

# Salinity Level Indicator using IoT



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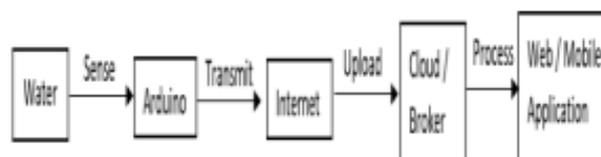
**Abstract** In recent years the groundwater has been contaminated with a lot of unwanted salts. So people started using purifiers which purifies the water which is sent to the water tank by using REVERSE OSMOSIS method. Reverse osmosis is a method in which a membrane will be present in the filter which will remove the unwanted salts present and reduce the hardness of water. This project is to check the level of TDS (using SENSORS) in the water which is going into the water tank and notify the resident with the level of TDS. If the level of TDS increases more than the normal level then the resident will be getting a notification on his or her mobile to change the filter which is being used in the water purifier. Till the filter in the water purifier is changed chlorine will be poured according to the pH level of the water present in the tank. The pH LEVEL is checked using the pH sensor. This entire process is done by using ARDUINO or Raspberry pi3.

**Keywords :** Arduino,pH Level,Sensors,TDS.

## I. INTRODUCTION

The major threat to human society is the scarcity of water. Most of the places in India has very low supply of water or no supply of water. Even though in some places if the water is available then the water that people get has lots of contamination. Due to these contaminations many people are getting lots of diseases. The groundwater level is getting decreased and a lot of impurities are present in them. So because of this the water which is available for the residents to use is becoming harmful. To reduce the hardness and to make the water contamination free people started using water purifiers in the water tank which stores the water for the entire house to use. These purifiers work under the concept of reverse osmosis. They reduce the hardness and filter the water to make it free from unwanted salts. The TDS present in the water is also reduced in this method. The normal level of TDS that human may use in his or her daily use is 1000 ppm. The salinity level indicator is a device which is utilized to check the degree of salts broke up in the water which is getting into the water tank and it additionally checks the TDS level. To do this we use sensors in the inlet area of the pipe. We use TDS meter, TDS sensors. These sensors will sense and find the level of TDS and the amount of salts dissolved in the water. They will send the data to the arduino board which is connected to it. We use an arduino which is compatible with

Wifi. We use this to send the information to the cloud. From the cloud the data will be sent to the Mobile phone of the resident. By using the board and sensors we can easily find the required datas.



Img.1 Flowchart

A pH sensor will also be placed with the TDS sensor to check the pH of the water. The normal pH level of pure water which humans can use is 7. The water is acidic when the pH is beneath 7 and the water is basic when the pH is over 7. For drinking purpose the water must be between 6.5 to 8.5. If the pH level increases more than 8.5 or goes below 6.5 then chlorine will be sprayed in the water to maintain the pH. Pouring of Chlorine also helps us to maintain the biological factor of water. To implement this we use IOT which is one of the advancing technology in the world. [8] IoT is advancing with a great many things interfacing every day to create enormous measure of data which can be utilized for future necessities. To ensure the supply of safe water we must do real time monitoring of water, We do this with the help of TDS Level Indicator. [8] In this project, we will actualize the plan of IOT for observing framework that checks the nature of water continuously. This framework comprises a few sensors which estimates the nature of water. The ongoing checking of water assets data will assist the occupant with changing the filter which will be available in the purifier. The main concept of TDS Level Indicator is to provide comprehensive and accurate information.

### Water Monitoring using IoT

Usually the testing of water is done by taking samples from the water to be tested to the laboratory and after the laboratory provides the result, the quality of water will be found. This was a time-consuming process. This process cannot keep a real time monitor on the water. It is important to keep the water safe from chemical and biological wastes. For example water for drinking must be free from chemicals that are harmful for humans, Water used for bathing must have less hardness. The water is mainly monitored to check the TDS in the water. As the toxic level of groundwater has been increased due to acid rains, usage of pesticides and other hazardous fertilizers, the level of TDS in groundwater has been increased in a high range. So we have to ensure the quality of water that is being used by the humans in their houses are free from these unwanted salts.

