# DETECTION OF WATER POLLUTION IN REAL TIME BY USING UNDERWATER SENSORS NETWORK

**Submitted By**

**Sameh Sayed Mohamed Medany**

B. Sc. Electrical Engineering, Military Technical College, 1999

A Thesis Submitted in Partial Fulfillment

Of

The Requirement for the Master Degree

In

Environmental Science

Department of Environmental Engineering Science

Institute of Environmental Studies and Research

Ain Shams University

**2013**

# APPROVAL SHEET

# DETECTION OF WATER POLLUTION IN REAL TIME BY USING UNDERWATER SENSORS NETWORK

**Submitted By**

**Sameh Sayed Mohamed Medany**

B. Sc. Electrical Engineering, Military Technical College, 1999

This Thesis towards a Master Degree in Environmental Science

Has Been Approved by:

Name Signature

**1-Prof. Dr. Abd El Haleem Abd El Naby Zekri** .....

Prof. of communication engineering, Faculty of Engineering

Ain Shams University

**2- Prof. Dr. Hadyea Saeed El Henawy** ……..……

Prof. of communication engineering & Ex-Dean, Faculty of Engineering

Ain Shams University

**3- Dr. Taha Abd El Azeem Abd El Razek** …...……..

Assoc. Prof., Department of Basic Sciences, Institute of Environmental Studies & Research, Ain Shams University

**4- Dr. Noha Samir Donia** …….

Assoc. Prof., Department of Engineering Science, Institute of Environmental Studies & Research, Ain Shams University

**2013**

# DETECTION OF WATER POLLUTION IN REAL TIME BY USING UNDERWATER SENSORS NETWORK

**Submitted By**

**Sameh Sayed Mohamed Medany**

B. Sc. Electrical Engineering, Military Technical College, 1999

A Thesis Submitted in Partial Fulfillment

Of

The Requirement for the Master Degree

In

Environmental Science

Department of Environmental Engineering Science

**Under The Supervision of:**

**1- Prof. Dr. Hadyea Saeed El Henawy**

Prof. of communication engineering & Ex-Dean, Faculty of Engineering
Ain Shams University

**2- Dr. Noha Samir Donia** .

Assoc. Prof., Department of Engineering Science, Institute of Environmental Studies & Research, Ain Shams University

**3- Dr. Mohamed Abd El Hamid Shaalan**

Assoc. Prof., Department of Computer Science, Faculty of Engineering,
Ain Shams University

**2013**

## ACKNOWLEDGEMENT

First and foremost I would like to thank **ALLAH** most beneficent and merciful for helping me to accomplish this study.

I would like to express my utmost appreciation and deepest gratitude to

***Prof. Dr. Hadyea Mohamed El Hennawy,***

***Dr. Noha Samir Donia,***

***&***

***Dr. Mohamed Abd Elhamid Shaalan***

For their large and consistent interest in my thesis during the times. They are also thanked for their help guidance, unlimited support, cooperation and constructive criticism, which were kindly given, are beyond acknowledgment.

I would like also to express my sincere thanks from my heart to my great Mother for her love, devotion, and never ending support to my studies and career. Many thanks to my wife and my kids for being a source of hope and encouragement.

# Abstract

Water thermal pollution is one of the most critical pollutions that threaten the Aquatic environment, any increase or decrease around water temperature standards is considered a thermal pollution. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers. When water used as a coolant then returned to the natural environment at a higher temperature, this change in temperature decreases the level of dissolved oxygen supply, and affects ecosystem composition. Fish and other aquatic organisms adapted to particular temperature range can be killed by the abrupt change in water temperature known as "thermal shock." thermal pollution may also increase the metabolic rate of aquatic animals, as enzyme activity, resulting in these organisms consuming more food in a shorter time than if their environment were not changed.

This type of pollution cannot be measured in laboratories because of the physical and chemical characteristics of water that establish chemical equilibrium with its new surroundings which results in false measurements for the water temperature parameter values. For this reason the control of water thermal pollution needs *In-situ temperature measurements*, so there is a necessity for a continuous water quality monitoring in real time to stand on the actual values of pollutants.

Different methods of water quality monitoring are illustrated in this study, discussing advantages of these methods and the challenges facing each method, Then the study scopes on the wireless monitoring of water thermal pollution through the use of locally assembled waterproofed sensors

connected to low power wireless sensor nodes which in turns communicate with the host computer through **Xbee** radio chip modules that support the **(IEEE 802.15.4/Zigbee)** wireless communication protocol. This communication protocol fill the gap of low data rate with low power consumption in the IEEE wireless communication protocols chart as presented in chapter two. Work in the study is done in many directions simultaneously, first the study used two types of local sensors, the **(LM35DZ)** analog temperature sensor and the **(DS18B20)** digital temperature sensor, validation of these sensors is done three times through the study, first after purchasing of sensors, then after waterproofing of sensors and finally after the assembly of the wireless sensor node with the implementation of the wireless connection. To receive data from sensors the study used two types of microcontrollers the **(16F877A)** PIC microcontroller and the Arduino Uno board that includes **(Atmega328a)** microcontroller, and that to determine the power consumption in both systems, also the study put into consideration the type of batteries to be used and a comparison between them in their capacities and discharge rates, in addition to the empirical experiments done to measure the signal strength of the wireless connection and to assign the optimal location for adding another sensor node to prevent signal loss between wireless nodes. Finally a visual basic software application has been designed as a user interface application for remote monitoring of all data collected from the wireless sensor nodes without the intervention of human on the process of collecting water samples.

## Contents

**CHAPTER 4**

**CHAPTER 5**



**CHAPTER 6**

## List of Figures

| Figure No. | Title | Page |
|---|---|---|