# SOLAR-POWERED WATER TANK OBSERVATORY SYSTEM VIA GSM

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# SOLAR-POWERED WATER TANK OBSERVATORY SYSTEM VIA GSM

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**BORANG PENGESAHAN STATUS LAPORAN**

**PROJEK SARJANA MUDA II**

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# ABSTRACT

This Final Year Project (FYP) refers to technical work and report writing experience that is relevant to professional development prior to graduation. One of the Universiti Teknikal Malaysia Melaka requirements for the award of Bachelor of Electronic Engineering (Wireless Communication) is that a student should complete his/her Final Year Project (FYP) and report. In order to that, my Final Year Project (FYP) titled "Solar-Powered Water Tank Observatory System Via GSM (WTOS)". Water tanks in a building needs to be monitored in order to ensure the consistent flow, capacity, load, volume and supply of water to a building's water supply system is safely ensured. When the power supply for the water pump is tripped, ( and this happens all too frequently and unpredictably) the water volume/capacity supply/flow to the particular tank will also terminate abruptly. It is common knowledge that water pumps often trip all too frequently and abruptly too. This is an unpredictable scenario and cannot be controlled as it involves electrical load and circuitry.

It all happens all too frequently and suddenly without any prior notice, expectation or warning to the administrator of a particular building in which a tank-based water supply system is needed or used. As this scenario is continuous, it will dry out the water volume in the tank without any notice as the demand of water usage is increased by its inherent users. This might jeopardize the reputation of that particular building's service provider.

Therefore, the intelligent Water Tank Volume Monitoring System was invented to monitor the level and volume of water in a particular tank continuously. The alert message which can be preprogrammed in our WTOS will be sent out instantly to the respective building manager or administrator's hand phone, via SMS. In the unpleasant ( and often unlikely ) event of such water volume load capacity incident is being abruptly and unknowingly drained-out, it is detected by our SPWTOS system and sms texts which are highly helpful is sent out. This will help the personnel from maintenance group/crew of a particular building to react quickly to rectify the defect before it reaches to an unpleasant, critical and a confusingly dry stage in terms of a tank's water volume and predictable/regular water capacity/content inflow.

# ABSTRAK

Projeck Sarjana Muda (PSM) adalah satu usaha dalam menanaman dan pembagunan sifat professional yang berasaakan kerja-kerja teknikal dan softskill secara menyeluruh. Salah satu syarat untuk melengkapkan penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Komunikasi Wayar), Universiti Teknikal Malaysia Melaka, seseorang mahasiswa perlu melengkapkan secara menyeluruh berkaitan Projek Sarjana Muda dengan sempurna. Berasaskan tujuan dan matlamat itu, Projeck Sarjana Muda (PSM) saya bertajuk "Sistem Pemantauan Isipadu Air Tangki Air dengan Kuasa Solar dan GSM"(WTOS). Tangki air di dalam sesebuah bangunan perlu diawasi supaya isipadu air yang mengalir keluar dan masuk dari sesebuah tangki air mengalir secara berterusan dari segi aliran, kapasiti, jisim, isipadu dan pembekalan air kepada sistem saliran air ke tangki air disesebuah bangunan.Apabila bekalan elektrik kepada sesebuah pam air tersekat, isipadu air, pengaliran air bekalan yang sedia ada dan biasanya penuh dari segi kandungan air di dalam sesebuah tangki air atau sistem tangki air akan menamatkan aliran air masuk atau aliran air yang dibekalkan kepada sistem tangki air tersebut. Tiada amaran lebih awal mengenai'tripping' pam air dan pentadbir/pengurus sesebuah bangunan di mana sistem tangki air kerap berada dilanda kesusahan serta kemuskilan di luar kawalan beliau

Oeh itu, secara bijak, Sistem Pengawasan Isipadu Air Tangki Air atau WTOS dicipta supaya pegawasan serta pemantauan bekalan serta isipadu air dapat di ramal, selia dan juga dikawal secara lebih berkesan dan padu.Teks amaran SMS yang kini boleh diprogramkan di dalam sistem WTOS akan dihantar kepada telefon bimbit secara otomatik dan segera kepada pengurus bangunan berkenaan di mana sistem ini dilanggani dan telah diprogramkan. Ianya dihantar melalui sistem pesanan ringkas atau SMS. Di dalam keadaan yang tidak diingini ini dimana gangguan bekalan air wujud tanpa amaran, sistem penghantaran SMS WTOS kami ini amat berguna dan boleh membaiki keadaan kesukaran gangguan bekalan air dengan lebih cepat serta di dalam jangka waktu yang ringkas dan cepat kerana ianya melibatkan penggunaan sistem SMS global yang diyakini dan boleh di percayai oleh industry air masa kini.