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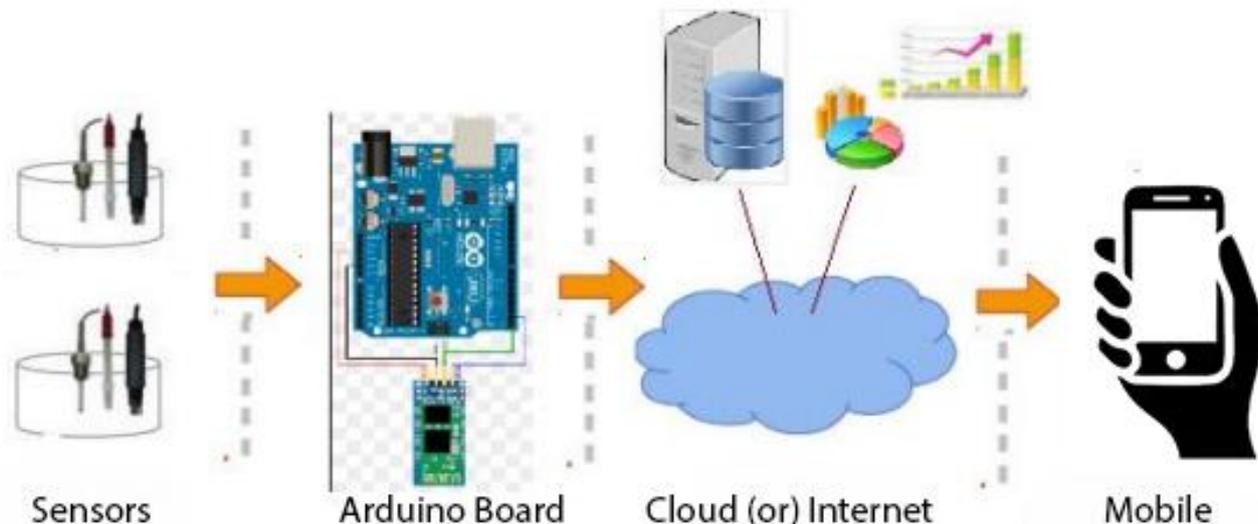
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The unwanted salts contain carbonates and sulphates in it. This makes the water hardness to increase. These salts are harmful for consuming also. The chlorine which is added will remove the carbonate and sulphate salts and form chlorine

salts. The Chlorine salts are not harmful like the carbonate and sulphate salts.



Img.2 The step by step representation of the process.

The conclusion for this problem is to check the water for its TDS and the pH level to make sure that the resident is using safe water for their daily requirements. The TDS will be checked and the resident must get the alert to change the filter in the water purifier and the pH will be recorded to maintain the pH by pouring Chlorine into the water present in the water tank. For doing this sensors are placed in the inlet pipe of the water tank. The sensors used are TDS sensor which checks the TDS and the pH sensor which checks the potential of hydrogen i.e. the pH of the water. This data will be stored by the system in its database but before that the necessary action will be taken in the water tank. This data will be then accessed by the resident in his mobile phone.

So an advanced approach is being introduced to keep a real time watch on water quality. The method uses Internet of Things (IoT), a network of devices, which enables these devices to collect and exchange data.

**Sensors:** This part consists of the TDS sensor and the pH sensor. They will sense the values regularly. They are controlled by the Arduino board.



Img 3. TDS sensor



Img.4 pH sensor

**Arduino:** This part contains an Arduino board with a Wi-Fi shield. In the wake of getting those values from sensors, the board will send that crude information promptly to the cloud utilizing the Wi-Fi shield. The information is crude as it is yet not mapped to its comparable and understandable values.

**Cloud:** Information got from Arduino is then changed over into human understandable values. This information is then handled over the cloud by utilizing cloud APIs. These generated values are then put away into the database of the cloud. If these qualities are surpassing the degree of security then the resident will get informed by the cloud. The values can likewise be routinely observed by the resident through the mobile.

**Mobile:** This is the device which receives the data from the cloud and allows the resident to check the TDS level and pH level. It also helps us to have a check of these regularly from wherever the resident is there.

### The IoT Pattern

IoT depends on three sets of patterns:

- Internet oriented (middleware).
- Things oriented (sensors).
- Knowledge oriented (semantics).

**Internet oriented:** The cloud service provides coordination and management to the proposed system. The sensed data is stored and analyzed and the resultant information or result is delivered as a notification to the desired user on their mobile phones or web portal. Cloud infrastructure provides efficient storage mechanism and accurate analysis; this provides flexibility, elasticity, and reliability to the system.

