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LITERATURE SURVEY ON WATER PURIFIER

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Abstract: Every year, almost 3 million people—including 1.3 million children under the age of six—die from drinking water contamination. As per the World Health Organization and UNICEF Eight people on the planet do not have access to safe, clean drinking water, and many are forced to drink water that they know is tainted with bacteria that might be fatal. People in underdeveloped nations can access up to five gallons of clean, safe water per day. Boiling water in wood stoves was a popular and less expensive way to purify water during the early stages of human civilization. However, this practice still poses risks in kitchens with inadequate ventilation and contributes to deforestation. This essay aims to analyze and summarize the published research that has been done thus far on a variety of low-cost water treatment techniques that are appropriate for rural areas, such as slow sand filtration, solar sterilization, distillation, chlorine filters, bone marrow, and emergency homemade filters. These sustainable low-cost water treatment tool solutions are ideal for rural infrastructures.

Keywords: Water purification, sediment filter, carbon filter, IoT, IoS , IoP and IoE, QOI levels

I. INTRODUCTION

Human activity has contaminated the world's water supplies. These human endeavors entail the discharge of industrial chemical waste into rivers and lakes. Water contamination is caused by a multitude of sources, including industrial waste disposal, population growth, and oil leaks. The earth's water resources include rivers, ice caps, glaciers, seas, and oceans. Contamination of water bodies is referred to as water pollution. Ground water is contaminated by substances like fertilizer and pesticides that farmers employ to keep insects and pathogens away from their crops. The process of purifying water involves taking out unwanted chemicals, biological impurities, suspended solids, and gases. The waters and marine life are seriously threatened by unintentional oil leaks. Tainted water from taps or unclean sources can lead to cholera, dysentery, typhoid, diarrhea, and polio.Because arsenic and fluorides are components of contaminated water, diseases like arsenicosis are brought on by their presence. Water purification is the process of eliminating bacteria, unwanted chemicals, and suspended particles. Sand and suspended particles are eliminated from the water using a sediment filter, which is the main step in the purification process. Water colorants and unpleasant odors are eliminated from the water by using a carbon filter. The next step, known as UF filtering, removes germs, colloidal debris, and smaller pollutants. Large pores in the membrane are employed in a technique akin to reverse osmosis. UF filtration operates on regular water pressure; energy is not needed for it to function.

II. LITERATURE SURVEY

According to Raj. Kishore.S.(2021)[1], Naturally occurring materials, such as plane sand that has been passed through an IS sieve measuring 425 to 600 microns, and wood charcoal that has been gathered and ground into particles no larger than 10 mm, are used to remove iron. Additionally, anthracite with a size of 625 microns and below as well as manganese-modified sand of 850 microns were employed. In order to produce drinking water, the zinc, copper, and iron solution was prepared and passed through various adsorption processes. The result was that the heavy metal solution, which had a concentration of 6.00 to 5.00 ppm, was filtered out of the water to leave up to 0.3 to 0.1 ppm and maintain a pH of 6.5-8.5. Therefore, utilizing materials that are readily available locally, the oxidation-reduction method is utilized as a tool for evaluating and determining the concentration of residual iron and dissolved oxygen in the infiltrate. The primary disadvantage of this procedure was its increased power consumption.

Feedback Control for Drinking Water Purification Alvaro E. Gil and Kevin M. Passino [2]. The writers of this research study examine a few methods for treating raw water as well as the control measures that have been put out thus far to attempt and provide drinking water in a dependable manner. The variable raw water quality, seasonal variations in pH and temperature that affect disinfection efficacy, transport delays related to water transportation times, and the multiple-input, multiple-output nature of the issue (i.e., multiple chlorine

sources and multiple water consumption points via multiple pipe paths) all contribute to the complexity of the control strategies suggested. The primary disadvantage of this procedure was the extremely high rate of corrosion.

Zahra Aghalarietal gathered information based on the inclusion and exclusion criteria as well as by doing a keyword search in publications published between 2008 and 2018 with an emphasis on the efficiency of waste water treatment systems in getting rid of bacterial agents[3]. Preferred reporting items for the systematic evaluations and meta analyses (PRISMA) standards checklists were used to gather qualitative data. Information was added into the checklist after the accuracy of the articles was confirmed, including the initial author's name, the year the report was published, the types of analysis, sample numbers, purification technique, types of microbiological agents, and rates of microbial agent removal. Additionally, the United States Environmental Protection Agency (USEPA) requirement was compared to the clearance rate of the microbial agent mentioned in the study. The primary disadvantage of this procedure was the high rate of pipe clogs.

