

PORTABLE WATER PURIFICATION FOR MILITARY PURPOSE

**Tirtha B. Ainapur^{*1}, Prajakata P. Gumtaji^{*2}, Anushka A. Patil^{*3},
Gayatri D. Patil^{*4}, Prof. M.B. Mulik^{*5}**

^{*1,2,3,4}Student, Department Of Electronics And Telecommunication Engineering, Sharad Institute Of Technology, Ichalkaranji, Maharashtra, India.

^{*5}Professor, Department Of Electronics And Telecommunication Engineering, Sharad Institute Of Technology, Ichalkaranji, Maharashtra, India.

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ABSTRACT

Water sustains life and is connected to almost every life form on earth. Water is considered as the most important aspect for survival, but as of now, not only water but clean water is required to sustain life. Contaminated water is the root cause of many diseases, especially in a developing country like India. With the current economic distress and rapid growth in population at an alarming rate, the availability of freshwater resources remains the same, which calls for a portable, low cost and low maintenance water filter, that will end not only the physical scarcity but also the economic distress thereby, providing access to safe drinking water for everyone as it is a fundamental right. This project aims to provide safe drinking water with almost negligible impurities with no bulky machines and costly maintenance. Since the device includes no chemicals, it eliminates the chance of intolerance from person to person. It can also be used by victims of the flood where water is readily available but having clean drinking is a difficult task. This device can help improve the life expectancy of the underprivileged and the destitute who have less or no access to clean water. As we all know, India is the second most populated country globally, with a population that does not have access to unsoiled water. This filter will provide clean potable water free from bacteria, microorganisms, turbidity and chemical agents, which can also benefit 'travelers and people stuck in floods or other natural calamities.

I. INTRODUCTION

Purified water is essential for living a healthy life as such everyone should have access to it. Drinking water conditions have great impacts on people's everyday life, especially in the rural and remote areas where access to safe drinking water is very crucial. Surface water often is the only source, thus water contaminations are difficult to avoid due to rigorous and reckless use of Surface water. Unsafe drinking water may result in fatal diseases. Statistics shows that these Diseases resulted in ninety percent of all deaths of children under five years old in developing Countries, due to low immunization of children to infections The most abundant natural resource of the earth is water which covers more than 70% of the earth's surface. However, merely 2.5 % of that total is in the form of freshwater. Many people worldwide are facing a water crisis, and the crisis will be severely fatal with time. Surface water and groundwater are the exclusive resources of drinking water. Water from each source of these sources contains various dissolved solids that contaminate it and make it impure. About 784 million people are deprived of safe drinking water and are subjected to its adverse effects. Poorly developed infrastructure, non-availability of electricity, poverty are some of the many problems that create hurdles in the management, filtration, storage, and supply of water. To accomplish the motive of providing safe water, the sediments from the water must be removed, and microbes must be killed. Our project aimed to create a water filter that won't be affected by prevailing the problems. When military personnel are deployed in remote areas or during emergencies, accessing clean drinking water can be a daunting task. Traditional methods like boiling water may not always be feasible due to limited resources or time constraints. The availability of potable water sources is uncertain, and consuming contaminated water poses severe health risks. Therefore, it becomes imperative to have efficient and portable purifiers that can effectively treat water on the go. Investing in portable purifiers can significantly reduce the cost of supplying pre-packaged water to military personnel. These purifiers are designed for durability and longevity, eliminating the need for constant replacements. Additionally, the ability to purify water from natural sources reduces the reliance on expensive bottled water or complex logistical operations. Using portable purifiers also promotes environmental

sustainability. By purifying water from local sources, there is a reduction in the need for single-use plastic bottles or extensive transportation of water supplies. This leads to a lesser carbon footprint and a more eco-friendly approach to sustaining hydration during military operations.

