade/propeller	30
4. Bending the structural support	31
5. Installation of belts and pulleys	31
6. Installation of fabricated vortex-type turbine	31
Operations	33
Fabricated Vortex-Turbine	34
Instrumentation	34
Data Analysis	35
Performance Parameters	36
Descriptive Analysis	36
Turbine Power Output	37
Activity 2. Performing other related tasks as assigned by the Director or immediate supervisor	37
Objectives	38
Activity 2a. Fabrication of DABE’s Front Door Steel Gate	38

a. List of materials	38
b. Fabrication process	
Measuring and Cutting	38
Welding and grinding	39
Painting the main frame and door frame	40
Activity 2b. Modification of micro-hydro power at CREaTe	41
Activity 2c. Repairing blocked Cabinet type mini rice mill	42
Activity 2d. Repairing portable gasoline generator	43
SUMMARY, CONCLUSION AND RECOMMENDATION	45
LITERATURE CITED	47
APPENDIX	49

LIST OF TABLES

TABLE		PAGE
1	Factors considered in the design of water vortex turbine	18
2	Specifications of Vortex Type Turbine and the Power Generating Unit	25
3	Materials and purposes	28
4	Instruments and functions.	34
5	Data obtained from the machine testing	36
6	Discharge Rate of the water system in the hydropower laboratory	42

LIST OF FIGURES

FIGURE		PAGE
1	Gravitational Water Vortex Power Plant (a) General Illustration	4
2	Conceptual framework of the study	14
3	CREaTe Location	16
4	Schematic diagram of the water vortex turbine	20
5	Vortex-Type Turbine Perspective	26
6	Top View	27
7	Front View	27
8	Isometric View	27
8	Rearview	27
9	Side elevation	27
10	Shaft and Propeller Front view	27
11	Cutting the GI plain sheet Frame and Angle Bar support	29
12	Welding and assembling the vortex turbine frame	30
13	Fabricating the turbine blade/propeller	30
14	Bending the structural support	31
15	Belt and pulleys are installed	32
16	Installed vortex-type turbine at the canal	32
17	Vortex-Type Turbine Representation	33
18	Measuring and cutting of tubular	39
19	Welding and grinding of tubular	40

20	Mainframe and door painting	41
21	Welding and grinding of steel pipe	42
22	Repairing blocked Cabinet type mini rice mill	43
23	Repairing portable gasoline generator	44

LIST OF APPENDICES FIGURES

FIGURE		PAGE
1	Preperation of materials in fabrication of vortex-type turbine	51
2	Cutting the G.I plain Sheet	51
3	Forming the structural frame of the turbine	51
4	Fabricating the turbine blade/propeller	52
5	Bending the structural support	52
6	Belt and pulleys are installed	52
7	Vortex turbine is welded and installed	53
8	Measuring and cutting of tubular	53
9	Welding and grinding of tubular	53
10	Mainframe and door painting	54
11	Installation of fabricated steel gate	54
12	Relocation of the water pump	54
13	Repairing portable gasoline generator	55
14	Repairing blocked Cabinet type mini rice mill	55

BIOGRAPHICAL SKETCH

The author, Christian C. Rubianes, was born on May 13, 1998 at Carranglan, Nueva Ecija. He is the first born of Ruel Curitana Rubianes and Wilma Conrada Rubianes.

He finished his primary education at Carranglan Central School at Brgy. G.S. Rosario, Carranglan, Nueva Ecija on March 2010 and secondary education at Carranglan National High School, Brgy. F.C. Otic, Carranglan, Nueva Ecija on March 2014. Christian's interest is not limited to academics. During his elementary school, Christian participated in sports particularly in baseball as one of the varsity player. In the year 2010, he was admitted at Central Luzon State University (CLSU) under the Bachelor of Science in Agricultural and Biosystems Engineering major in Agricultural Power, Energy and Machinery Engineering.

Aside from sports and academics, he is also engaged in extra-curricular activities. He is a proud member of CLSU baseball varsity team.

