SMART INDIA HACKATHON

Ministry/ Organization Name: Government of Goa

Problem Statement: Water Quality Measuring Device

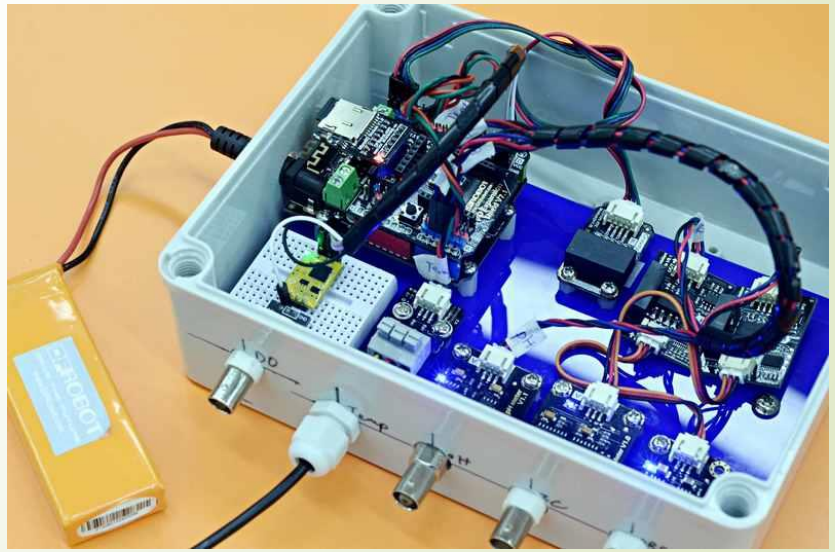
Team Statement: H2O

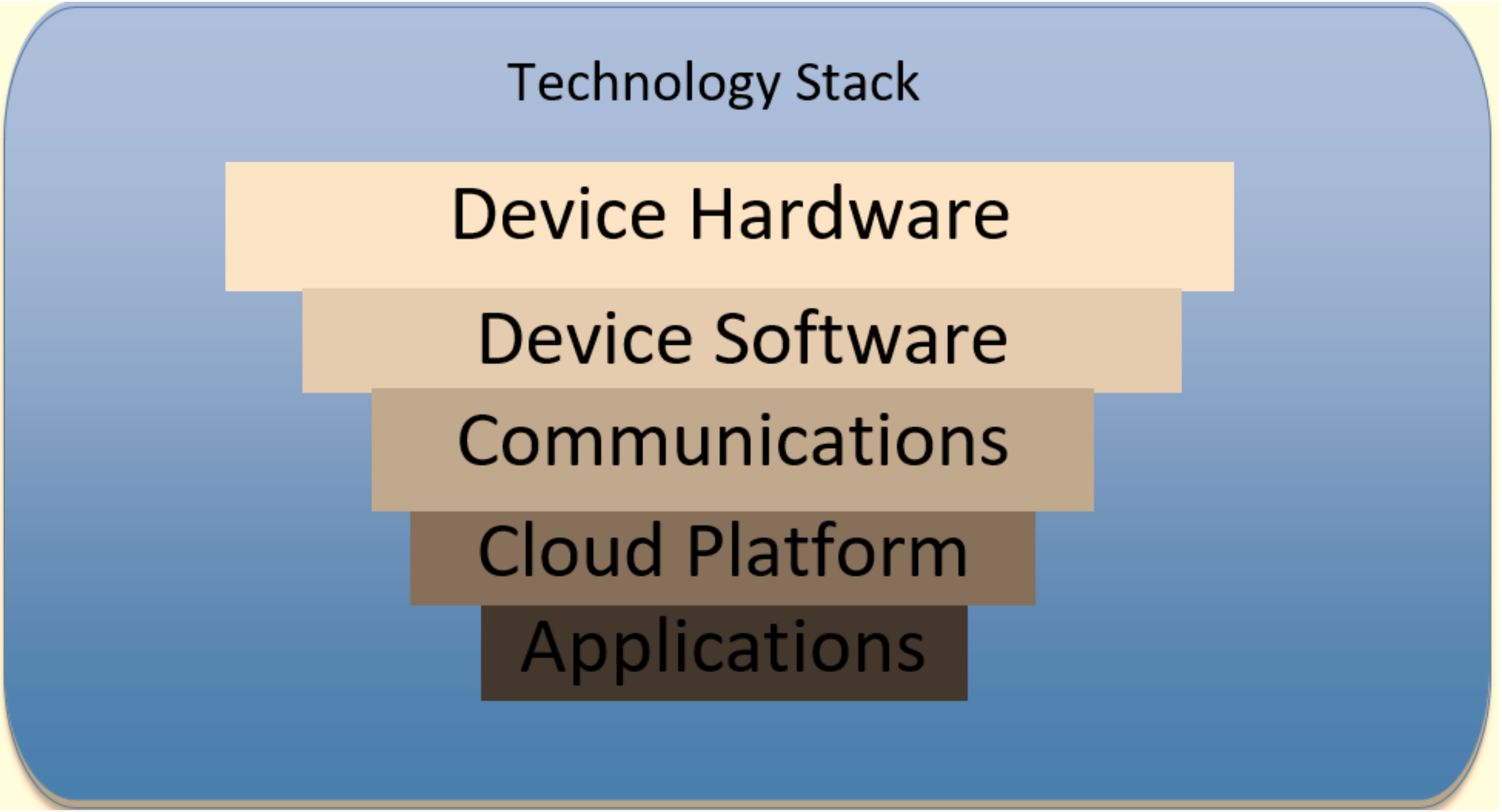
Team Leader Name: Tejas Nitin Bhanushali College Code:

Water Shielder

- **This device** which aims on water pollution caused by industries. The basic idea of the system is to monitor & alert the authorities regarding the characteristic forms of effluents that are deposited in the water bodies. Such water contains harmful substance which effects on living organism. The requirement for such situation is to have an identification and monitoring for harmful pollutants on the basis of their permissibility prescribed by authorized agency.

This system aims for a controlled outflow from sewages that are mixed in water bodies and identification is to be done with geo-informatics technology to have administrate control for certain industries who all are responsible for it. With the facility of IoT in this system to analyse the data over the time. This will further lead to the reduction of water and air pollution on multiple scales.




Technology Stack
Device Hardware
Device Software
Communications
Cloud Platform
Applications

Industries in Goa

4 Major Industries that are Responsible for Causing Pollution

- **1. Fertilizer Industries:**

The fertilizer industries are among the most hazardous industries as the solid waste of these industries is also very dangerous because it may contain heavy metals as well as high concentration of poisonous chemicals.

For example, at Zuari Agro Chemicals Ltd, Goa, effluents like cooling tower blow down, hand washing in bagging plant. The fertilizer industries are regarded as potent chemicals bombs because of the hazards associated with them. They emit toxic smoke and generate large amounts of toxic effluents. These toxic effluents are responsible for massive killing of fish and marine animals in oceans, rivers and lakes. Assuming 0.1 percent as the effective utilization rate for chemical pesticides, pesticide pollution in Goa is expected to be in the range of 1800 to 2200 tonnes per year.

- **2. Tannery Industry:**

The problem is that while processing about 2500-3000 tonnes of raw material, Indian leather industry generate about 80,000-90,000 cubic metres of waste water per day in this way leather Industry.

India's 2500 tanneries produce about 1.8 billion square feet of leather every year. They also discharge about 24 million cubic metres of waste water with high COD, BOD and total dissolved solids (TDS) concentration, along with about 0.4 million tonnes of hazardous solid wastes per annum. This pollution is the outcome of highly polluting chrome tanning manufacturing process, used by about 80% of India tanneries.

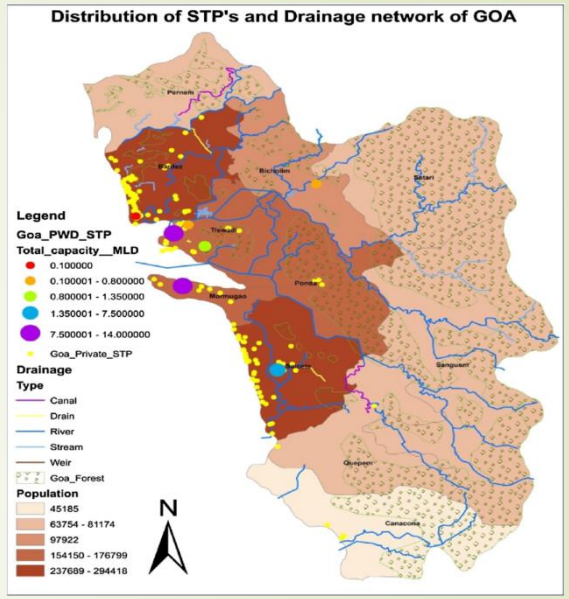
Report article source: Supriya k Sept. 2019

3. Pesticides Industries:

There are thousands of pesticides in the market. They either contaminate the water by phosphate or chloride along with increase of BOD, COD, Sulphates and nitrates. There are some pesticides which cause BOD even to the range of 20000-30,000 mg/1. The dangerous pesticides such as DDT, aldrin, dialdrin, hexachor benzene etc. are harmful for the aquatic life and human beings.