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| | | |
|---|---|---|
| GSM | - | Global System for Mobile Communication |
| UTeM | - | Universiti Teknikal Malaysia Melaka |
| FYP | - | Final Year Project |
| PSM | - | Projek Sarjana Muda |
| WTOS | - | Water Tank Observatory System |
| PH | - | Power of Hydrogen |
| PIC | - | Peripheral Interface Controller |
| LCD | - | Liquid-Crystal Display |
| H20 | - | One Molecule of Water and has Two Hydrogen Atom |
| SYABAS | - | Syarikat Bekalan Air Selangor |
| LED | - | Light-Emitting Diode |
| BNC | - | Bayonet Neill-Concelman |
| ADC | - | Analog-Digital Converter |
| PC | - | Personal Computer |
| I/O | - | Input or Output |
| GPRS | - | General Packet Radio Services |
| SAMB | - | Syarikat Air Melaka Berhad |
| KM | - | Kilometer |
| PCB | - | Printed Circuit Board |
| DC | - | Direct Current |
| PLC | - | Programming Logic Controller |
| RTU | - | Remote Terminal Unit |
| SCADA | - | Supervisory Control and Data Acquisition |
| GUI | - | Graphical user Interface |
| WSN | - | Wireless Sensor Network |
| PHP | - | Hypertext Preprocessor |

# CHAPTER I

# INTRODUCTION

The aim of this project is to design a Solar-Powered Water Tank Observatory System via GSM for use on water tank at remote area for real time water tank observatory. This observatory system will automatically detect the changes of water level and the concentration of pH (acidity and alkalinity) level in water and send the information to the responsible authorities. This information can help authorities make decisions earlier during the water shortage and also high pH level session.

## 1.1 Importance of water and the impacts towards mankind

This project is mainly about water monitoring system. Before I entered in water observatory system, study the basic knowledge of water quality system. Generally, water is a chemical type compound with the chemical formulation of H2O and consists of atoms attached by covalent bonds. Water is a creature of on the earth and a symbol of living. Quality of water is important indicator in our life to go smoothly. Each and every living thing around the world needs water, without it virtually no life would present in the entire world.

Water contains 500 items million of salt dissolved inside it. The Strategies of pure water are obtainable at waterways, streams, lakes, ponds, groundwater, cave water, springs, floodplains, and wetlands. The entire body of a human being made up of from 55% to 78% water, based on physical body size. The body of a human to work accordingly the entire body ought between 1and 7 liters of water each day to stay away from dehydration. Furthermore human need water for their daily activities too.

In Malaysia, the latest observation among the air, water, land, sound, light pollutions, the water pollution is leading problem that cause a lot of problems nowadays. This happened because there are a lot of factories, technologies and human activities that polluted water. It's effect the normal process of water treatment process. So those, the quality of water system around the world are in critical level. Everyday's human activities are one of the major reasons that water pollution happened nowadays. Once the water is polluted, the water qualities after the water treatment are also not satisfied. In recent years there are a lot of water monitoring system invented to solve this problem by using multiple technique and networks. Automated observatory system is an important in order to secure ambient for being and human being and it would not interrupt especially at clean water sources.

Now a day's there is a rapid development which each and everything in this world are automatically controlled and operated. Now modern world, there are less used old or traditional method for everything. In traditional method of drinking water supply system is facing many problem in many ways. It's due to filtration, water pumping, water distribution and water testing. Currently, In Malaysia there is 50% of the Malaysian was unable to received safe water for drinking. Other 50% of Malaysian was used filter to filter the treated water from water distribution system.

