International Journal of Scientific Research and Engineering Development-– Volume 6 Issue 2, Mar-Apr 2023

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RESEARCH ARTICLE OPEN ACCESS

WATER QUALITY AND PIPE LINE MONITORING SYSTEM

Mrs.N.Chamanthi.M.Tech[1], D.Suhitha Reddy[2], P.Pujitha[3], S.Preetham Raju[4], P.Satwika Chowdary[5], P.Somasekhar Reddy[6]

(Assistant. Prof , ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[1](B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[2](B.Tech.IVYearStudent,ECEDept,SiddarthainstituteofscienceandTechnology,Puttur ,A.P,India)[3]

(B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[4](B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[5](B.Tech. IV Year Student, ECE Dept, Siddartha institute of science and Technology, Puttur, A.P, India)[6](Email.id:- suhithareddy1604@gmail.com)

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Abstract:

Peoplenowadaysalwayswantsomethingthat can make their life easier. To fulfill therequirement of the people we develop thesmart water monitoring system for home oroffice. In this the water monitoring systemssuchaswaterpollutionmonitoringandwater pipeline leakage sensing monitoring.Thissystemisusedtoavoidthehugeamountof water is being wasted by uncontrolled useofhome/officesandalsoinagriculture.Inthissystem we use the sensors to check the pipeleakageandwaterquality.Leakdetectioninwater pipelines, we use the Flow sensor toleakdetection,itwillcheckthewaterqualityby using the pH value, Turbidity and theTDSofthewater.Thevaluesarecontinuously updated to cloud server and isdisplayed on LCD. Here the extra feature isaddedthatistodistributetheWateratcertain timings we have to set the timingsbased on the timings water will distribute sothatwecan decrease thewastageofwater.

Keywords— Arduino Mega, Flow sensor,TDS, pH ,Leak detection,GSMmodule.

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I. INTRODUCTION

Though 70 percent of the world is covered inwater,only2.5percentofthewaterpresentcanbecons umed.Just2.5percentofthewaterneeds to serve 7.5 billion people on the planet.Withsuchstaggeringscarcityinresources,wate r needs to be used very wisely. Yet, withthepresentsystemmajorinefficienciescreepinwh ich leads to either contaminating the supplyorwastageof water duetoleakage.

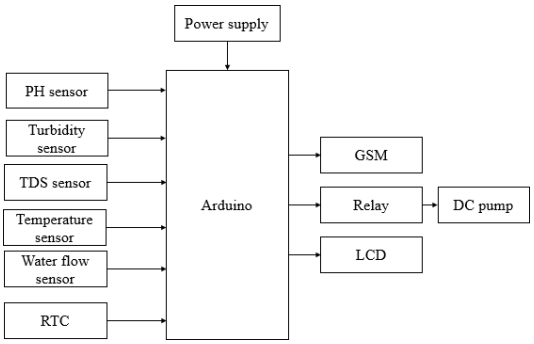
According to WHO, globally, 2 billionpeopleusecontaminatedwater.Justbecauseofthein efficienciesinthepresentpipelinesystemthiscontaminatio ntakesplace.Thereisnoautomatedprocesstocheckthiscont amination.

Till the authorities come to know about suchcontamination in the water distribution systemthedamageisalreadydone.Contaminantcanbea ny undesirable chemical, biological, physical,or radioactive substances which can adverselyaffectthewaterquality.Thesecontaminantss eep into the pipelineand degrade the

watermakingitun consumable.Everyyear485000deathsarecaused duetodiseasescausedbyconsumptionofcontaminatedwater.Theselivescan be saved with just improving the standardsofthepresent pipelinenetwork.In this paper, a new approach is proposed forcontaminatedwater andwastage of water.Bysaving water, this allows us to save more water,especially on our water bill.The project mainaims that not waste water .Here by using RTCmodule we are distributing the water based onthetimingsweset,ithelpstopreventwastageofwater.