4. Chemical Industries:

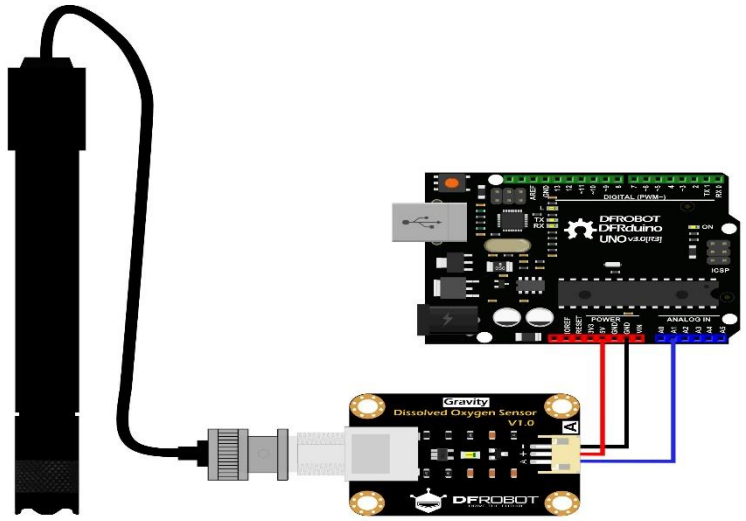
The chemical industries discharged various toxic chemicals in the field causing destruction of vegetation, soil and water. They should discharge effluent after proper treatment otherwise the life on this planet will be difficult. They release even cyanides in the field due to which at the one time about 50000 fish were died in Meerut Kali River in 1984



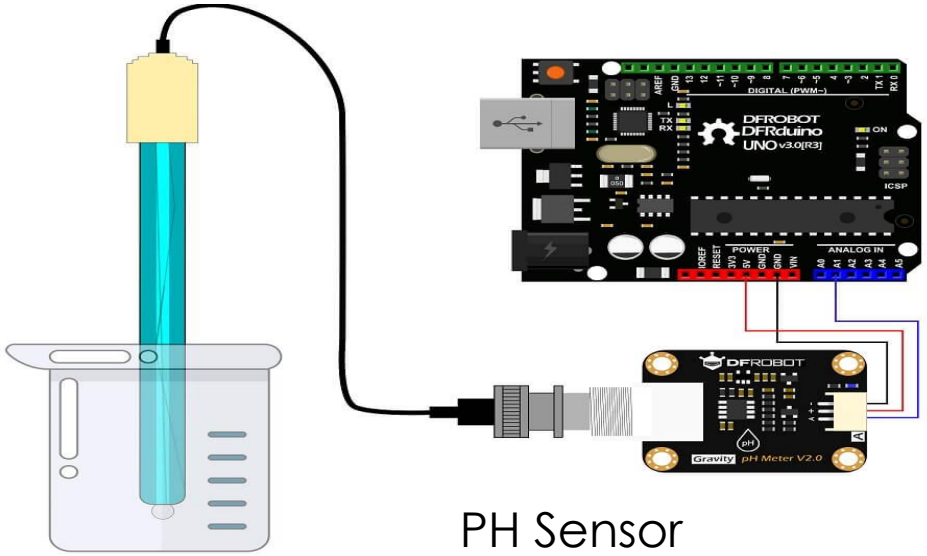
The acceptable range for environment of this parameter

Parameter	Range
pH	6-9
TSS	Less then 150 ppm
TDS	Less than 2100 ppm
DO	4.5-8
COD	Less than 200 ppm
BOD	Less than 50 ppm