**Thing-oriented:** Brilliant Objects can be characterized as articles which can depict its very own conceivable interactions. Smart Objects may give the data about item properties, conduct, and furthermore connection data. In the proposed framework, sensors can be utilized to test and check the immaculateness of water. Here the sensors demonstrate like a shrewd article.

Following are the types of sensors that we use:

1.TDS sensor:

TDS is the measure of salt broken down in water.It is estimated in parts per million.The present of high measure of unsafe salts isn't useful for the use in day by day life.Therefore we can utilize this sensor to quantify the TDS and help in changing the filter present in the water purifier.

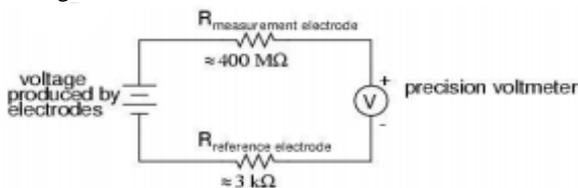
Scope of saltiness:

- Fresh water - Less than 1,000 ppm.
- Slightly saline water - From 1,000 ppm to 3,000 ppm.
- Moderately saline water - From 3,000 ppm to 10,000 ppm.
- Highly saline water - From 10,000 ppm to 35,000 ppm.

It comprises of two poles one is reference bar and the other is measuring bar. The voltage is given to the reference bar and the conducting current goes to conducting pole. The voltage present in the conducting bar is relative to the salt present in the water.

2.pH sensor:

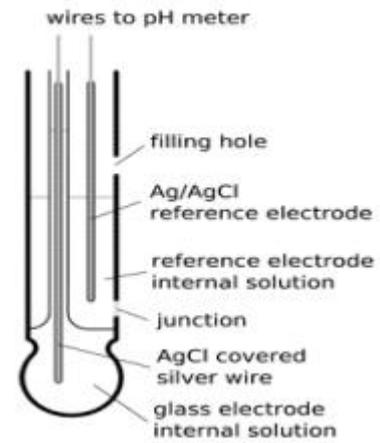
pH sensor is utilized to decide the substance arrangement in water that is whether the water is acidic , basic or neutral. The worth extents from 0 to 14 pH. On the off chance that value is below 7, the water is considered as acidic if over 7 it is basic and at 7 it is neutral. As indicated by Indian Standards water having pH between 6.5 to 8.5 is sheltered to drink.It has two poles to gauge the estimation of the pH esteem in the water. The pH meter is utilized for the quality check if water is ok for drinking.It gives Full range pH perusing from 1 to 5 voltage scale range and gives a Single reading.



Img.5 Circuit outline for pH sensor

The Equivalence Value of the potential of Hydrogen(pH) Sensor in terms of Voltage for Water.

pH Value	Sensor	Output Voltage	Level
3		0	Acidic pH
4		1	
5		1.5	
6		2	
7		2.5	Neutral
8		3.5	Alkaline pH
9		4	
10		5	



Img.6 potential of Hydrogen(pH) electrode

Knowledge oriented:

In this work a physical model is given, for shrewd execution and speedy survey of water quality testing. Data to be observed is independently given depending on sensor abilities. This framework is enhanced with semantics to portray, share, and incorporate data, inducing new learning identified with water,the board and channel substitution. It additionally makes machine interpretable and self-engaging information in the IoT space. It empowers interoperability between various information sources like sensors and different gadgets.

System description

The system consists of two sensors they are connected to an Arduino which is compatible with the wifi.The Arduino sends the recorded results to the cloud and there it is converted to human understandable language and then it is sent to the end devices like mobile phones.

- Input: The water entering the tank.
- Output: pH, TDS level.
- Conditions for success: We must get the TDS level and the pH value in the mobile phone. We must also get the alert if the value of the TDS and pH is increased more than the safety limit.
- Conditions for failure: The system is a failure if we do not receive the alert in the mobile phone.

