IOT BASED WATER FLOW RATE AND MANAGEMENT USING NODEMCU AND FLOW SENSOR

A Mini Project Report

in partial fulfillment for the award of the degree
of
Bachelor of Technology
in
Electronics and Communication Engineering

Submitted By

Aditi Priya (20bec001)
Aman Kumar (20bec003)
Bhoomija Tripathi (20bec016)

Under the Guidance of

Mr. Ashish Suri

School of Electronics & Communication Engineering
Shri Mata Vaishno Devi University
Kakryal, Katra, J&K-18232

SHRI MATA VAISHNO DEVI UNIVERSITY
School of Electronics and Communication Engineering

STUDENT DECLARATION

We hereby declare that the work which is presented in the B. Tech Mini Project Report entitled "**IOT BASED WATER FLOW RATE MEASUREMNET AND MANAGEMENT USING NODEMCU AND FLOW SENSOR"** in the partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Electronics & Communication Engineering** and submitted to the School of Electronics & Communication Engineering, Shri Mata Vaishno Devi University, Katra, J & K is an authentic record of our own work which has carried out during a period from August, 2022 to December, 2022 under the guidance of **Mr**. **Ashish Suri**. The matter presented in this report has not been submitted elsewhere by us for the award of any other degree.

Aditi Priya(20bec001)

Aman Kumar(20bec003)

Bhoomija Tripathi(20bec016)

SHRI MATA VAISHNO DEVI UNIVERSITY
School of Electronics and Communication Engineering

CERTIFICATE

This is to be Certified that the mini project entitled "**IOT BASED WATER FLOW RATE AND MANAGEMENT USING NODEMCU AND FLOW SENSOR**" Aditi Priya(20bec001), Aman Kumar(20bec003), Bhoomija Tripathi(20bec016) , to the School of Electronics and Communication Engineering is completed under the supervision and guidance of **Mr. Ashish Suri**. The report has reached the standard of fulfilling of requirement of the regulation related to degree.

We wish the best for his endeavor.

Mr. Ashish Suri — **Project Guide**

Dr. Manish Sabraj — **Head of the Department**

ACKNOWLEDGEMENT

We have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and our organization. We would like to extend our sincere thanks to all of them.

We are highly indebted to our project guide Mr. Ashish Suri and Lab coordinator Bhawani sir for their guidance and constant supervision as well as for providing necessary information regarding the project & also for their support in completing the project.
We would like to express our gratitude towards parents & members of Shri Mata Vaishno Dev University for their kind co-operation and encouragement which helped us in completion of this project.

School of Electronics and Communication Engineering
SCHOOL NAME

Mr. Ashish Suri
PROJECT MENTOR

ABSTRACT

IOT BASED WATER FLOW RATE MEASUREMENTAND MANAGEMENT USING NODEMCU AND FLOW SENSOR

Introduction

In this project, we have built a water management system using water flow sensor & NODEMCU. We have interfaced the water flow sensor with NODEMCU and LCD and controlling the switching through self-made webpage and also connected to cloud via thing speak IOT platform, and program it to display the volume of water, which has passed through the valve. For this project, we have used the YF-S201 water flow sensor, which uses a hall effect to sense the flow rate of the liquid.

This project utilizes the pulses of flow of water from sensor which is to measure the rate of water flow for generating certain useful information like the amount of water usage, the bill. accordingly, & the time of water availability locality wise and uploading those in personal portals making it highly convenient.

Advantages

This project would allow the user to switch of the water flow remotely from anywhere having internet connectivity

