



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

P.O. Box 236, Tororo, Uganda
Gen: +256 - 45 444 8838
Fax: +256 - 45 4436517
Email: info@adm.busitema.ac.ug

www.busitema.ac.ug

FACULTY OF ENGINEERING

DEPARTMENT OF WATER RESOURCES ENGINEERING MINING ENGINEERING

**A SMART HYDRO-INFORMATICS SYSTEM FOR REALTIME MONITORING OF
SOLAR POWERED SURFACE WATER PUMPS.**

BY

AUMA NELVINE AND IGUNE YOKOLAM

UNDER SUPERVISION OF MR. MASERUKA BENEDICTO

ABSTRACT

Surface water pumping is carried out worldwide. It is carried out to move water from areas of low altitudes to areas of high altitude for domestic uses and irrigation purposes.

After a short period of time, many pumps get damaged before reaching their design period due to lack of real time monitoring systems for both water quality and hydraulic water parameters. This leaves us with high operational, maintenance and treatment costs.

This design focused on addressing the major problems encountered due to uncontrolled pump failures this has resulted from negligence of water parameter monitoring

The system achieves its functionality through use of various sensors to automatically respond to these parameters by turning off and on of the pump

DECLARATION.

I IGUNE YOKOLAM, AUMA NELVINE do hereby declare that this project proposal is my original work and has never been published for any other degree award to any other university or institution of higher learning.

SIGN:

DATE:

SIGN:

DATE:

APPROVAL

This final year project report for the design and construction of a smart hydro-informatics system for real-time monitoring of solar powered surface water pumps has been prepared under the supervision of;

Project Supervisor

Mr. Maseruka Benedicto

Signature

Date.....

ACKNOWLEDGEMENT

I thank the Almighty God for the far that He has brought me, the gift of life and protection he has rendered throughout the writing of this final year project.

I extend my deep sense of gratitude and indebtedness to my academic supervisor Mr. Maseruka Benedicto, for his kind attitude, keen interest, immense help, inspiration and encouragement which helped me throughout this final year project. My heart pulsates with the thrill for tendering gratitude to the entire staff of the Department of Mining and Water Resources Engineering Busitema University for providing any form of assistance throughout this final year project.

Lastly, I thank all those who were involved directly or indirectly during my final year project writing.

May the good Lord reward you all!

List of abbreviations

LCD: LIQUID CRYSTAL DISPLAY

GSM: GLOBAL SYSTEM FOR MOBILE COMMUNICATION

MODEM: MODULATOR DEMODULATOR

DC: DIRECT CURRENT

NPSH: NET POSITIVE SUCTION HEAD

SMS: SHORT MESSAGE SERVICE

HTML: HYPER TEXT MARK UP LANGUAGE

AJAX: ASYNCHRONOUS JAVA SCRIPT AND XML

PHP: HYPERTEXT PREPROCESSOR

CSS: CASCADING STYLE SHEETS

List of figures

Figure 1 showing centrifugal pump	6
Figure 2 showing pump impellers.....	7
Figure 3 Showing Battery-Coupled Solar Pumping Systems	10
Figure 4 Showing Direct-Coupled Solar Pumping System.....	12
Figure 5 showing pv solar panel.....	19
Figure 6 circuit diagram	21
Figure 7showing system archetecture.....	22
Figure 8showing a system block diagram	24
Figure 9 showing ph sensor	25
Figure 10 showing temperature sensor.....	26
Figure 11 showing turbidity sensor.....	27
Figure 12 showing flowrate sensor.....	28
Figure 13 showing LCD.....	28
Figure 14 showing a multimeter	31
Figure 15 showing logical diiagram.....	32

Table of contents

ABSTRACT.....	i
DECLARATION.....	ii
APPROVAL.....	iii
ACKNOWLEDGEMENT.....	iv
List of abbreviations.....	v
List of figures.....	vii
1.0 Introduction.....	1
1.1 Background.....	1
1.3 Problem Statement.....	2
1.4 Justification.....	3
1.5 OBJECTIVES.....	3
1.5.1 Main objective.....	3
1.5.1.1 Specific objectives.....	3
1.6 Significance.....	3
1.6 The scope of the study.....	4
1.6.1 Concept scope.....	4
1.6.2 Time Scope.....	4

CHAPTER TWO	5
2.0 Literature Review.....	5
2.1 Solar pumps	5
2.2 Pump Performance.....	8
2.3 Effect of speed variation	9
2.4 Existing pumping systems	9
2.4.1 Battery-Coupled Solar Pumping Systems.....	9
2.4.1.1 System Components.....	10
2.4.2 Direct-Coupled Solar Pumping System.....	11
2.4.2.1 System Components.....	12
2.5 Challenges and weaknesses of the existing system	12
2.6 Benefits of this system.....	12
2.7 System components	13
2.8 Control measurements	13
2.8.1 Water quality monitoring.....	13
2.8.2 Hydraulic monitoring.....	16
2.9 Solar energy potential in Uganda.....	17
2.9.1 Existing solar pumps.....	17
2.9.2 Principle of operation of solar pv panels	18
CHAPTER THREE	20
3.0 METHODOLOGY	20
3.1 Introduction:.....	20
3.2 Requirement Analysis.....	20
3.4 System Design	21
SOFTWARE REQUIREMENTS.....	22

3.5 Water quality monitoring	25
Construction of system prototype	29
Programing:.....	30
Methodology for specific Objective Three	31
Economic analysis	33
CHAPTER FOUR.....	38
Results and discussion	38
CHAPTER FIVE	44
Conclusions and recommendations.....	44
Conclusion	44
References:.....	45