II. METHODOLOGY

Overall, portable water purification systems are essential for military operations. They help to protect soldier health and morale, increase mission flexibility, reduce logistical burden. The project to develop new and improved portable water purification systems for military purpose is highly relevant, as it has the potential to significantly improve the capabilities of militaries around the world. Newer and more effective water purification systems can help to protect soldiers from waterborne diseases, allow militaries to operate in more challenging environments, and reduce the logistical burden on military operations. Additionally, the development of new and improved portable water purification systems can also have benefits for civilian applications. For example, new water purification technologies can be used to develop more affordable and effective water purification systems for people in developing countries and for use in disaster relief operations. Another proposed system for portable water purification for military purposes is an ultraviolet (UV) light system. UV light systems use UV light to kill bacteria and viruses in water. UV light systems are very effective at disinfecting water, and they are also relatively lightweight and portable, making them ideal for military use. A proposed system that combines RO and UV light technology could provide a highly effective and portable water purification system for militia. Such a system could be used to purify water from a variety of sources, including fresh water, brackish water, and seawater. The system could also be used to remove a wide range of contaminants from water, including bacteria, viruses, salts, and other chemicals. Portable water purification systems can be used to purify water from a variety of sources, including fresh water, brackish water, and seawater. However, it is important to note that not all portable water purification systems are created equal. Some systems are more effective at removing certain contaminants than others. It is important to choose a system that is designed to remove the specific contaminants that are present in the water source that you will be using. Portable water purification systems are an essential piece of gear for anyone who plans to spend time in the outdoors, especially if they will be in a remote area where access to clean water is limited. By using a portable water purification system, you can ensure that you have access to safe, clean drinking water, even in the most challenging environments. The system is designed to be lightweight and portable, so that it can be easily deployed by soldiers in the field. It should be able to purify water from a variety of sources, including fresh water, brackish water, and seawater. The system should also be able to remove a wide range of contaminants from water, including bacteria, viruses, parasites, protozoa, cysts, sediment, heavy metals, and chemical contaminants. The system is powered by a variety of sources, including batteries, solar energy, or hand pumps. It is typically easy to use and maintain, even by soldiers with limited training. The system can be used to purify water for individual soldiers or for groups of people. It can also be used to fill water containers or bladders. Portable water purification systems for military purposes are an essential piece of gear for soldiers who operate in remote areas where access to clean water is limited. By using a portable water purification system, soldiers can ensure that they have access to safe, clean drinking water, even in the most challenging environments.

III. MODELING AND ANALYSIS

Components of a Purification System:

Sediment Filter: A sediment filter captures and removes particulate matter like dirt and debris from your water. Sediment is a generic term for all the particulate matter in your water that is not liquid.

Carbon Filter: Carbon is a commonly-used medium in water filtration processes. In fact, nearly every type of water filter system--whether it's a backpacking water filter, refrigerator filter, shower filter.

UF Membrane: Ultrafiltration (UF) is a membrane filtration process similar to Reverse Osmosis, using hydrostatic pressure to force water through a semi-permeable membrane element.

Mineral Cartage: Discriminate between the good and bad particles is the main problem with RO systems as they tend to remove everything, including the good ones.

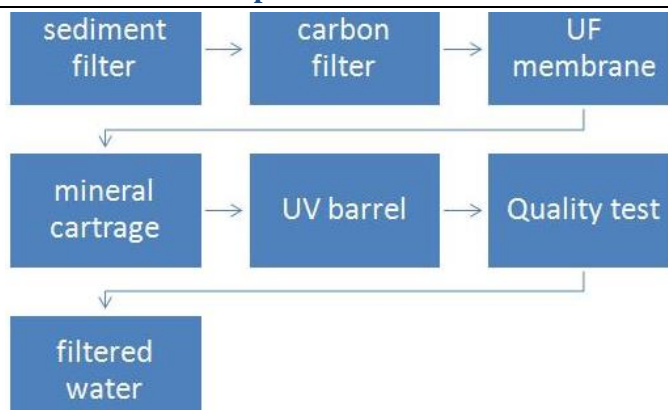


Fig. 3.1 Flow Diagram of Purification System

Microcontroller The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM.

Implementation Steps:

Software Development:

Thing Speak is an open source IoT platform used to store and retrieve the data stored in cloud over the internet. Thing speak also supports the MATLAB where we can analyses and visualize the Data.

Language specification in embedded C:

When designing software for a smaller embedded system with the 8051, it is very commonplace to develop the entire product using assembly code. With many projects, this is a feasible approach since the amount of code that must be generated is typically less than 8 kilobytes and is relatively simple in nature.

System Architecture:

A system architecture or systems architecture is the conceptual model that defines the structure, behaviour and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system.