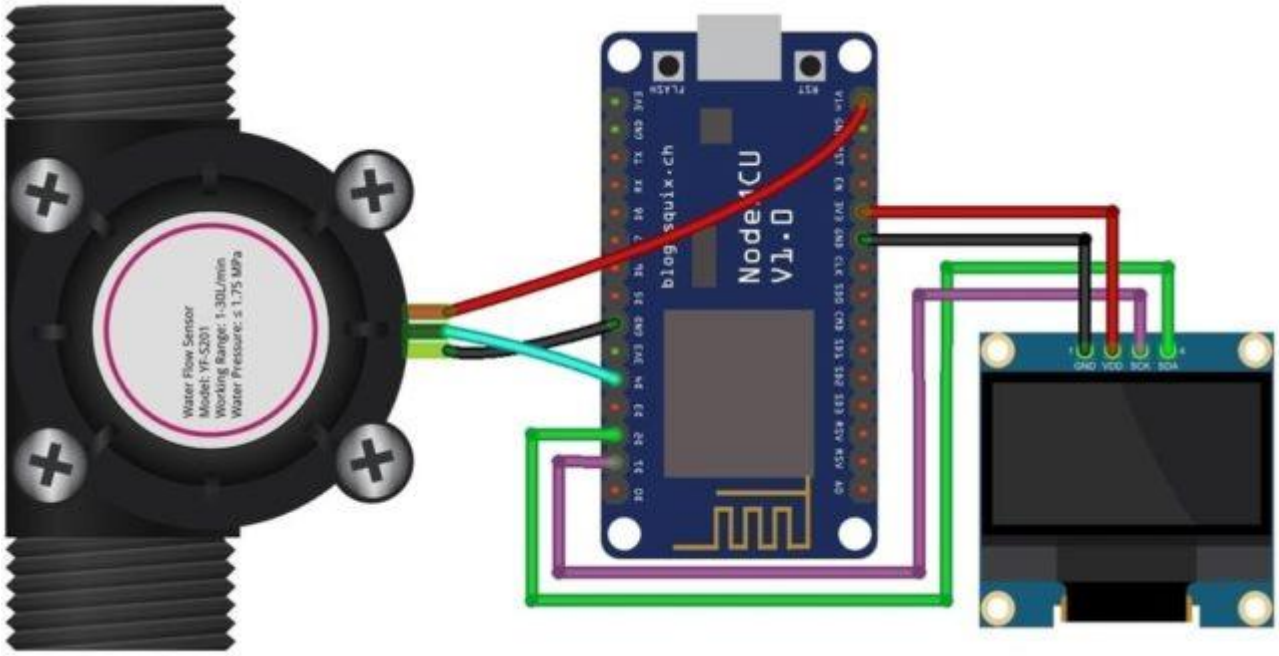
Soft Drink Industries and Chemical industries must constantly measure and quantify the liquids that they are handling during this automation process, and the most common sensor used to measure the flow of a liquid is a Flow Sensor. By using a flow sensor with a microcontroller like NODEMCU, we can calculate the flow rate, and check the volume of liquid that has passed through a pipe, and control it as required. Apart from manufacturing industries, flow sensors can also be found in the agriculture sector, food processing, water management, mining industry, water recycling, coffee machines, etc.

Further, a water flow sensor will be a good addition to projects like Automatic Water Dispenser and Smart Irrigation Systems where we need to monitor and control the flow of liquids.

This project has a time saving edge to it as it allenes the work to control the flow while sitting at one place unlike other present-day devices that do tell when to take action, but it requires physical movement.

This project will help to improve the water wastage and mismanagement problem

CIRCUIT DIAGRAM



WORKING

In our project, we connected the water flow sensor to a pipe. If the output valve of the pipe is closed, the output of the water flow sensor is zero (No pulses). There will be no interrupt signal seen at the pin 2 of the NODEMCU, and the count of the flow frequency will be zero. In this condition, the code which is written inside the else loop will work.
If the output valve of the pipe is opened. The water flows through the sensor, which in turn rotates the wheel inside the sensor. In this condition, we can observe pulses, which are generated from the sensor. These pulses will act as an interrupt signal to the NODEMCU . For every interrupt signal (rising edge), the count of the flow frequency variable will be increased by one. The current time and clop Time variable ensure that for every one second the value of the flow frequency is taken for calculation of flow rate and volume. After the calculation is finished, the flow frequency variable is set to zero and the whole procedure is started from the beginning.

TABLE OF CONTENTS

Chapter1: INTRODUCTION

The preservation of natural resources in general, and water, is a vital requirement for sustainable survival of the human species. As you all know that the water level is decreasing day by day. So, we need a water management system. **Water Management System** is an important part of Smart City Management. Water management involves supplying water according to the real requirement & without wasting Water. In a house or building it is especially important to regularly analyze the consumption of water and thus act, avoiding unnecessary costs.