They unable drink the treated water directly from pipe, where need another filtration process to filter the water again. It's because the lack of water monitoring process. So that the qualities of water are getting worst each by each day. To overcome above said problems Solar-Powered Water Observatory System via GSM (Global

System for Mobile Communications) was introduced as Solar-Powered WTOS via GSM is a solution above said. These observatory systems are wirelessly observe the water quality. Furthermore these systems are fully powered by solar power.

Once the systems powered by solar panel, then observed and collected data from the water tank and send the data to mobile user via GSM. These systems there are two processes, which is first process are water level detection and second process was pH level detection. To achieve the best possible level, various aspects need to evaluate and analyze them follow certain aspects. By implementation the Solar-Powered WTOS via GSM can be reduce human involvement, volume of water and another problem.

## 1.2 Problem Statement

In this past century, the existing water observatory systems have using manual and traditional method which is not atomized. The traditional method systems require a lot of man power to manually observe and supervise the water tank. The system has shown in Figure 1.1

The problems occur with the above mentioned systems are specify as below:

- Used traditional method which not atomized [2]
- Use manual water quality monitoring system which not efficient [3]
- Access difficulties, electric power supply and communication Leeds major difficulties situation of water tank.[4]

Figure 1.1: Manually observe and supervise the water tank

The best way concerning perfect health starts with assisting the entire body are getting alkaline. The acid-alkaline equilibrium is essential, due to the fact several features within the body come up mainly at a specific amount of acidity or alkalinity. Multiple enzymes and also chemical type side effects inside the body perform best at a certain pH. A tiny improvement in the pH may have an explicit impact on entire body functionality. A decreased muscle pH as an illustration, brings about diminish in muscular organ permeability, which keeps nutriments from entering cells. Supplement ingestion from nutrition or supplement sources evolves into jeopardized. Whenever your entire body is much more acidic compared to alkaline, it is even more fertile for illnesses to improve. [1]. The figure 1.2 below show the pH equation and also heath.

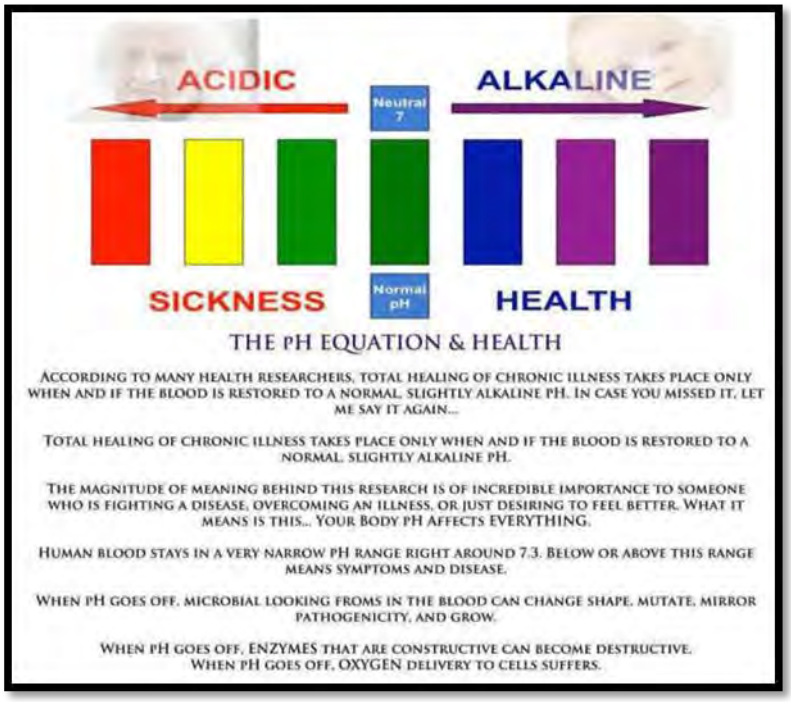


Figure 1.2: pH Equation and Health

Contaminants in drinking water may cause it to provide better algal and also plant expansion, caused by greater temperature or abundance of nutrients, inflicting pH levels to ascend. While such little alterations in pH are almost impossible to contain an immediate impact on aquatic life, they considerably persuade the presence and solubility of every chemical makes in the lake and may exacerbate nutrient issues. For instance, an alteration of pH will enhance the solubility of phosphorus, rendering it much more accessible for plant growth and ensuing a a larger enduring demand for dissolved oxygen.

