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Water Quality Inspection and Automatic Cleaning Cycle for RO purifier

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Abstract- Water is present everywhere on earth, but it needs to be purified before it can be consumed. Here comes the difficult part. It needs electricity to or fuel along with large systems to purify it and make it consumable. In this project we are implementing a system to monitor and inspect the water parameters such as PH, Turbidity, TDS Through Sensors and use this data fr quality analysis and alert users about water quality issues. the second main important function of our project is automatic cleaning cycle which uses reverse pressure technique to remove all impurities present in filter cartridges this cleaning cycle will be programmed for specific time intervals or can also be programmed based on quality parameters and will help to avoid damage issues of filter cartridge and increase its life and reduce replacement costs.

Index Terms-Water Quality inspection and automatic cleaning cycle for RO Purifier

I. INTRODUCTION

The health burden of poor water quality is enormous. It is estimated that around 37.7 million Indians are affected by waterborne diseases annually, 1.5 million children are estimated to die of diarrhoea alone and 73 million working days are lost due to waterborne disease each year. The resulting economic burden is estimated at $600 million a year. The problems of chemical contamination is also prevalent in India with 1,95,813 habitations in the country are affected by poor water quality. The major chemical parameters of concern are fluoride and arsenic. Iron is also emerging as a major problem with many habitations showing excess iron in the water samples. It is true that providing drinking water to such a large population is an enormous challenge. Our country is also characterised by non-uniformity in level of awareness, socio-economic development, education, poverty, practices and rituals which add to the complexity of providing water. Water resource problems for community consumption in terms of quality and quantity are important obstacles for quality of life in nearby communities. The project took place in the upper zone of Ban Dong Sub-District, MEA Moh District, Lampang Province of Northern Thailand. The main objectives were: to co-investigate the current situation of water problems for consumers in terms of quality and quantity; to develop mechanisms to supply drinking water through community participation and to design an appropriate model for sustainable water management. At present villagers face not only water shortages but also water quality related problems. The water shortage is rather caused by the lack of effective community participation to manage integrated solutions from the raw water preparation and to distribute water throughout the community. These problems are lessened where the community in upper zone has been mindful about forest preservation and regulation around the Mae Moh water basin. The pilot projects were launched to initiate the working group, which assembled volunteers led by the village leader and representatives. The result helped the community to understand the issues and self-created solutions for reducing costs and improving sustainability, including developing the use of a slow sand filtering system for drinking water and maintaining the village water supply system. Participatory activities could be passed on to other villages around District so that villagers can develop sustainability mainly through their own self-supported work. WASH (inequalities, schools, health centres, refugee camps, women and girls) 1) Insufficient quality of drinking water. Rural villagers have insufficient access to purified drinking water due to impacts of low income, technical solutions, community internal management, water contamination from agricultural chemicals, industries, and waste disposal. 2) Lack of sustainable development of drinking water. Villagers cannot develop sustainability of their drinking water. Instead, they solve the problem by buying bottled water which it is the wrong solution. Water resources management (water-use efficiency, integrated water resources management, transboundary cooperation, sustainable extraction and supply of

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freshwater) 1) There is high opportunity of own producing drinking water for villagers through action and participatory community as a mechanism in water management. 2) When villagers buy plastic bottled water for daily consumption. Increase daily expense which it is opposite the concept of appropriate sustainability as well as the more problem of waste disposal management/ It is likely to increase at local level and it shall begin with the ecological balance. Water quality (pollution, dumping of toxic materials, wastewater management, recycling, reuse, restore ecosystems and aquifers) 1) Up-stream, middle stream, down-stream parts of water logistics should be used to value, both quality and quantity, for high economic benefit of a community. In overall, productivity in term of agriculture and industry reflects poor health and less access to qualified water supply because, on the contrary, the increase in buying number of water bottles. 2) Community sustainability development can be seen from the natural water restoration and forest preservation in the local and upstream area. Risks (mortality, economic losses caused by natural and human-induced disasters) Drought and flood in community are naturally reality. However, to bring local for solving the risk of water shortage is related to techniques and social support and risk management

II. BLOCK DIAGRAM

The block diagram represents a **Water Quality Monitoring and Control System** using an **ATMEGA328p** microcontroller. Below is a **detailed breakdown** of each component and its function:

1. **Power Supply**

- Provides the required voltage and current to all system components.
- Likely converts AC to DC (if needed) and ensures stable power for the **ATMEGA328p,** sensors, and output devices.
- Could use a **battery, adapter, or regulated power source (like 5V or 12V DC).**

2. Sensors (Input to ATMEGA328p)

The system has **three key water quality sensors**, which send real-time data to the microcontroller:

a) pH Sensor

- Measures the acidity or alkalinity of water.
- The pH scale ranges from **0 to 14**(0 = acidic, 7 = neutral, 14 = alkaline).
- Used to determine if water is safe for consumption or industrial use.
- The microcontroller reads the pH value and compares it with set thresholds.

b) Turbidity Sensor

- Measures the clarity of water by detecting suspended particles.
- High turbidity means **cloudy water with contaminants.**
-Works using **light transmission** (optical method) where more suspended particles reduce the light passing through the water.

c) TDS (Total Dissolved Solids) Sensor

- Measures the concentration of **dissolved salts, minerals, and metals** in water.
- Higher TDS means **more dissolved substances**, which could indicate poor water quality.
- Used in drinking water, aquaponics, and industrial application.