Michal Lom, Ondrej Pribyl, Miroslav Svitek entitled "Industry4.0 as a Part of Smart Cities"[4] suggested a notion utilizing industry 4.0. The Internet of Things (IoT) will be utilized to produce so-called smart products, according to the Industry 4.0 idea. The product's subcomponents each had their own intelligence. Enhanced intelligence is employed throughout a product's lifecycle, from its creation to its handling and disposal (smart processes). Additional significant elements of Industry 4.0 encompass the Internet of Services, specifically encompassing intelligent transportation and logistics (smart mobility, smart logistics), and the Internet of Energy (IoE), which establishes the appropriate utilization of natural resources (such as electricity, water, and oil). Industry 4.0 can be seen as a component of smart cities, and IoT, IoS, IoP, and IoE can be considered as an element that can connect the Smart City Initiative and Industry 4.0. The primary disadvantage of this procedure was the extremely high cost of model development.

Zhanwei Sun ,Chi Harold Li ,Chats Chik Bisdikian, Joel W.Branch and Bo Yang entitled "QOI-Aware Energy Management in Internet-of- Things Sensory Environments"[5]. This research examines an effective framework for energy management that can yield a good quality of experience (QOI) in IOT sensory contexts. In contrast to previous efforts, it maintains energy efficiency over time without compromising any achieved QOI levels and is transparent and compatible with lesser protocols in use. In particular, the novel idea of "QOI-aware sensor-to-task relevancy" takes into account both the QOI needs needed by a job and the sensing capabilities provided by a sensor to the IOT sensory environments. a brand-new idea for choosing the sensors to support a task over time: the "critical covering set" of every particular task. Decisions about energy management are done dynamically during runtime in order to maximize long-term traffic statistics while limiting service latency. The concepts and techniques presented in this paper are finally illustrated using a comprehensive case study that uses sensor networks to monitor water levels. Additionally, a simulation is created to illustrate the effectiveness of the suggested approach. The primary disadvantage of this procedure was its increased power consumption.

B.K. Nandi[6],This researcher talked about a low-cost ceramic percussor creation that was created utilizing affordable inorganic raw materials that were readily available locally, like sodium carbonate, quartz, boric acid, and sodium meta silicate, which are in the range of ceramic membranes that are below 75 microns. In order to create the ceramic filter, thermal, structural, and morphological analyses of the prepared membrane were conducted. The ceramic membrane was sintered at 800°C to 950°C in an oven to filter water from a solid, insoluble membrane. Water was passed through ceramic holes with sizes ranging from 0.185 to 0.323 µm and membrane porosities between 34.6 and 19.6% in order to test this. The oil rejection effectiveness of the membrane was found to be 98.8%. Pipe obstructions were the primary disadvantage of this procedure.

Mr. Anil K.Rajvanshi and Amol Dalvi[7],Rural households can purchase an affordable solar water purifier from the Nimbkar Agricultural Research Institute in Phaltan, Maharashtra, India. The author has talked about a solar-powered water purifying technique. They purified the water in their system using a basic solar gadget. They began utilizing tubular solar collectors to heat water. By employing solar energy to heat water, all dangerous deposits were removed; however, in order to reach the appropriate temperature, the water must be heated till the following morning. The following morning, they had to pick it up. The water purification procedure requires a lot of time, just like this process. Furthermore useless for this strategy are the wet seasons and the colder months. As a result, the time needed is extremely high, as though we desire a purifier with quick service. They also conducted an analysis and a survey on the number of days when the temperature will be over 45 degrees. The primary flaw with this technique was that it was affected by temperature.

Vishal. L[8], Presented is a water filter constructed of wooden charcoal, sand, and a plastic container. A cheap water filter made of sand and wooden charcoal is available. As a result, it is determined that the most straightforward and affordable method for removing iron is adsorption. Since sand is the least expensive adsorbing surface, it removes dissolved iron from drinking water very well and filters at a very high rate. The only drawback is the bacterial layer that later develops as a result of frequent use. Thus, washing is occasionally necessary. The primary disadvantage of this procedure was its increased power consumption.