Various approaches have been proposed to improve the management of water supplies, including awareness campaigns, leak management, specialized equipment (such as aerating shower spouts, low-flush or composting toilets and high- efficiency clothes washers), the passing of proposed water management laws, rain water harvesting and waste water reuse

One approach that offers various fringe benefits is that of smart metering. Driven mostly by the recent emergence of ubiquitous wireless networking, smart metering enables autonomous metering of utilities (e.g., electricity and water usage). Two key benefits of smart metering, both of which affect savings, are the low-latency and highly visualised method of data reporting. These two factors ensure that the consumer o the utility, who is usually also the payer thereof, is aware of consumption patterns, which leads to more responsible behavior. The main enabler behind the reduction in latency with smart metering, is that utility suppliers do not need to manually read the meters for billing purposes, but can autonomously capture and process all the data centrally, without having to send an official to every household to read the meter readings

Significant inroads have been made towards achieving smart metering in the energy sector Progress in smart metering of water supplies has, however, been much slower. A key challenge faced by smart water metering is the prohibitive cost and complexities associated with electronic water flow meters. There are many ways to measure water flow these days. as well as various types of water flow meters used to measure the amount of water flow in pipelines, but they are all too expensive. Instead of these expensive water flow meters, we can use readily available and low-cost YFS201 Water Flow Sensor. This sensor can be used in Soft Drinks Industries and Chemical industries to continually measure and quantify the liquids that they are handling during this automation process.

This project is about **IoT Based Water Flow Meter using NodeMCU ESP8266** & **YFS201 Water Flow Sensor**. We had **interfaced YFS201 Hall Effect Water Flow Sensor with NodeMCU** ESP8266 Board and **0.96″ OLED Display, and controlling the switching actions using a led via a webpage** The possibility of track/control multiple points of water through a single web page is enabled by this project, or even the automatic cut of water supply when detecting a flooding.

In this project, the monitoring can be done locally or remotely, this way you can generate alerts programmatically in order to warn the administrator about an over-consumption in any part of a building.

Let us know about the 3 main components used in making of this project in detail.

YF-S201 Hall-Effect Water Flow Sensor

This is an image of the YF-S201 Hall-Effect Water Flow Sensor. This sensor can be connected to the waterline as it has both inlet and outlet. Inside the sensor, there is a pinwheel that measures how much liquid has moved through it. There's an integrated magnetic hall effect sensor that outputs an electrical pulse with every revolution.

The sensor comes with three wires:
1. Red (5-24VDC power)
2. Black (ground)
3. Yellow (Hall effect pulse output)

By counting the pulses from the output of the sensor, you can easily calculate the water flow rate. Each pulse is approximately 2.25 milliliters. Note that it is cheaper but this isn't a precision sensor, and the pulse rate does vary a bit depending on the flow rate, fluid pressure, and sensor orientation. It will need careful calibration if better than 10% precision is required. However, it's great for basic measurement tasks!

Features of Flow Sensor:

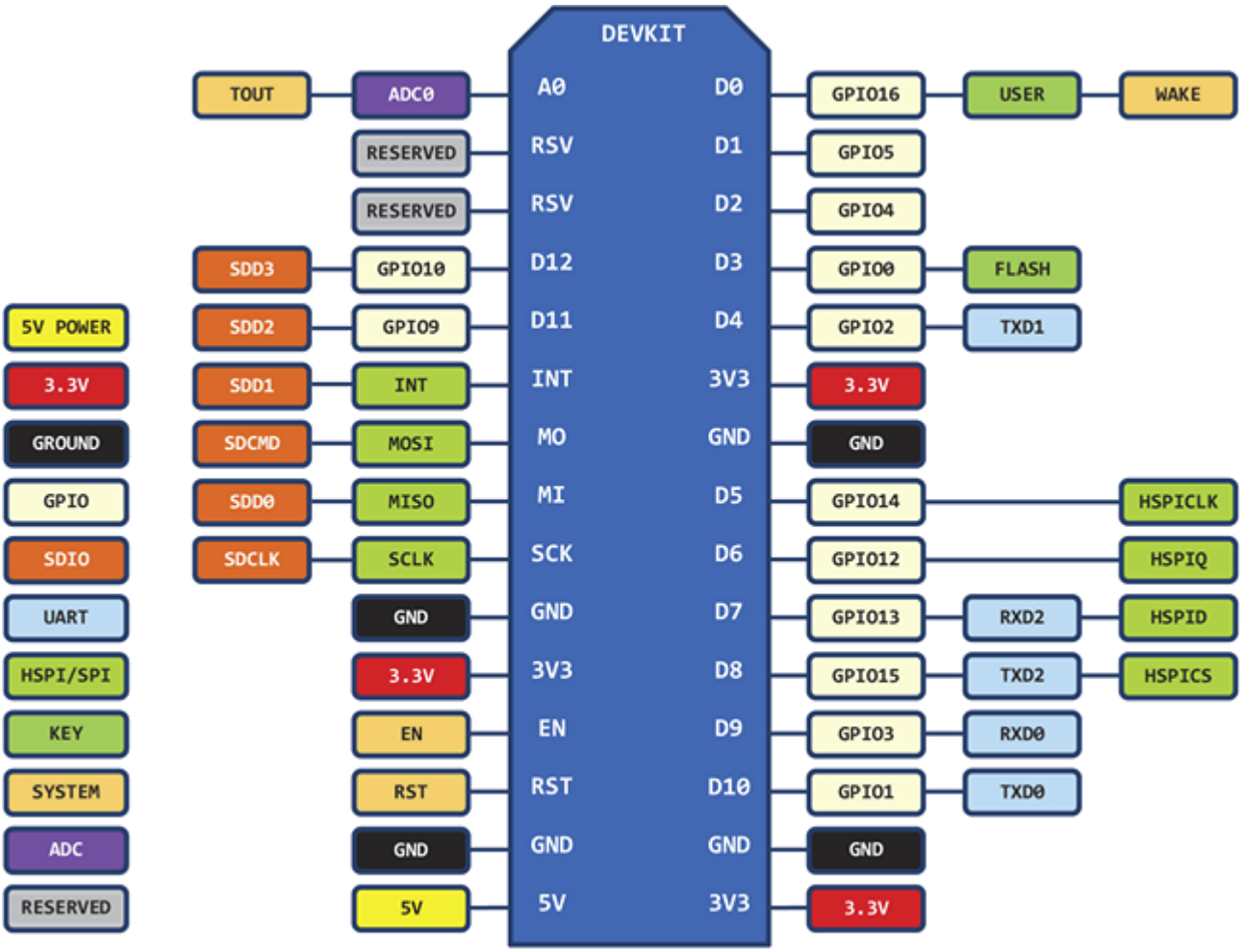
Model: YF-S201
Sensor Type: Hall effect
Working Voltage: 5 to 18V DC (min tested working voltage 4.5V)
Max current draw: 15mA @ 5V
Output Type: 5V TTL
Working Flow Rate: 1 to 30 Liters/Minute
Working Temperature range: -25 to +80℃
Working Humidity Range: 35%-80% RH
Accuracy: ±10%
Maximum water pressure: 2.0 MPa

Output duty cycle: 50% +-10%
Output rise time: 0.04us
Output fall time: 0.18us
Flow rate pulse characteristics: Frequency (Hz) = 7.5 * Flow rate (L/min)
Pulses per Liter: 450
Durability: minimum 300,000 cycles

ESP8266 NodeMcu

ESP8266 NodeMcu is a popular and widely used development board based on the ESP-12E WiFi Module that combines elements of easy programming with NODEMCU IDE (C\C++) and WiFi capability. Through the build-in programmer and CH340G USB-to-Serial chip, flashing the ESP8266 and serial output on a PC, development and prototyping projects are done with ease. Just like NODEMCU boards, the ESP8266 NodeMcu has GPIO pins, voltage regulator, ADC, Micro-USB port (for flashing and serial output) – all on one board. On top of that the ESP8266 NodeMcu has a full WiFi that takes care of the WiFi communication to a server or client. he ESP8266 is a System on a Chip (SoC), manufactured by the Chinese company Espressif. It consists of a Tensilica L106 32-bit micro controller unit (MCU) and a Wi-Fi transceiver. It has 11 GPIO pins* (General Purpose Input/Output pins), and an analog input as well. This means that you can program it like any normal NODEMCU or other microcontroller. And on top of that, you get Wi-Fi communication, so you can use it to connect to your Wi-Fi network, connect to the Internet, host a web server with real web pages, let your smartphone connect to it, etc . The possibilities are endless! It's no wonder that this chip has become the most popular IOT device available.

It contains a built-in 32-bit low-power CPU, ROM and RAM. It is a complete and self-contained Wi-Fi network solution that can carry software applications as a stand-alone device or connected with a microcontroller (MCU). The module has built-in AT Command firmware to be used with any MCU via COM port. The ESP8266 can be flashed and programed using the NODEMCU IDE. Due to its large open source developer community, a large number of libraries for this popular microcontroller is available .



D0(GPIO16) can only be used as gpio read/write, no interrupt supported, no pwm/i2c/ow supported.