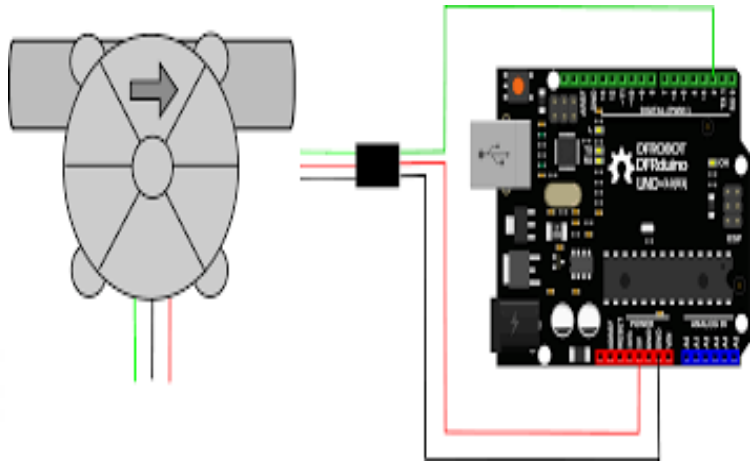
LIST OF PERIPHERALS WITH CONTROLLER SEPARATELY



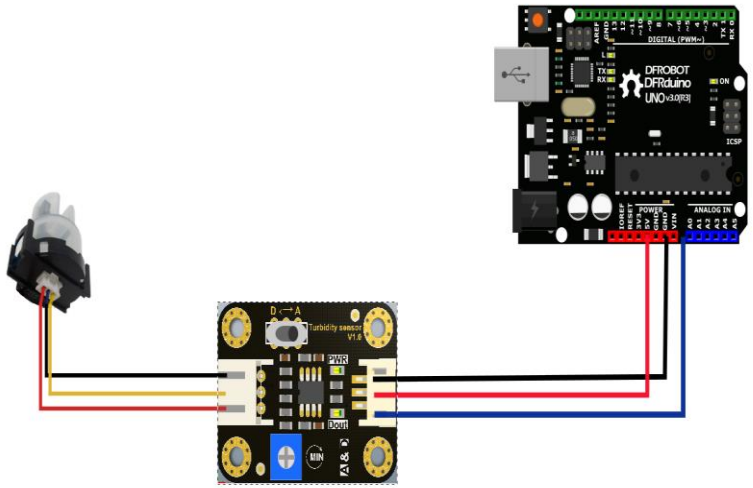
Biochemical Oxygen Demand Sensor(BOD)



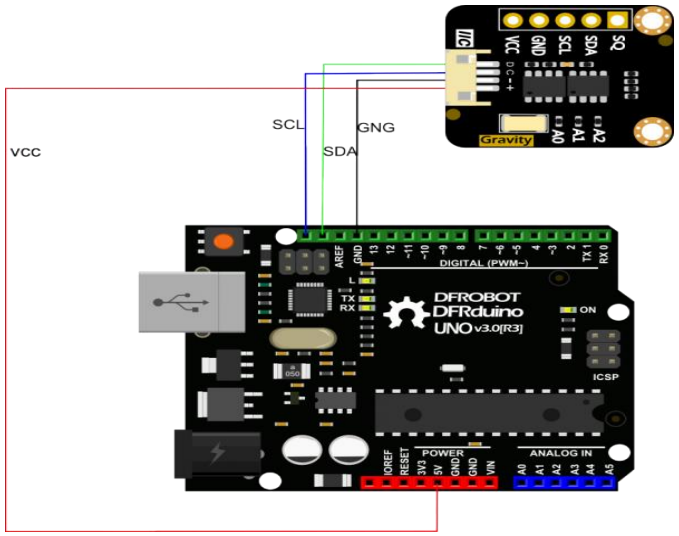
PH Sensor



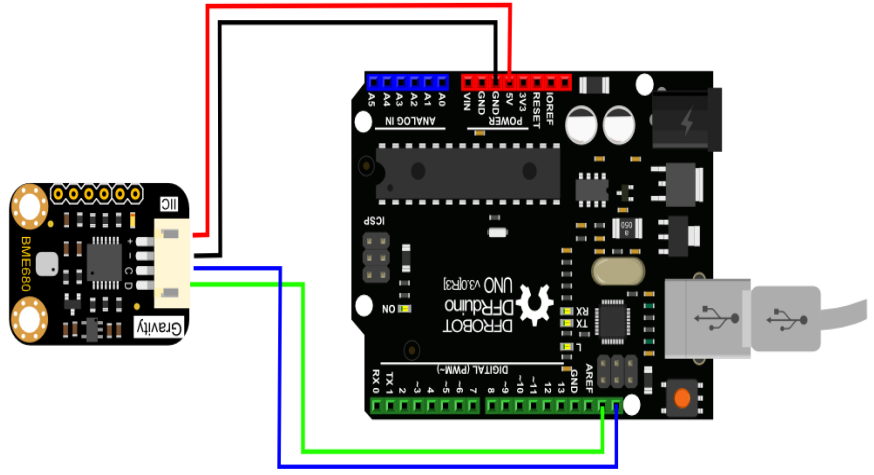
Flow Meter



Total Suspended Solids Sensor(TSS)



RTC sensor



Total Dissolved Solids Sensor(TDS)


HAOSHI

Total Dissolved Solids(TDS)

TDS (Total Dissolved Solids) indicates that how many milligrams of soluble solids dissolved in one litre of water. In general, the higher the TDS value, the more soluble solids dissolved in water, and the less clean the water is. Therefore, the TDS value can be used as one of the references for reflecting the cleanliness of water.