LITERATURE CITED

- Alrikabi, N. K. M. A. (2014). Renewable energy types. *Journal of Clean Energy Technologies*, 2(1), 61-64. <http://jocet.org/papers/092-J30008.pdf>
- Anderson T., Doig A., Khennas S., Rees D. (1999). Rural Energy Services: A handbook for sustainable energy development, Intermediate Technology Development Group (ITDG), London. Thesis
- Amongo, R. M., & Larona, M. V. (2015). *Agricultural Mechanization Policies in the Philippines* (5th ed.). Policy Brief. <https://un-csam.org/publications/policy-brief-issue-no5-march-2015-agricultural-mechanization-policies-philippines>
- Aquino, A., Correa, A. B., & Ani, P. A. (2013, December 16). *Republic Act 10601: Improving the Agriculture and Fisheries Sector through Mechanization*. FFTC Agricultural Policy Platform (FFTC-AP). Retrieved July 8, 2022, from <https://ap.fftc.org.tw/article/594>
- Badger, A.R. (2011). Technology Assessment of Hydrokinetic Energy: Run-of-River and In-Stream Tidal Systems. Retrieved August 19, 2022 from <https://commons.lib.jmu.edu/cgi/viewcontent.cgi?article=1154&context=master201019>
- Date, A. (2009). Low head simple reaction water turbine. Retrieved August 19, 2022 from <https://core.ac.uk/download/pdf/15624852.pdf>
- F.M. Tamiri (2020). Low Head Micro Hydro Systems for Rural Electrification. Retrieved from IOP Conf. series . Materials Science and Engineering 834 (2020) 012041
Doi: 10.1088/1757-899X/834/1/012041
- Fraenkel, P., Paish O., Bokalders V., Harvey A., Brown A., Edwards R., (1991). *MicroHydro Power A guide for development workers*, London: Immediate Technology Publications in association with the Stockholm Environment Institute.
- Hazan, J.I., et al. (2012). A Comprehensive Study of Micro-Hydropower plant and Its Potential in Bangladesh. *International Scholarly Research Notices* Retrieved from <https://doi.org/10.5402/2012/635396>
- Ibrahim, W.I et al, (November, 2021). Hydrokinetic energy harnessing technologies: a review.
DOI:10.1016/j.egy.2021.04.003

Ishak Yuce M. and Muratoglu A., (2015). Hydrokinetic energy conversion systems: A technology status review. Science Direct, retrieved August 19, 2022 from <https://doi.org/10.1016/j.rser.2014.10.037>

Ishak Yuce M. and Muratoglu A., (2015). Hydrokinetic energy conversion systems: A technology status review. Science Direct, retrieved August 19, 2022 from <https://doi.org/10.1016/j.rser.2014.10.037>

Linkedin.Com. Retrieved July 3, 2022, from <https://www.linkedin.com/pulse/20140617225331-162049572-the-role-of-agricultural-mechanization-in-the-enhancement-of-sustainable-food-production-in-nigeria>

Mewang, M. (2006). Distributed Renewable Energy systems for Rural Village Electrification: The Case of Bhutan. MSc. Thesis. Delft University of Technology. The Netherlands.

Niebuhr, C. M., van Dijk, M., Neary, V. S., & Bhagwan, J. N. *A review of hydrokinetic turbines and enhancement techniques for canal installations: Technology, applicability and potential*. United States. <https://doi.org/10.1016/j.rser.2019.06.047>

Office of energy efficiency and renewable energy. Water power technologies: how hydropower works. Energy.Gov. retrieved august 18, 2022, from <https://www.energy.gov/eere/water/how-hydropower-works>

Peake, S. (2018). *Renewable energy-power for a sustainable future* (No. Ed. 4). OXFORD university press. <https://www.cabdirect.org/cabdirect/abstract/20183376622>

Rahman, M. S. (2015). *Renewable Micro Hydro Power Generation*. Researchgate. Retrieved August 19, 2022, from https://www.researchgate.net/publication/295862020_Renewable_Micro_Hydro_Power_Generation/link/56cf1f3008aeb52500c97f9b/download

Titus, J., & Ayalur, B. (2019). Design and fabrication of in-line turbine for pico hydro energy recovery in treated sewage water distribution line. *Energy Procedia*, 156, 133-138.

Union of Concerned Scientists (2008). How Hydrokinetic Energy Works. Retrieved August 18, 2022, from <https://www.ucsusa.org/resources/how-hydrokinetic-energy-works>