NodeMCU ESP8266 Specifications & Features

Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106

Operating Voltage: 3.3V

Input Voltage: 7-12V

Digital I/O Pins (DIO): 16

Analog Input Pins (ADC): 1

UARTs: 1

SPIs: 1

I2Cs: 1

Flash Memory: 4 MB

SRAM: 64 KB

Clock Speed: 80 MHz

USB-TTL based on CP2102 is included onboard, Enabling Plug n Play

PCB Antenna

Small Sized module to fit smartly inside your IoT projects

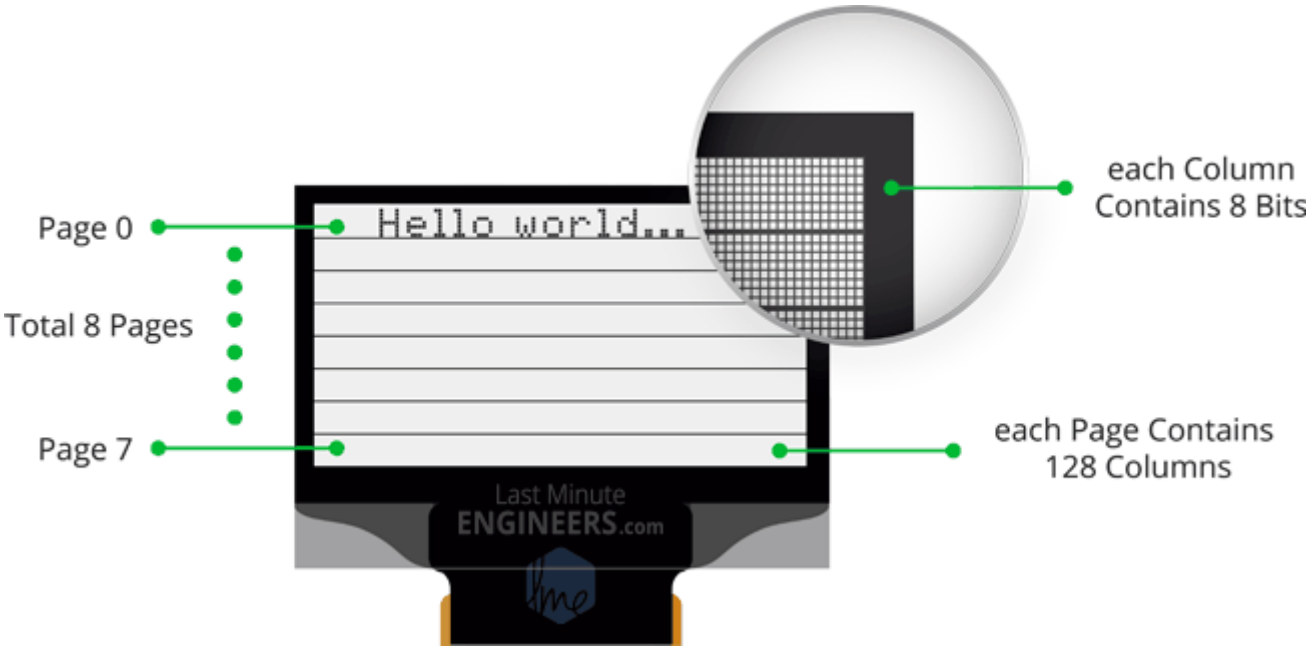
OLED Display Module

The OLED display module breaks out a small monochrome OLED display. It's 128 pixels wide and 64 pixels tall, measuring 0.96″ across. It's micro, but it still packs a punch – the OLED display is very readable due to the high contrast, and you can fit a deceivingly large amount of graphics on there.

As the display makes its own light, no backlight is required. This significantly reduces the power required to run the OLED and is why the display has such high contrast, extremely wide viewing angle and can display deep black levels.

At the heart of the module is a powerful single-chip CMOS OLED driver controller – SSD1306, which handles all the RAM buffering, so that very little work needs to be done by your ESP8266. Also the operating voltage of the SSD1306 controller is from 1.65V to 3.3V – Perfect for interfacing with 3.3V microcontrollers like ESP8266.

To have absolute control over your OLED display module, it's important to know about its memory map. Regardless of the size of the OLED module, the SSD1306 driver has a built-in 1KB Graphic Display Data RAM (GDDRAM) for the screen which holds the bit pattern to be displayed. This 1K memory area is organized in 8 pages (from 0 to 7). Each page contains 128 columns/segments (block 0 to 127). And each column can store 8 bits of data (from 0 to 7). That surely tells us we have The whole 1K memory with pages, segments and data is highlighted below.