II METHODOLOGY

Block diagram



In this system we are using Arduino mega2560asmicrocontrollerandsensors.ByusingArduinomega2560microcontroller,wecaneliminateADC modulewhichdecreases complexity. In this project we are using pH,Turbiditysensor, TDSSensorstochecktheequality of water. Turbidity is mainly used forthe detecting dust particles in the water. Basedon the dust particles we can decide the waterquality. pH Sensor is to know whether water isacidic,basicorneutralinnature.TDSSensoristo measure any harmful solutions present inwater. The values are uploaded to cloud serverand message will be sent if any sensor crossesthe threshold value. By using RTC module weare distributing the water based on the timingsweset.

III LITERATURESURVEY

1. Pasika, S., & Gandla, S. T (2020) SmartWater Quality Monitoring System with cost-effective-IOT.

Freshwater is a world resource that is agiftofnatureandimportanttofarming,manufacturing,andthelifeofhumanbeingsonearth.Around40%ofdeathsarecausedduetocontaminated water in the world. Hence, thereisanecessitytoensuresupplyofpurifieddrinking water for the people both in cities andvillages. Water Quality Monitoring (WQM) isa cost-effective and efficient system designedto monitor drinking water quality which makesuseofInternetof Things(IoT)technology.

2. Palpandian,P.,Govindaraj,V,Dharmashastha,S.,Gokul,S.,&MariSelvam,K. (2021). Water Pipeline Leakage DetectionandControlManagementSystemUsing Iot

Here, the designed model will measurethewaterflowinendtoendmonitoringsystem. This system will monitor the water leakage bymeasuringtheflowofliquidthroughwaterpipelinenetwork.Around40%ofdeathsarecausedduetocontaminatedwaterintheworld.Hence, there is a necessity to ensure supply ofpurifieddrinking water for the people both incities and villages. In every field, devices andsensorscancommunicatewithalldeviceswhicharconnectedinsamenetworkwiththehelpofinternetorlocalareanetworksorothercommunicationprotocols.

3. Olisa, S. C, Asiegbu, C. N., Olisa, J. E.,Ekengwu, B. O., Shittu, A. A., & Eze, M. C.(2021). Smart two-tank water quality and leveldetectionsystem viaIoT.

Duetolimitedcontrolintheexistingpumpingsystem,waterwastagebecomesinevitable. Determining the quality of water inthe overhead tank before supply in the home isstillunaddressed.Inthiswork,anintegratedAndroid mobile App and a control system weredeveloped to assess the water quality, performlevel check in the overhead tank, and activateintelligentpumping control.

4. Al Qahtani, T., Yaakob, M. S., Yidris, N.,Sulaiman,S.,&Ahmad,K.A.(2020).Arevieww water leakage detection method in the waterdistributionnetwork.

Leak detection in transfer ofpipelines iscruciallyessentialforthesafetyoperation.Pipelinelea kdetectionsystemsplayamajorroletominimizetheprobabilityofoccurrenceofleaksandhencetheirimpacts.Theissueofwaterleakage from these pipelines causes clean waterloss, energy loss and a noteworthy increment inwater contamination with dangerous syntheticcompoundsand metals.

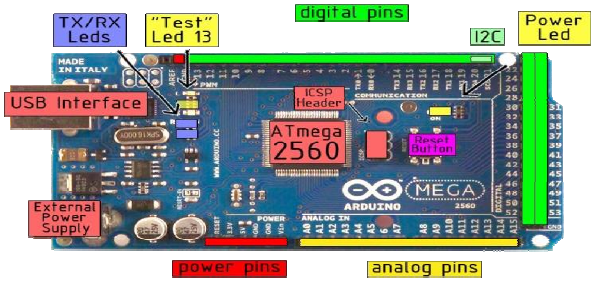
5. EligantiRamaLakshmi,KavyaNannapaneni,(2020). Water quality monitoringandWater pipeLeakageDetection.