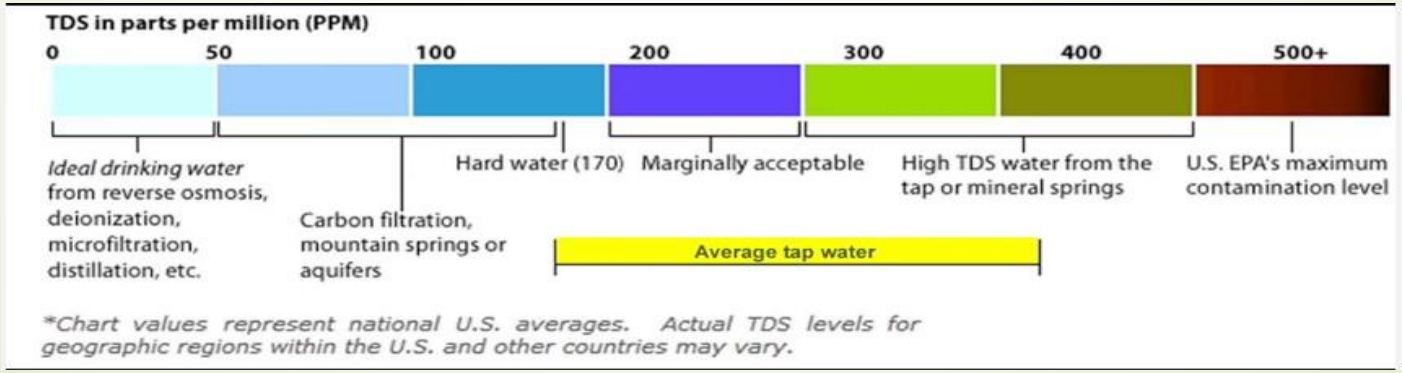
SPECIFICATION

Signal Transmitter Board

- Input Voltage: 3.3 ~ 5.5V
- Output Voltage: 0 ~ 2.3V
- Working Current: 3 ~ 6mA
- TDS Measurement Range: 0 ~ 1000ppm
- TDS Measurement Accuracy: ± 10% F.S. (25 ℃)
- Module Size: 42 * 32mm
- Module Interface: PH2.0-3P
- Electrode Interface: XH2.54-2P

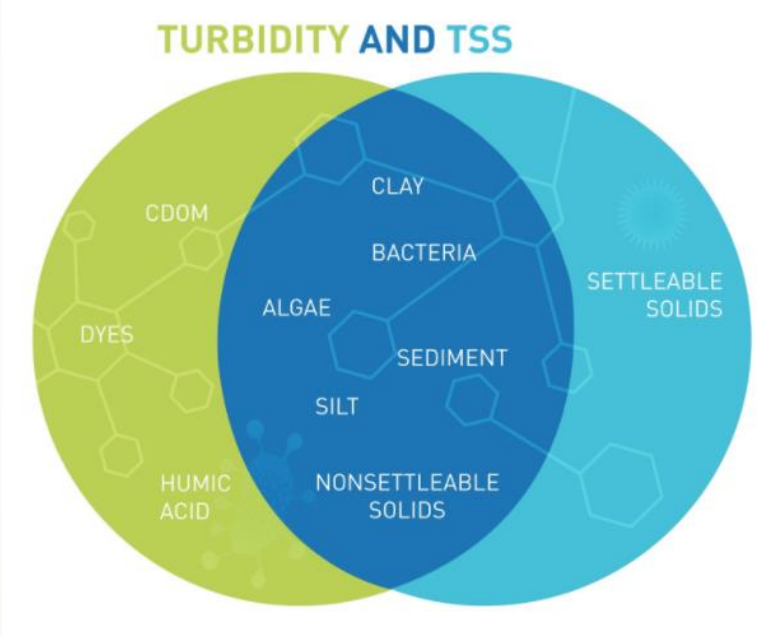
TDS probe

- Number of Needle: 2
- Total Length: 83cm
- Connection Interface: XH2.54-2P
- Color: Black
- Other: Waterproof Probe



Total Suspended Solids (TSS)

- The TSS sensor detects water quality by measuring level of turbidity. It is able to detect suspended particles in water by measuring the light transmittance and scattering rate which changes with the amount of TSS in water. As the TTS increases, the liquid turbidity level increases.
- Turbidity sensors can be used in measurement of water quality in rivers and streams, wastewater and effluent measurements, sediment transport research and laboratory measurements.