3. ATMEGA328p with Power Port (Microcontroller Unit - MCU)

- **Processes sensor data** and makes decisions based on pre-programmed conditions.
- Communicates with output devices (display, buzzer, and cleaning system).
-Could be programmed using **Arduino IDE** since ATMEGA328p is the main chip in Arduino boards.
-Has **analog and digital input/output pins** to read sensor values and control external devices.

4. Outputs (Controlled by ATMEGA328p)

a) Display (LCD/LED/OLED Screen)

- Shows real-time sensor values (pH, turbidity, TDS) to the user.
- Can be an LCD (16x2 or 20x4) or an **OLED display**.

b) Buzzer

- Alerts if water quality parameters exceed acceptable limits.
- Example: If pH is too low (acidic) or turbidity is too high, the buzzer will sound an alarm.

c) Output to Cleaning Valves

- Activates cleaning mechanisms. if water quality is poor.
- Could be used to trigger solenoid valves, pumps, or chemical dosing systems to purify water.
-Ensures automated maintenance without manual intervention.

5. Working Process

1.Sensors measure water quality parameters in real time.
2. ATMEGA328p reads sensor data and processes it.
3. If values exceed preset thresholds, the microcontroller:
   - **Displays data on the screen.**
   - **Activates the buzzer (alert mechanism).**
   - **Triggers cleaning valves to purify the water**.

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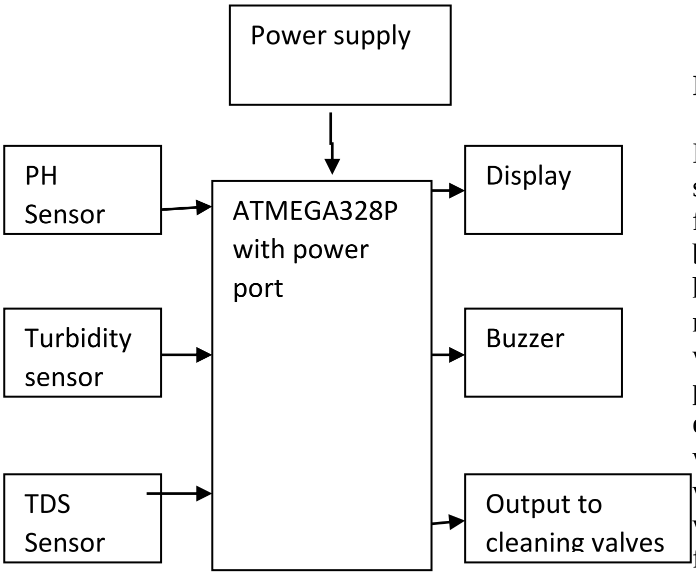
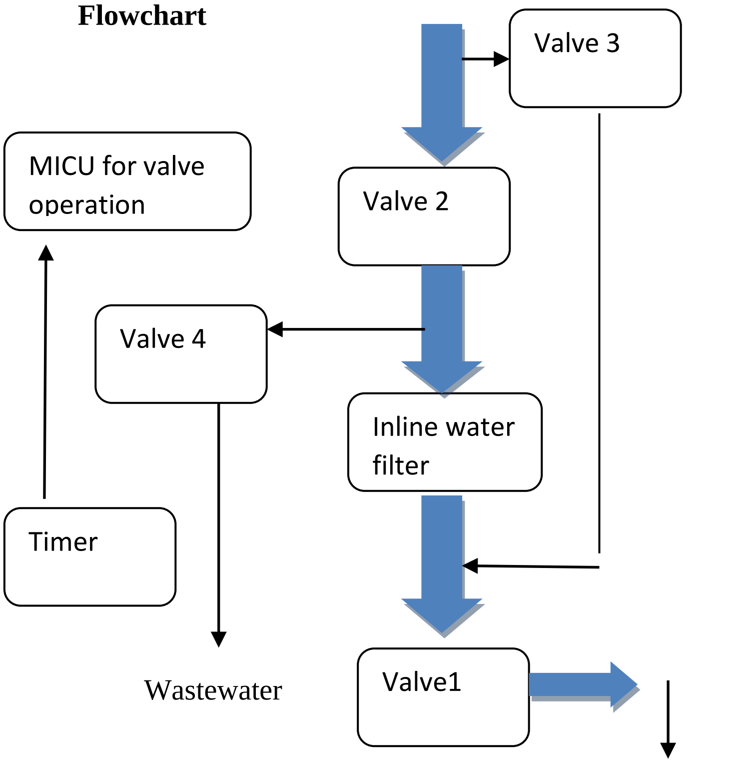


Figure 1: Block Diagram

Flowchart



Output to storage tank

Figure 2: Flowchart

III. CONCLUSION

In conclusion, In India, investments in community water supply and sanitation projects have increased steadily from the 1st plan to the 10th plan. However, the health benefits in terms of reduction in waterborne disease have not been commensurate with the investments made. Though health sector is bearing the burden of water and sanitation related infectious diseases, presently it does not have adequate institution or expertise for monitoring and surveillance of community water supply programmes in the country. India has witnessed significant improvement in rural water supply with increasing coverage of areas and a large volume of financial resources made available. A series of schemes are aimed at improving the supply of drinking water for rural habitations and now for monitoring and ensuring quality. The past few years have seen greater emphasis on water quality monitoring and surveillance with specific allocation being made under Central grants. There has been great focus on setting up and upgrading laboratories at the state and district levels, and on water monitoring through field testing kits

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