Each bit represents particular OLED pixel on the screen which can be turned ON or OFF programmatically.

Chapter2: LITERARTURE

Research and survey papers on smart water monitoring system

1) **https://ijarcce.com/wp-content/uploads/2021/06/IJARCCE.2021.105127.pdf:** In this paper Smart Water Management system using Microcontroller ZR16S08 as IoT Solution presents that system operates through the smart monitoring of the water flow in pipes of the water distribution network, aiming to ensure the quality of the water supply, knowing that water losses characterize one of the great problems in the world, as pipe holes may be open doors to water contaminants.
2) **http://www.warse.org/IJATCSE/static/pdf/file/ijatcse131922020.pdf:**

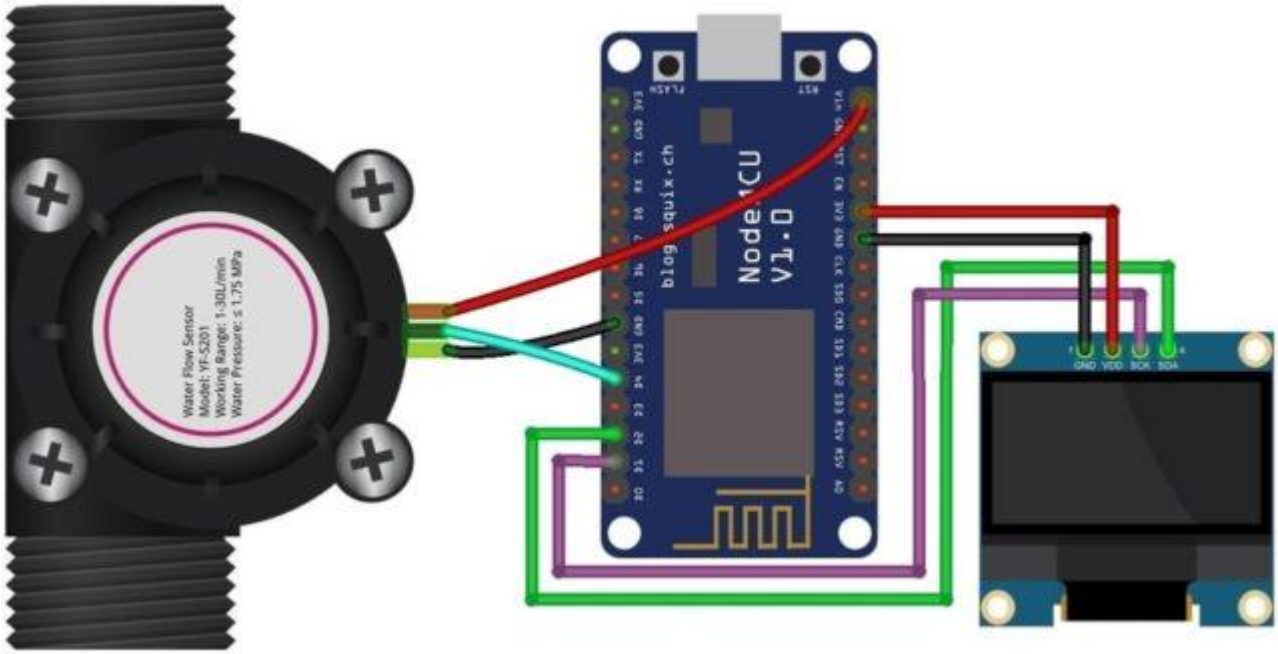
   According to the work of Ria Sood, Manjit Kaur andHemant Lenka, they have contributed to the design andconstruction of an automated water flow meter.Paper aimed at developing a low-cost flow meter modelfor calculating the flow rate through the irrigationpipeline.Kulkarni and Tim Farnham focused onidentifying the significant problems associated with watertreatment plants, such as leakage management, demandmanagement, asset management and so on.Early work on the optical water meter has been performedusing a hall-effect sensor and a microcontroller.

Chapter3: Working Principle

This project employs the functionality of three main components namely, the flow meter, NodeMCU, and the OLED display. The working principles of each needs to be understood in order to make this project and gain insights from it. The main task in here is to understand how does the flow meter we are using in this project actually works and calculates the total amount and rate of flow of water through it. The second main task is knowing the interfacing of the wifi module with the flow meter and the OLED display.