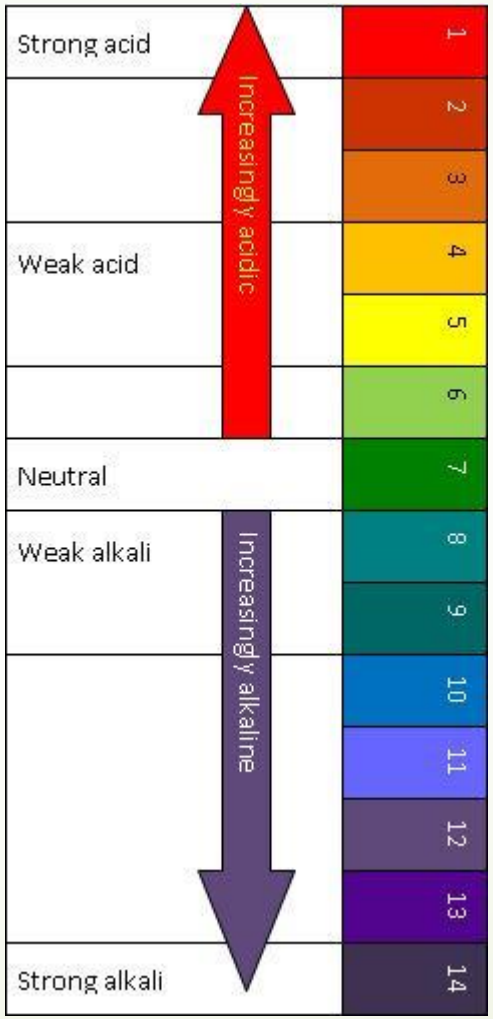


SPECIFICATION

•Operating Voltage: 5V DC
•Operating Current: 40mA (MAX)
•Response Time: <500ms
•Insulation Resistance: 100M (Min)
•Output Method: Analog
•Analog output: 0-4.5V
•Digital Output: High/Low level signal (you can adjust the threshold value by adjusting the potentiometer)
•Operating Temperature: 5℃~90 ℃
•Storage Temperature: -10℃~90℃
•Weight: 30g
•Adapter Dimensions: 38mm*28mm*10mm/1.5inches *1.1inches*0.4inches

pH Sensors

- Analog pH meter, specially has convenient and practical “Gravity" connector and a bunch of features. Instant connection to your probe an your Arduino to get pH measurements at ± 0.1pH (25 ℃).
- It has an LED which works as the Power Indicator, a BNC connector and PH2.0 sensor interface.
- To use it, just connect the pH sensor with BND connector, and plug the PH2.0 interface into the analog input port of any Arduino controller. If pre-programmed, you will get the pH value easily.