IV COMPONENTS

ArduinoMega:

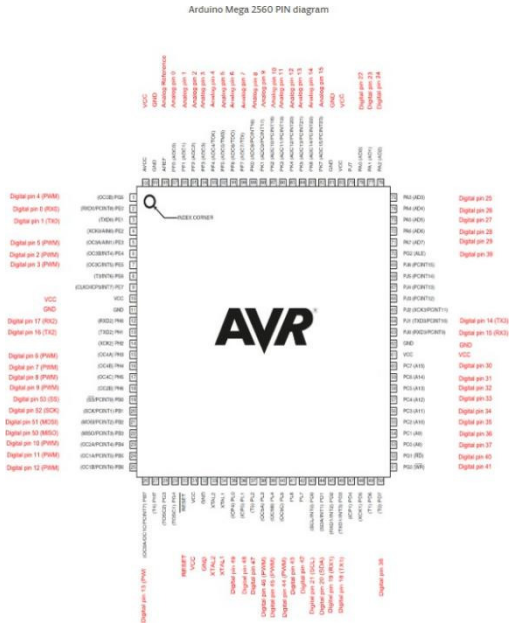
The Arduino Mega 2560 is a microcontrollerboardbasedontheATmega2560(data sheet).Ithas 54 digital input/output pins (of which 14canbeusedasPWMoutputs),16analoginputs,4 UARTs (hardware serial ports), a 16 MHzcrystal oscillator, a USB connection, a powerjack, an ICSP header, and a reset button. Itcontainseverythingneededtosupportthemicrocontroller;simplyconnectittoacomputer with a USB cable or power it with aAC-to-DCadapterorbatterytoget started.

Specifications:
Microcontroller:ATmega2560.OperatingVoltage:5 V.
InputVoltage(recommended):7-12V.InoutVoltage(limit): 6-20V.
DigitalI/OPins:54(ofwhich15providePWM output)
PWM Digital I/O Pins: 15AnalogInput Pins:16
DCCurrentperI/OPin:40mA.



FeaturesofArdunio

Each of the 54 digital pins on the Mega can beused as an input or output,using pinMode(),digitalWrite(),and digitalRead() functions. They operate at 5 volts. Each pincanprovideorreceive20mAasrecommendedoperating condition and has an internal pull-upresistor (disconnected by default) of 20-50 kohm. A maximum of 40mA is the value thatmustnotbeexceededtoavoidpermanentdamagetothemicrocontroller.



PHSENSOR

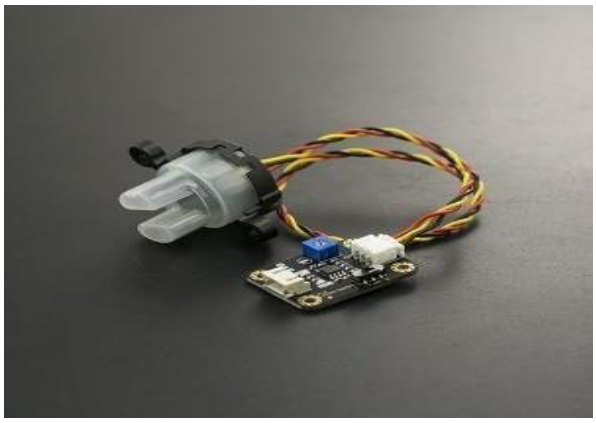
ApHsensorhelpstomeasuretheacidityor alkalinity of the water with a value between0-14. When the pH value dips below seven, thewaterstartstobecomemoreacidic.Anynumberabovesevenequatestomorealkaline.Eachtypeof pH sensor works differently to measure thequalityof the water.

TurbiditySensor:

The turbidity sensor detects water quality bymeasuring the levels of turbidity. It uses light todetectsuspendedparticlesinwaterbymeasuring the light transmittance and scatteringrate, which changes with the amount of totalsuspended solids (TSS) in water. As the TTSincreases,theliquidturbiditylevelincreases.