The "LifeStraw" technology was initially established in 2005 for usage in emergency situations. It is being employed to purify water in both areas with a severe lack of clean water and in settings that are generated during tourist visits[9]. Membrane modules, activated carbon, prefilter grids, and plastic or metal enclosures make up this device. The filter's efficiency exceeds 1000 dm3, which is sufficient to give one person access to clean water for an entire year.. The research done between 2010 and 2015 verified that 99.9% of the parasites

(schistose, ascarids, etc.) and 99.9999% of the bacteria (Brucella melitensis, pyogenes Streptococcus) had been removed. The device's more intricate adjustments worked well against viruses. The device's high degree of water filtration can be explained by the usage of a cartridge membrane element with a hollow fiber structure. The primary disadvantage of this procedure was the extremely high rate of corrosion.

Department of Chemistry, J.L Charturvedi College of Engineering, Nagpur, India. S.S Turkar, D.B Bharti and G.S Gaikwad[10] There are several techniques used in water treatment to reduce pollution. The author suggests a number of waste water treatment techniques to reduce water contamination. The study delves into the various attributes of water, including its physical, chemical, biological, and radioactive properties. The physical characteristics that they established were hue, turbidity, and temperature. The chemical properties of water, such as its pH, hardness, and ability to dissolve substances. Biological features included viruses, bacteria, and protozoa. Additionally, they have distinguished between the criteria of waste water and natural water. There were various techniques, including thermal and fixation procedures, for treating hazardous pollutants in water. They also offer some data on the quantity of water contamination by state, broken down by year.

In a study Tanushree. B[11], Presented Tulsi and Neem leaves are used to purify water and reduce cheek coli-form in water samples by the use of fresh leaf juice, alcoholic leaf extract, and aqueous leaf extract. The antibacterial activity of plant leaf extract can be effectively achieved by the synergistic impact of the active components found in plant leaves. These provide sand and charcoal filtering in advance to lessen load contamination. The usage of carbonic acids was the primary flaw in this procedure.

Katadyn Group[12] is a Swiss company whose responsibility it is to supply food and drink to people in the field during conflicts and emergencies. The company sells water filters that are universal in nature, as well as tablets and gadgets that are used to cleanse surfaces. Among them are several gadgets meant for individual usage. The most common ones are the "KATADYN HIKER PRO" models, which have an activated carbon cartridge, a glass fiber cartridge, a ceramic prefilter, and a mechanical intake filter. - "KATADYN VARIO" is made up of an activated carbon cartridge, a glass fiber cartridge, a ceramic prefilter, and a mechanical intake filter. The "KATADYN POCKET" is made up of a ceramic filter with a 0.2 micron filtering rating and a mechanical filter mesh All of these filters get rid of dissolved particles, cysts, bacteria, protozoa, and algae. These ergonomic devices offer safe, high-quality drinking water. distributed for use by tourist groups, armed forces units, and philanthropic organizations. The primary flaw with this technique was that it was affected by temperature.

Ranjan Pandhare[13], Dr. Isha Khedikar conducted a feasibility research on domestic water purifiers for rural areas. The study's main focus is on the viability of installing water purifiers in rural areas to shield family members—especially children—from water-borne illnesses. The Bhabha Atomic Research Centre designed the water filter utilized in this investigation, with design inputs from IIT Bombay. The utilization of nano membrane technology in purification is what sets this filter apart from others. It is affordable and practical for long-term use thanks to this membrane filter. This study is conducted in four villages in Gadchiroli's isolated and tribal districts, where the issue of water-borne illnesses is a serious concern. The primary disadvantage of this procedure was the extremely high cost of model development.

N. Corderio[14], Investigate the raw material as well as the outer bark layer, which has a higher cellulose fiber content. The primary component of the two types of materials, cooked banana trash, had a polysaccharide content that was high enough—between 60 and 70 percent—to warrant the pulping precautions. Moreover, there was relatively little lignin present. The comparatively high concentration of ashes and extractives was the only startling discovery. These residues were pulped by using soda, kraft, and soda-anthraquinone cooking methods. The optical pulping conditions involved cooking the residues for a brief period of time at 120°C in the presence of 0.25–0.35% anthraquinone. This takes thirty minutes. The use of Kraft pulping conditions, longer cooking durations, and higher cooking temperatures did not improve the performance of the rice. The primary disadvantage of this procedure was its increased power consumption.