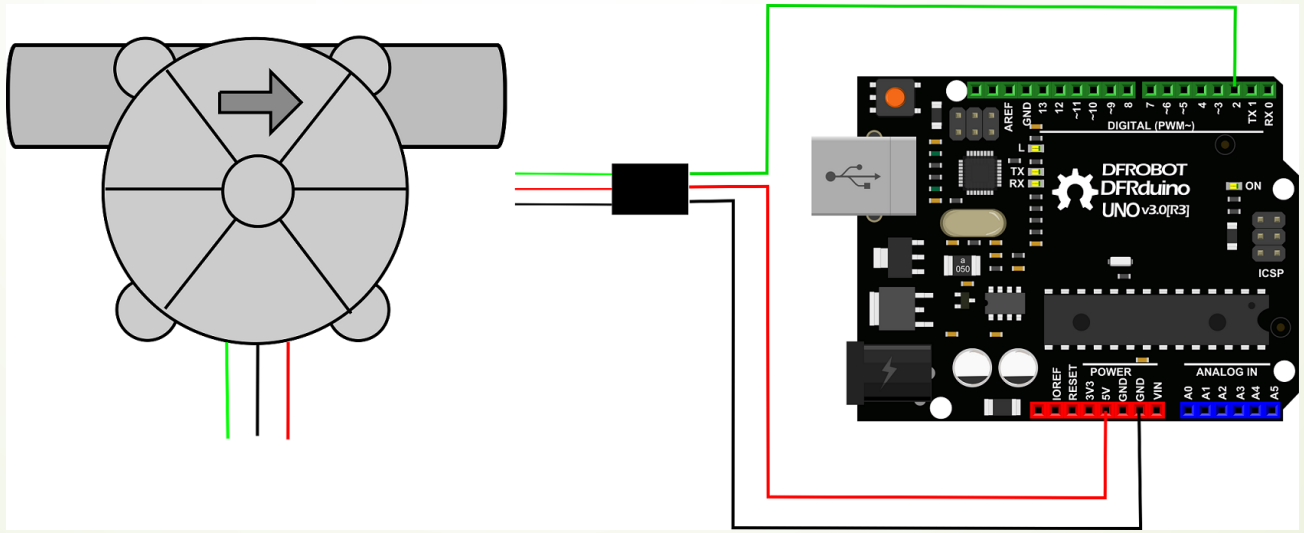


SPECIFICATION

- Module Power : 5.00V
- Module Size : 43 x 32mm(1.69x1.26")
- Measuring Range :0 - 14PH
- Measuring Temperature: 0 - 60 ℃
- Accuracy : ± 0.1pH (25 ℃)
- Response Time : ≤ 1min
- pH Sensor with BNC Connector
- pH2.0 Interface (3 foot patch)
- Gain Adjustment Potentiometer
- Power Indicator LED

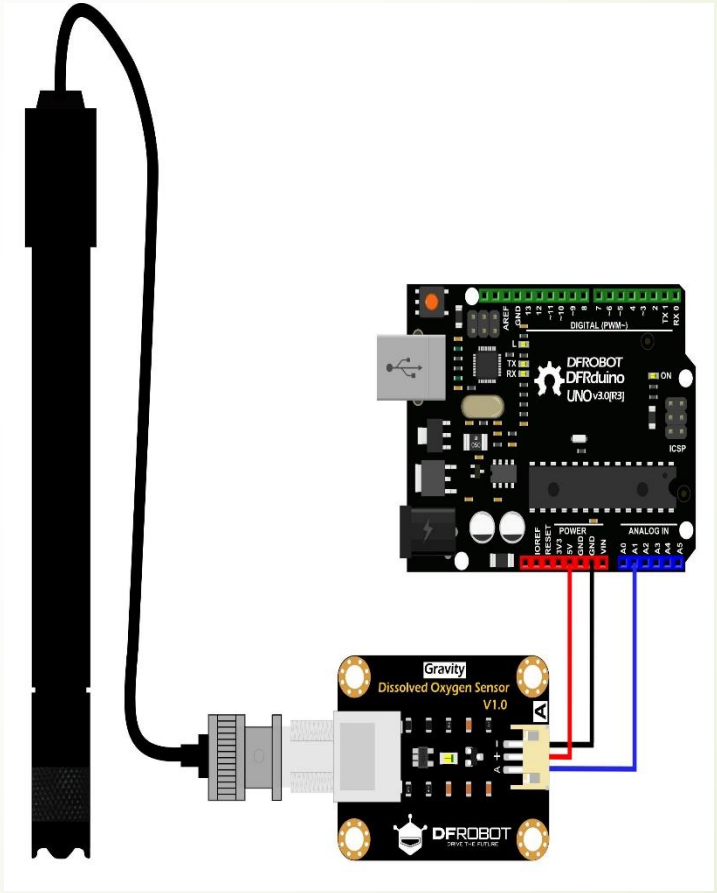
Analog Flow Sensor

- The Gravity Water Flow sensor measures the rate of a liquid flowing through it.
- The YF-S201 water flow sensor consists of a plastic valve body, flow rotor and hall effect sensor. It is usually used at the inlet end to detect the amount of flow.
- When liquid flows through the sensor, a magnetic rotor will rotate and the rate of rotation will vary with the rate of flow. The hall effect sensor will then output a pulse width signal.



Biochemical Oxygen Demand

- This peripheral is used to measure the dissolved oxygen in water, to reflect the water quality. Low dissolved oxygen in water will lead to difficulty in breathing for aquatic organisms, which may threaten their lives.
- The probe is a galvanic probe, no need of polarization time, and stay available at any time. The filling solution and membrane cap is replaceable, leading to the low maintenance cost. The signal converter board is plug and play, and has the good compatibility. It can be easily integrated to any control or detecting system.