Specifications:

- OperatingVoltage:5VDC
- OperatingCurrent:40mA(MAX)
- ResponseTime:<500ms



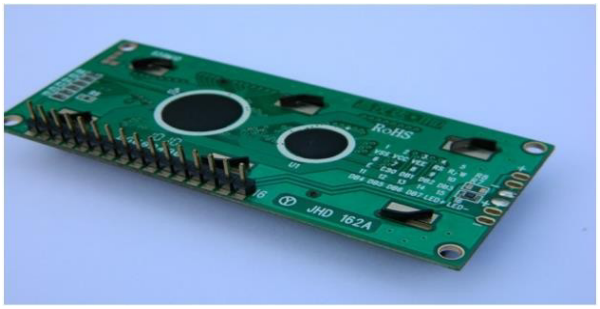
TDSSensor:

TDS(TotalDissolvedSolids)indicatesthathowmanymilligramsofsolublesolidsdissolved in one liter of water. In general, thehigher the TDS value, the more soluble solidsdissolved in water, and the less clean the wateris.Therefore,theTDSvaluecanbeusedasoneof the references for reflecting the cleanlinessof water. TDS pen is a widely used equipmentto measure TDS value. Matching with Arduinocontroller,youcanbuildaTDSdetectoreasilyto measurethe TDS valueof liquid.

LCD:

LCD(LiquidCrystalDisplay)istheinnovationutilized in scratch pad shows and other littlerPCs. Like innovation for light-producing diode(LED)andgas-plasma,LCDspermitpresentationstobealotmoreslenderthaninnovationforcathodebeamtube(CRT).LCDs showsandgasshowssincetheyworkasopposedtoemanatingitontheguidelineofblocking light.

LCD–FrontView



LCD– BackView

Flowsensor:

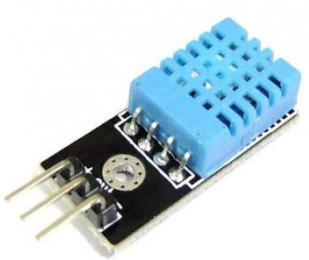
expendconsiderablylesspower

A flow sensor (more commonly referred to as a“flowmeter”)isanelectronicdevicethatmeasures or regulates the flow rate of liquidsandgasseswithinpipesandtubes.Flowsensorsare generallyconnectedtogaugestorendertheirmeasurements,buttheycanalsobeconnectedtocomputersand digital interfaces.

Temperaturesensor:

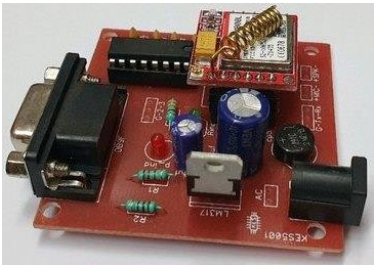
Atemperaturesensorisadevicethatdetectsandmeasures hotness and coolness and converts itintoan electrical signal.

Specifications:
Range: 0to 100degrees
Levels:0 and5volts



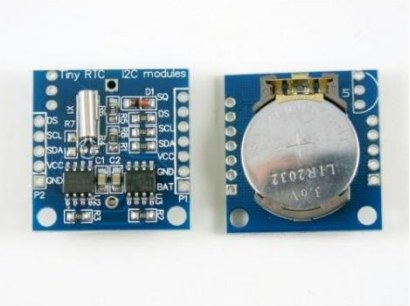
GSMModule :

GSM modules are one of the normally utilizedcorrespondence modules in implanted gadgets.A GSM module is utilized to speak with theGSM/GPSR arrange by a microcontroller (orcoordinatedcircuits)..AGSMMODEMconsolidatesaGSMmodulesimilarlyasvariousfragments,forinstance,correspondence interface, (for instance, SerialCommunication-RS-232), control supply and acoupleofpointers.AGSM/GPRSmoduleisanICorchipthatutilizesaSIM(SubscriberIdentity Module) and Radio Waves to interfacewith the GSM arrange. Basic radio frequenciesare850MHz,900MHz,1800MHzand1900MHzinwhicharunofthemillGSMmoduleworks.