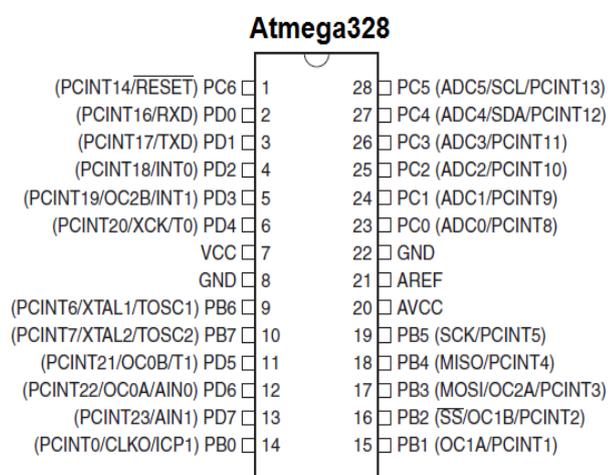
Arduino Microcontroller:

In this undertaking an arduinouno microcontroller is utilized. This microcontroller will take the data from sensors.This assembled data is then changed over to advanced form(using ADC present in microcontroller).This arduinouno smaller scale controller depends on ATmega328P. This arduino has 14 computerized information or yield pins (among which 6 can be utilized as Pulse Width Modulation(PWM) yields), 6 simple data sources, a 16MHz precious stone oscillator. Specifications:

The microcontroller which we are going to utilize is Atmega 328.The essential working voltage of this microcontroller is 5V.The prescribed info voltage for it is from 7V to 12V.The furthest reaches of the information voltage is 6V to 20V.

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The absolute number of advanced I/O pins are 14. Among these 14 pins 6 pins give Pulse Width Modulation output. The number of simple information pins is 6. The DC Current per I/O Pin is 40 mA and the DC Current for 3.3V Pin is 50 mA. The Flash Memory is 32 Kbytes. The SRAM comprises of 2 KB and the EEPROM comprises of 1 KB.



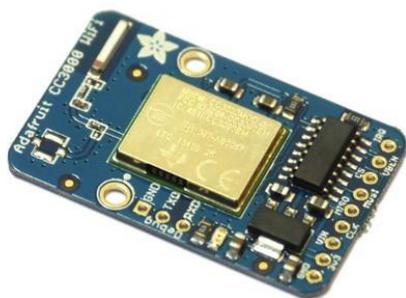
**Img.7 Microcontroller**

Wi-fi shield:

CC3000 is the wifi shield which is compatible with arduino board. With the help of this shield data can be transmitted wirelessly. This shield is mounted over arduino board & helps in sending data to cloud or any storage system.

Specifications:

- Wireless Network Processor.
- IEEE 802.11 b/g.
- Embedded IPv4 TCP/IP stack.
- Transmit power(TX power): 11Mbps is + 18dBm, CCK.
- Receiving power(RX power): -86dBm, 8% packet error rate (PER), 11 Mbps.
- Operating temperature range: -20 ° C to 70 ° C.



**Img.8 CC3000**

### Conclusion and Result

The monitoring of water is much needed to make sure that the residents of a house are using safe water. The methods which were used for checking the quality of water in the previous days i.e. the traditional methods had some drawbacks. Now with the help of IoT which allow devices to communicate among themselves in taking action and this

helps the resident to know better about the water purifier that he/she uses to reduce the hardness of the water that is let inside the water tank.

So for this the Salinity Level Indicator which was developed by us helps us to maintain the pH level of the water and helps us to change the filter in the water purifier in regular intervals. This brings the resident the knowledge about the time interval in which a filter must be changed. This also records the TDS level. So the resident can get a proper information about the water that he is using for all the purposes in his daily life.

The result is generated with the help of the system in the following way. First the TDS level and the pH level is calculated. This is done by taking the readings that is recorded by the sensors that are present in the inlet pipe. The voltage level recorded will be converted into human interpretable language. This will be sent to the cloud server and it is stored in the cloud server. Cloud servers like IBM Bluemix, Thingspeak or any cloud servers that are approved can be used. So the recorded values will be then analysed and graphs will be plotted by the API that is present in the cloud server. Then these results will be forwarded to the mobile phones or any web server. If the limit extends the human friendly limit then the resident will get a notification regarding the increase in TDS in the tank water.

In future the Salinity Level Indicator can be used not only for a particular water tank in a house, they can also be extended for the usage in Companies, Water treatment industries, etc.

Thus the Salinity Level Indicator is an advanced device which can be used to give the resident the basic knowledge of changing the filter in the water purifiers present in their house.

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