Nerox Filters[15] The NPP "Simpex" firm started producing these filters more than 20 years ago. The Joint Institute for Nuclear Research invented the track membrane, which serves as the primary structural component of this filter. Studies show that these membranes are quite effective at removing heavy metals and microbiological pollutants. The polymeric films with a thickness of 10-23 microns are used to create the track membrane by subjecting them to high-energy krypton ions that penetrate the film. Individual ions of the destroyed material form channels in the route, with their physical and chemical characteristics different from those of the undamaged material The film treated with ions in the alkaline solutions at the track site produces identical cylindrical through holes during additional etching. Depending on the etching circumstances, the diameter of these apertures might vary from 0.05 to 3 microns. Utilizing a U-400 ion accelerator, which can produce up to 1012 ions per second for the JNII's nuclear processes, track membranes with pore densities between 105 and 109 pores per centimeter2 can be produced in large quantities. These membranes have a porosity of 10–15%. The primary characteristic of track membranes that sets them apart from other membrane types is their extreme selectivity. The primary disadvantage of this procedure was the extremely high cost of model development.

III. DRAWBACKS OF THE EXISTING SYSTEMS

1. Cost of developing this model was very high.
2. Time consuming process
3. Enamel of teeth is affected due to carbonic acids used.
4. The rate of corrosion was high and fast.

IV. OBJECTIVES OF THE PROPOSED METHOD

1. External temperature will not affect this process.
2. Carbonic acids and harmful chemicals are not used.
3. Cost effective.
4. This process is less time consuming.
5. Low maintenance Cost.

V. PROPOSED METHOD

The water to be filtered is connected to the input block intern linked to the filter and sensor (1) in the suggested technique. Sensor (1) is used to measure the water's volume, and the filter is utilized to remove the dust particles. When the water volume before and after sensor (1) is compared, if the volume of water is less than the initial flow, a wireless alert about a filter blockage is delivered. The second sensor is used to measure the water's hardnessWhen water has an extremely high hardness level, it is held in a tank and used for various purposes. After the bacteria in the water are identified using sensor (3), the water is smoothed out using a smoother. The water has been further smoothed and transferred to sensor (4). It will test whether the water is safe to drink. The water is sent to a storage tank if it is safe to drink. The water is returned to the smoother if it is unfit for consumption.