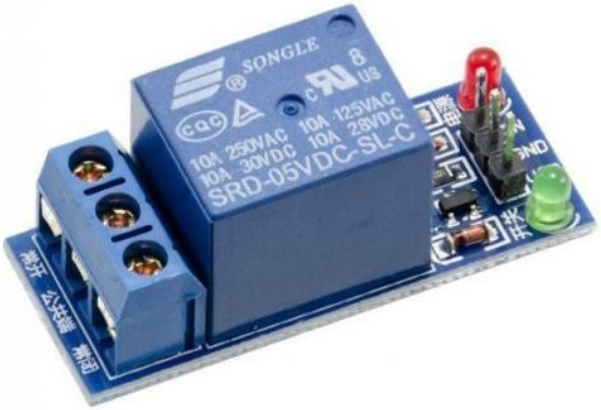
RTC:

Real Time Clocks, as the name suggests areclockmodules.Theyareavailableasintegratedcircuits (ICs) and manages timing like a clock.SomeRTCICsalsomanagesdatelikeacalendar. The main advantage is that they havea system of battery backup which keeps theclock/ca lender running even in case of powerfailure. A very small current is required forkeeping the RTC alive. This in most case isprovidedbyaminiature3vlithiumcoincell.SoeveniftheembeddedsystemwithRTCispoweredofftheRTCmoduleisupandrunning bythebackupcell.hissametechniqueisusedinPCtimingalso.Ifyouhaveopenedyourcomputer case you will notice a small coin cellinthemother board.



Relay

A relay is an electromagnetic switch that isused to turn on and turn off a circuit by a low powersignal, or where several circuits must be controlledby one signal. Most of the high end industrialapplicationdeviceshaverelaysfortheireffective working. Relays are simple switcheswhichareoperatedbothelectricallyandmechanically.Theswitchingmechanismiscarried out with the help of the electromagnet.There are also other operating principles for itsworking.Buttheydifferaccordingtotheirapplications.Mostofthedeviceshavetheapplicationofrelays.



DCPump:

AmachinethatconvertsD.Cpowerintomechanical power is known as a d.c. motor. Itsoperation is basedontheprinciplethatwhenacurrentcarryingconductorisplacedinamagneticfield,the conductorexperiencesamechanicalforce.Thedirectio

nofthisforce is given by Fleming's left

handruleandmagnitudeis given by;
F=BIl newton's

Specifications:

Framesizesfrom8to35mm.Speedsfrom5,000 to 14,000 rpm.
Continuousmotortorque-0.36to160mNm.Corelessrotor design.
Low rotor inertia. REE coil.Highpowertoweightratio.
NeodymiummagnetavailableinsomebrushDCmotor module.

V PROPOSEDWORK

In the proposed method we are using pH,Turbiditysensor, TDSSensorstochecktheequality of water. Turbidity is mainly used forthe detecting dust particles in the water. Basedon the dust particles we can decide the waterquality. pH Sensor is to know whether water isacidic,basicorneutralinnature.TDSSensoristo measure any harmful solutions present inwater. The values are uploaded to cloud serverand message will be sent if any sensor crossesthe threshold value. By using RTC module weare distributing the water based on the timingsweset.

VI SOFTWAREREQUIREMENT

ArduinoIDE:

ArduinoIDEwhereIDEstandsforIntegratedDevelopmentEnvironment – AnofficialsoftwareintroducedbyArduino.cc,thatismainlyusedforwriting,compiling and uploading the code in theArduinoDevice.AlmostallArduinomodules are compatible with this softwarethatisanopensourceandisreadilyavailable to install and start compiling thecodeon the go.

IntroductiontoArduinoIDE:

[1] Arduino IDE is an open source softwarethatismainlyusedforwritingandcompilingthecodeintotheArduinoModule.

[2] ItisanofficialArduinosoftware,makingcodecompilationtooeasythat evenacommon person with no prior technicalknowledge can get their feet wet with thelearningprocess.

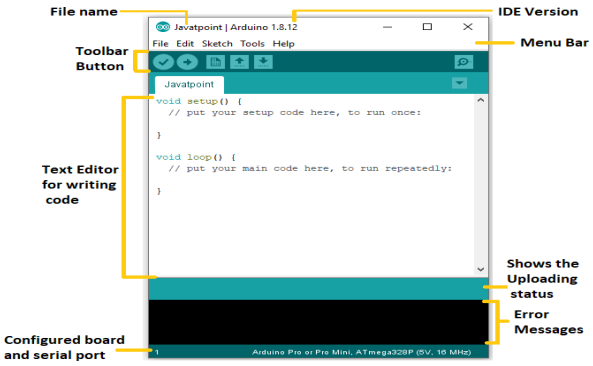
[3] ItiseasilyavailableforoperatingsystemslikeMAC,Windows,andLinuxandrunson the Java Platform that comes with inbuiltfunctionsandcommandsthatplayavitalrolefordebugging,editingandcompilingthecodein the environment.