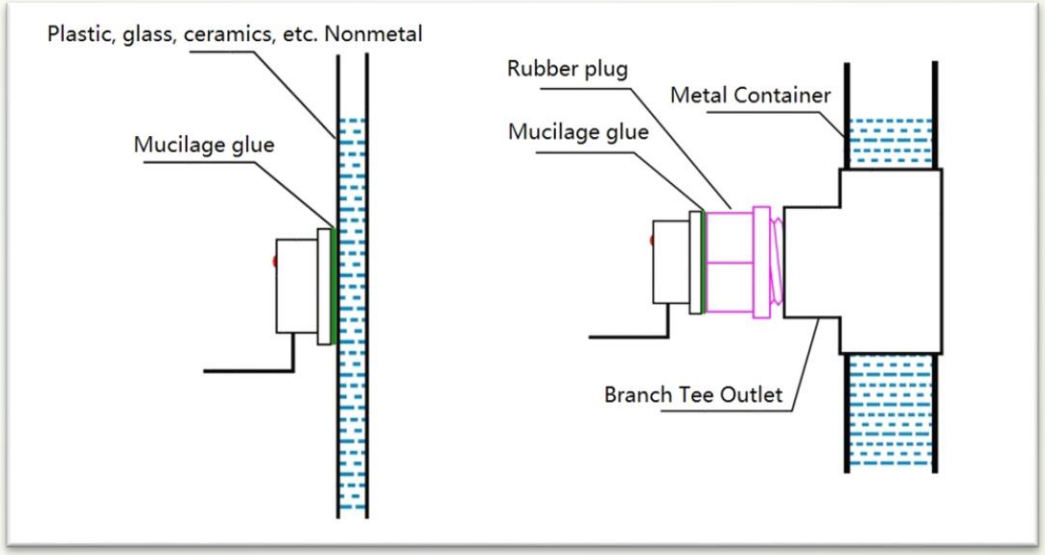
SPECIFICATION

Dissolved Oxygen Probe

- Type: Galvanic Probe
- Detection Range: 0~20mg/L
- Response Time: Up to 98% full response, within 90 seconds (25℃)
- Pressure Range: 0~50PSI
- Electrode Service Life: 1 year (normal use)
- Maintenance Period: Membrane Cap Replacement Period: 1~2 months (in muddy water); 4~5 months (in clean water) Filling Solution Replacement Period: Once every month
- Cable Length: 2 meters
- Probe Connector: BNC

Non-contact Digital Water / Liquid Level Sensor

- This is a non-contact water / liquid level sensor. It utilizes advanced signal processing technology with high-speed operation capacity to achieve non-contact liquid level detection.



No contact with liquid makes the module suitable for hazardous applications such as detecting toxic substances, strong acid, strong alkali and all kinds of liquid in an airtight container under high pressure.

Specification

- Operating Voltage (InVCC) : DC 5 ~ 24 v
- Current consumption: 5 mA
- Output voltage (high level) : InVCC
- Output voltage (low level) : 0V
- Output current: 1 ~ 50 mA
- Response time: 500 ms
- Operating Temperature : 0 ~ 105 ℃
- Range for thickness of induction (sensitivity): 0 ~ 13 mm
- Humidity: 5% ~ 100%
- Material: ABS.
- Waterproof performance: IP67
- Dimension : 28 * 28 mm / 1.1 * 1.1 inches

Product Differentiation

- **Water Shielder** device which will monitor parameters of effluents like
- *TSS * TDS * pH value *BOD *Liquid Flow

*non-contact liquid level….. & more to be added, with RTC (Real Time Clock) monitoring update facility on mobile application/ web servers also data is stored on SD card added along with Microcontroller used.

Currently, Water Shielder can be powered by a 7.4V lipo battery, The field test will be described in a separate research note later in project.

- Software- Arduino IDE, Web servers(OUTPUT DISPLAY).
- Interfacing of all this peripherals and complete product will cost around minimal ₹ 10,000- ₹ 12,000 /- with includes all industrial sensing device, faster flashing microcontroller, RTC interfacing for tabular/graphical representation for real time data, complete Wiring of product& Water resistant outer body covering to protect the hardware of the Device.
- This Differentiates the Water Shielder device than effluent monitoring system with most possible accuracy and minimal price factor which can be planted in greater scale by the government than planting costlier monitoring device on lesser industires.

Thank you!