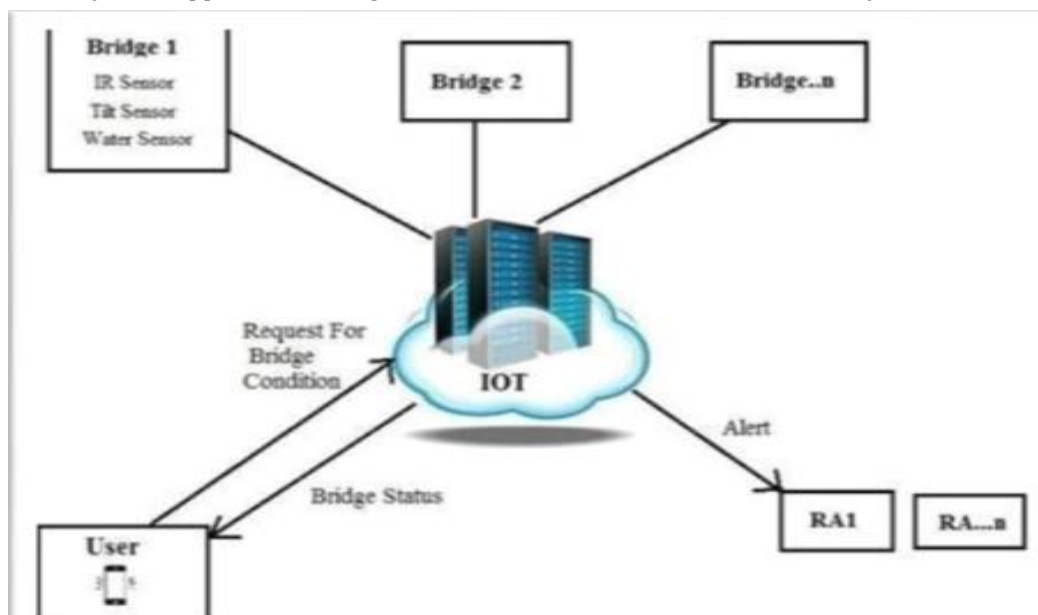


Fig. 3.2 Architecture Diagram of Implementation

When designing software for a smaller embedded system with the 8051, it is very commonplace to develop the entire product using assembly code. With many projects, this is a feasible approach since the amount of code that must be generated is typically less than 8 kilobytes and is relatively simple in nature. If a hardware engineer is tasked with designing both the hardware and the software, he or she will frequently be tempted to write the software in assembly language. The trouble with projects done with assembly code can be that they

can be difficult to read and maintain, especially if they are not well commented. Additionally, the amount of code reusable from a typical assembly language project is usually very low. Use of a higher-level language like C can directly address these issues. A program written in C is easier to read than an assembly program. Since a C program possesses greater structure, it is easier to understand and maintain. Because of its modularity, a C program can better lend itself to reuse of code from project to project.

IV. RESULTS AND DISCUSSION

In order to check the efficacy of the device, a water sample of around two liters was taken from a puddle. The water sample was then further contaminated using 150 grams of loose soil. The sample was then divided into two parts, namely sample A and sample B. Both samples come from the same origin and are further contaminated precisely the same. Sample A contained water that was contaminated and unfiltered. Sample B contained water that was passed through the water filter. Both the samples were further Process

Improved soldier health and morale Access to safe, clean drinking water is essential for maintaining soldier health and morale. By providing soldiers with a reliable source of safe drinking water, the proposed system could help to reduce the risk of waterborne diseases and improve soldier health and morale. Increased mission flexibility The proposed system is lightweight and portable, which would allow soldiers to operate in remote areas where access to clean water is limited. This would give military commanders more flexibility in planning and executing operations. Reduced logistical burden The proposed system could help to reduce the logistical burden on military operations by providing soldiers with a way to purify water from natural sources. This would reduce the need to transport bottled water to forward operating bases. Environmental sustainability The proposed system could help to reduce the environmental impact of military operations by providing soldiers with a way to purify water from natural sources. This would reduce the need to bottle water and transport it to forward operating bases. Overall, the proposed system of portable water purification for military purposes has the potential to provide a number of significant benefits to soldiers, militaries, and civilian populations around the world The proposed system of portable water purification for military purposes is a promising technology with the potential to make a significant impact.

V. CONCLUSION

The portable water filter created during the course of the project has evidently been successful in eliminating the harmful bactericidal entities present in the source water used for testing the filter. Water testing results show that the filter has remarkably reduced many different types of dissolved solid impurities along with some chemical entities implying that combining hollow fiber filters and coconut carbon fiber is valuable and efficient. The filter clearly demonstrates its use in purifying water on the go with its portable and easy to use design making it a smart choice for everyone deprived of clean drinking water irrespective of their financial background. Even with the use of all the components used in the filter, the user will experience an uninterrupted flow of water effortlessly in an instant.

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