But first of all let us all see the circuit diagram to understand the basic connections of the various components.

Circuit Diagram



There are 3 wires connected from the flow meter to the NodeMCU. The red wire is for the power supply and is connected to the Vin of the ESP8266, the black one is for the ground and is connected to the ground pin of the NodeMCU. The third one is the hall effect pulse output wire and since this water flow sensor is a digital sensor therefore it is connected to any one of the digital input pins of the ESP8266 (in this case to **GPIO2**, i.e., **D4)**. Similarly, I2C OLED Display **SDA & SCL** pins are connected to **D2 & D1** of ESP8266 respectively. The OLED Display works at **3.3V** so it can be connected to 3.3V pin of NodeMCU.

Now that we are clear on the circuit diagram lets move on to the working of the various components and their combined working that leads to the completion of the project.

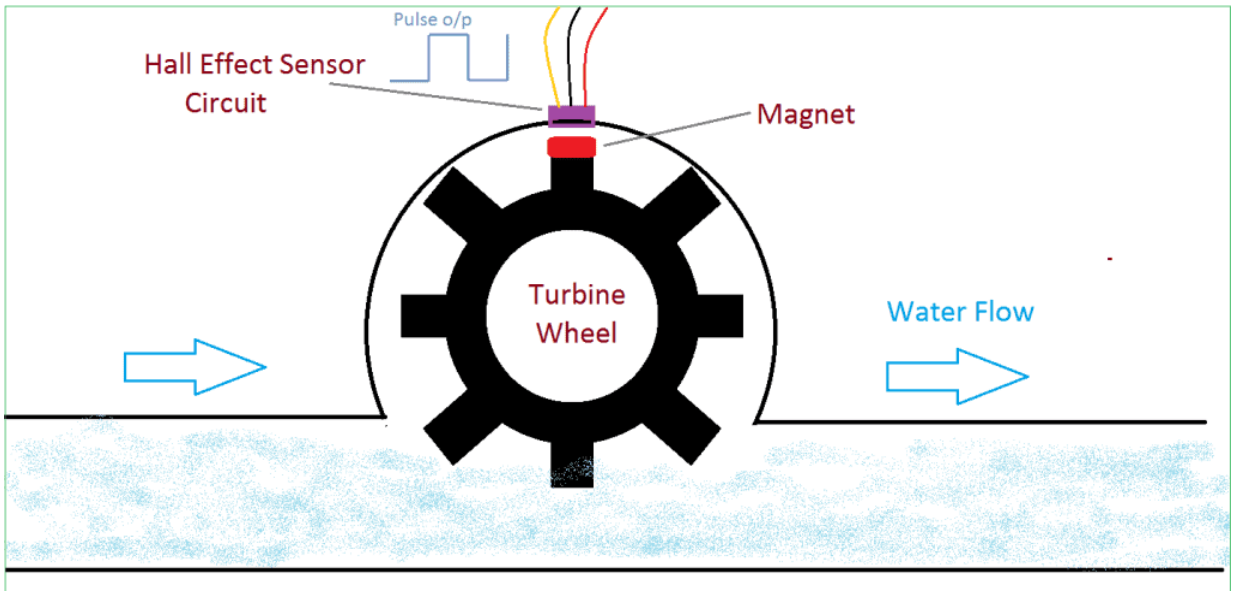
Working Code for webpage interfacing with nodemcu

```
#include <ESP8266WiFi.h>
 WiFiClient client;
WiFiServer server(80);
#define switch D6
 void setup()
{Serial.begin(9600);
WiFi.begin("aman", "aman@020");
while(WiFi.status() != WL_CONNECTED){
delay(200);
Serial.print("..");
_}
_Serial.println();
_Serial.println("NodeMCU is connected!");
_Serial.println(WiFi.localIP());
_server.begin();
_pinMode(switch, OUTPUT);}
void loop()
{
_// put your main code here, to run repeatedly:
_client = server.available();  //Gets a client that is connected to the server and has data available for reading.
_if (client == 1)
_{
String request =  client.readStringUntil('\n');
Serial.println(request);
_request.trim();
```

```
if(request == "GET /switchon HTTP/1.1")
{digitalWrite(switch, HIGH);}
if(request == "GET /switchoff HTTP/1.1"){
digitalWrite(led, LOW);_}client.println("Content-Type: text/html");
client.println("");
client.println("<!DOCTYPE HTML>");
client.println("<html>");
client.println("<h1>Welcome to the IOT Switching contro!</h1>");
client.println("<h3>Switch Controls<h3>");
client.println("<br>");
client.println("<a href=\"/switchon\"\"><button>SWITCH ON</button></a>");
client.println("<a href=\"/switchoff\"\"><button>SWITCH
OFF</button></a><br/>");client.println("</html>");}
```