Alkalinity and calcium supervision to boot induce the immovability of water and handle its aggressiveness to pipe and device. Outage to help reduce rusting may result in the |infection of drinking water and in uncomfortable side effects on its quality and overall look. Malfunctioning to prevent rusting can lead to the infection of drinking water and in adverse outcomes on its taste and overall look. [2]

In today's atmosphere of more restrictive handle and observing, it is essential to know precisely the levels of several chlorine and ammonia variety in the water. Many chlorination utilities have traditionally relied on a dosing ratio to control their process, such as five parts chlorine to one part ammonia. The dosing ratio is a starting point, but does not account for effects of varying pH levels, temperature, or existing ammonia in the water and chlorine demand in the source water.

Furthermore, there is another very important problem is improper dosing method conducted. Utility operators may overlook a measurement that reveals a drop in chlorine residual as chlorine is added, because it is counterintuitive. But, if the balance is not corrected, chlorine residuals may remain too low to sustain water quality through the distribution system, (said Gary Visser, Regional Sales Manager at Hach.)

On the other side of the chloramination curve, if a utility doses too much ammonia or not enough chlorine, free ammonia may be present in the distribution system. This may lead to nitrification problems, including water quality, health, and regulatory compliance issues. If nitrification is left uncontrolled, costly line flushes may be required. The biggest problem for many utilities is a reduction in total chlorine residuals. Nitrification can present additional issues, and can also lead to lower alkalinity and pH levels, which can increase distribution system corrosion. The figure 1.3 below show the effect of high chlorination and other acidity present in the distribution system.[3]

Figure 1.3: The cancer risk to people who drink chlorinated water

The documented side effect of chlorine such as, Based on the U.S. Council of Environmental Good quality, the cancer danger to individuals who consume chlorinated water is 93 percent greater than with those whose water should not have chlorine. The people of a little town in Pennsylvania who had diets high in inundated animal fatty acids as well as milk owned no heart problems – until they switched from mountain spring water to fluoridated water. Research from the University of Nijmegen in the Netherlands found that individuals who swam in chlorinated pools or contaminated waters as children had 2.2 to 2.4 times the danger of forming melanoma matched against people that could not swim in chlorinated waters. Male tobacco users who drank chlorinated tap water in excess of 40 years had double the danger of bladder cancer as using tobacco males who drank non-chlorinated water.[4]


Figure 1.4: Public complained about dirty tap drinking water

Figure 1.5: Rusty and phenolic chemical drinking water

The above figure 1.4 and 1.5 illustrate the water tank is infested with rusty along with other contamination. It's mainly because of high chlorination dosing mixture drinking water. Furthermore the phenolic chemicals with very little taste and odour thresholds, more determination and toxicity, was rising upward as water pollutants. The compounds are likely to exist in fresh water together with in remedied water. The quantity of phenolic concern pollutants in water within the catchment section of the Linggi River Treatment Plant in Negeri Sembilan, Malaysia, which includes the Linggi river basin, was observed.. The outcome prove that at most of the sampling stations, specifically those within the Seremban municipality, the amount of phenols was observed to outperform the recommended Malaysian standard of 2.0 µg/L-1 for fresh water. Generally perceived to be the complete impact of industrialized and urbanization of the location and evidently has shown the hazardous state of the Linggi River.

Water quality might be sampled implementing 'depth-samplers' at 3 various amounts (top, middle, bottom) and successive clearing out of the reservoirs will be conducted if any water quality violations are observed. Under this encoded every one service reservoirs will be cleaned manually/ robotically and afterward checked out every single six (6) months. This program will develop, however the tank gets dirt's before the time frame.[5]

Depicting Water Quality Personnel Making Samples from Water Sampling Stations through SYABAS has introduced the in-house Water Quality Sampling and Experimentation Programmed according to the similar frequency of sampling and