[4] ArangeofArduinomodulesavailableincluding ArduinoUno,ArduinoMega,ArduinoLeonardo,ArduinoMicroandmanymore.

[5] Each of them contains a microcontrolleron the board that is actually programmedandacceptstheinformationintheformofcode.

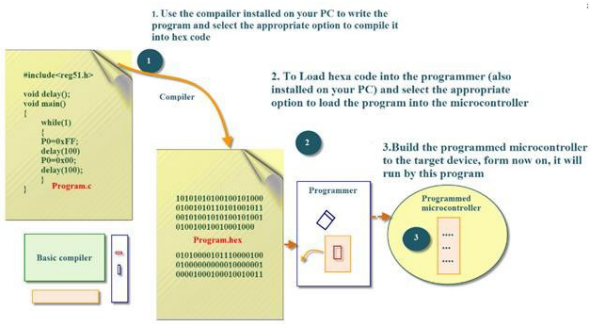
[6] The main code, also known as a sketch,createdontheIDEplatformwillultimately generate a Hex File which isthentransferredanduploadedinthecontrollerontheboard.TheIDEenvironment mainly contains two basicparts: Editor and Compilerwhere formeris used for writing the required code andlater is used for compiling and uploadingthecodeinto thegiven Arduino Module.

[7] This environment supports both C andC++languages.



[8] EmbeddedCismostpopularprogramming language in software fieldfor developing electronic gadgets. Eachprocessorusedinelectronicsystemisassociatedwith embeddedsoftware.

[9] Embedded C programming plays a keyrole in performing specific function bythe processor. In day-to-day life we usedmany electronic devices such as mobilephone, washing machine, digital camera,etc. These all device working is based onmicrocontroller that are programmed byembedded.



VII ADVANTAGESANDAPPLICATIONS

Advantages:

- Waterquality monitoring
- Lowcost
- Lowpower consumption
- Easytoaccess.
- Itsaveswaterbill.
- Itsavesthehumantime.

Applications:

- WaterandAirquality
- Drinkingwaterdistributingsystems
- Lake,River,Sea watermonitoring

VIII CONCLUSION

ThemonitoringofthewaterqualityisdonesuccessfullyusingpH,TurbidityandTDSsensors by detecting nature of the water and theparticlespresentinthewater.Thesystemautomatically monitors the water quality and islowcost.Sothewaterqualitytestingislikelytobe more economical, convenient and fast. Thesystem has good flexibility. Only by replacingthecorrespondingsensorsandchangingtherelevant software programs, this system can beused to monitor other water quality parameters.Theoperation is simple.

IX REFERENCES

- Pasika, S., & Gandla, S. T. (2020). Smartwaterqualitymonitoringsystemwithcost-effectiveusing IoT.*Heliyon*,*6*(7),e04096.
- Palpandian,P.,Govindaraj,V.,Dharmashastha,S.,Gokul, S.,&MariSelvam,K.(2021).WaterPipelineLeakageDetectionandControlManagement System Using Iot. *Annals oftheRomanianSocietyforCellBiology*,5752-5757.
- Eliganti RamaLakshmi, KavyaNannapaneni,(2020).Waterqualitymonitoringandwaterpipeleakagedetection. AEGAEUM JOURNAL ISSNNO:0776-3808.
- Al Qahtani, T., Yaakob, M. S., Yidris, N.,Sulaiman, S., & Ahmad, K. A. (2020).Areview on water leakage detection methodinthewaterdistributionnetwork. 68(2),152–163.
- Olisa, S. C., Asiegbu, C. N., Olisa, J. E.,Ekengwu,B.O.,Shittu,A.A.,&Eze,M. C. (2021). Smart two-tank water qualityand level detection system viaIoT.*Heliyon*, *7*(8), e07651.