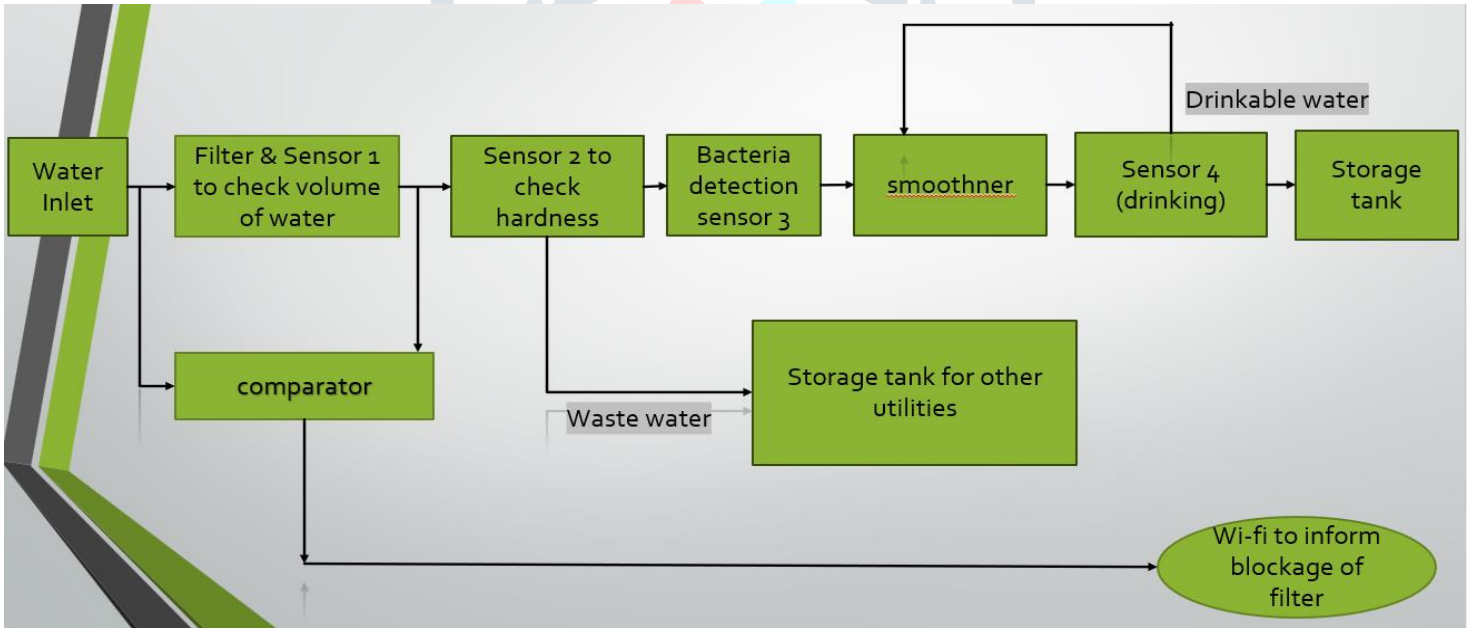

Figure 1: Block diagram

A.Flowchart

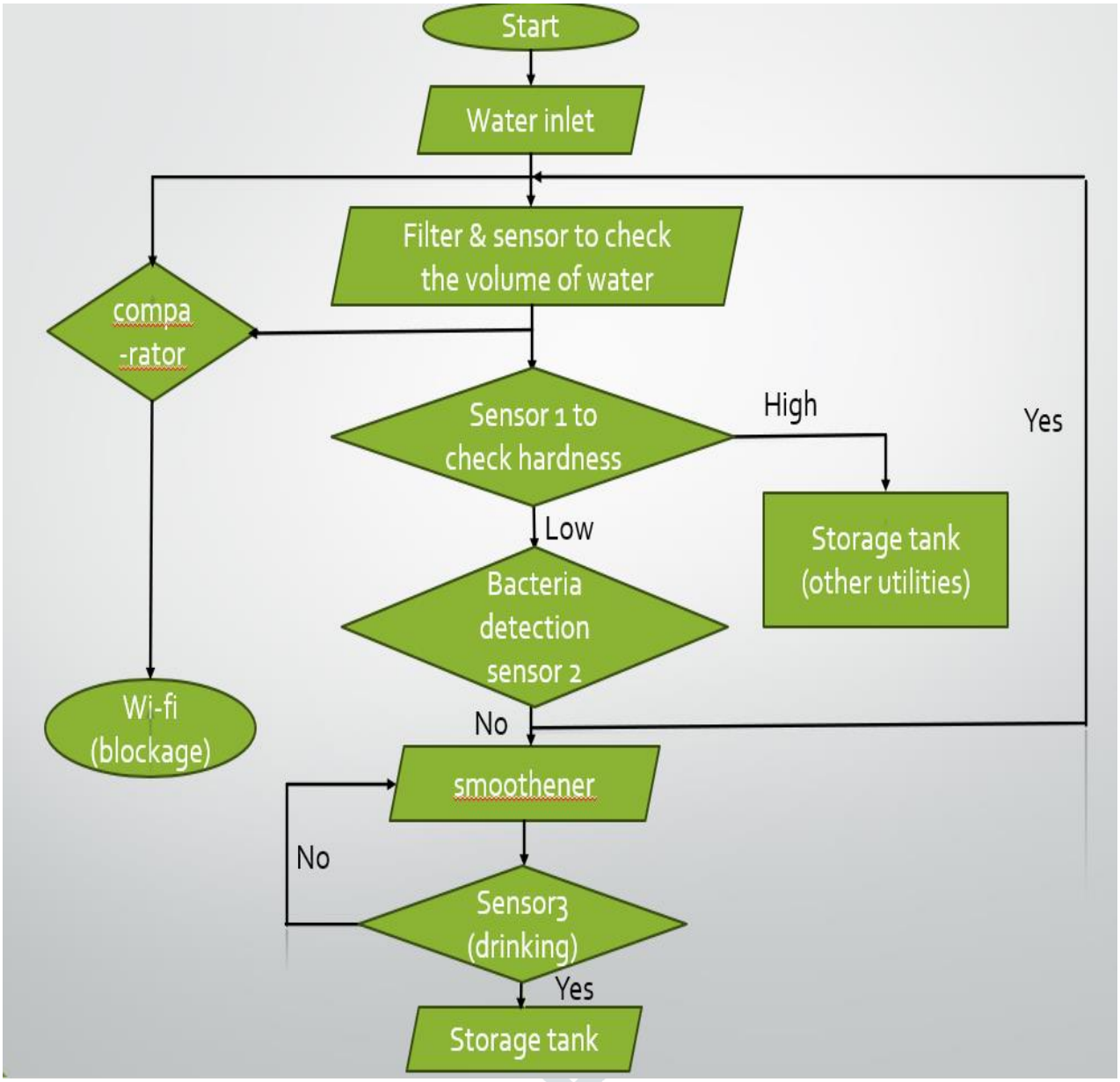

Figure 2: Main flowchart

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