Working of YFS201 Hall Effect Water Flow Sensor:

The Water Flow Sensor for Flow Rate & Volume Measurement using NODEMCU works on the principle of the Hall effect. According to the Hall effect, a voltage difference is induced in a conductor transverse to the electric current and the magnetic field perpendicular to it. Here, the Hall effect is utilized in the flow meter using a small fan/propeller-shaped rotor, which is placed in the path of the liquid flowing.



The liquid pushes against the fins of the rotor, causing it to rotate. The shaft of the rotor is connected to a Hall effect sensor. It is an arrangement of a current flowing coil and a magnet connected to the shaft of the rotor, thus a voltage/pulse is induced as this rotor rotates. In this flow meter, for every litre of liquid passing through it per minute, it outputs about 4.5 pulses. This is due to the changing magnetic field caused by the magnet attached to the rotor shaft. We measure the number of pulses using ESP8266 and then calculate the flow rate in litres per hour (L/hr) and total volume in Litre using a simple conversion formula

Working Code for interrfacing OLED, water flow sensor with node mcu and cloud server

```
#include <ESP8266WiFi.h>
#include <SPI.h>
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

#define SCREEN_WIDTH 128    // OLED display width, in pixels
#define SCREEN_HEIGHT 64    // OLED display height, in pixels
#define OLED_RESET -1       // Reset pin # (or -1 if sharing Arduino reset pin)

Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire,
OLED_RESET);

String apiKey = "KBD1JSZTUKCXJ15V";
const char *ssid = "aman";
const char *pass = "aman@020";
const char* server = "api.thingspeak.com";
```

```
#define LED_BUILTIN 16
#define SENSOR  2

long currentMillis = 0;
long previousMillis = 0;
int interval = 1000;
boolean ledState = LOW;
float calibrationFactor = 4.5;
volatile byte pulseCount;
byte pulse1Sec = 0;
float flowRate;
unsigned long flowMilliLitres;
unsigned int totalMilliLitres;
float flowLitres;
float totalLitres;

void IRAM_ATTR pulseCounter()
{
  pulseCount++;
}

WiFiClient client;

void setup()
{
  Serial.begin(115200);
  display.begin(SSD1306_SWITCHCAPVCC, 0x3C);
  display.clearDisplay();
  delay(10);

  pinMode(LED_BUILTIN, OUTPUT);
  pinMode(SENSOR, INPUT_PULLUP);

  pulseCount = 0;
  flowRate = 0.0;
  flowMilliLitres = 0;
  totalMilliLitres = 0;
  previousMillis = 0;

  attachInterrupt(digitalPinToInterrupt(SENSOR), pulseCounter, FALLING);
}

void loop()
{
  currentMillis = millis();
  if (currentMillis - previousMillis > interval)
  {
```

```
pulse1Sec = pulseCount;
pulseCount = 0;

  flowRate = ((1000.0 / (millis() - previousMillis)) * pulse1Sec) / calibrationFactor;
previousMillis = millis();

 flowMilliLitres = (flowRate / 60) * 1000;
flowLitres = (flowRate / 60);

 totalMilliLitres += flowMilliLitres;
totalLitres += flowLitres;

// Print the flow rate for this second in litres / minute
Serial.print("Flow rate: ");
Serial.print(float(flowRate));  // Print the integer part of the variable
Serial.print("L/min");
Serial.print("\t");       // Print tab space

display.clearDisplay();

display.setCursor(10,0);  //oled display
display.setTextSize(1);
display.setTextColor(WHITE);
display.print("Water Flow Meter");

display.setCursor(0,20);  //oled display
display.setTextSize(2);
display.setTextColor(WHITE);
display.print("R:");
display.print(float(flowRate));
display.setCursor(100,28);  //oled display
display.setTextSize(1);
display.print("L/M");

// Print the cumulative total of litres flowed since starting
Serial.print("Output Liquid Quantity: ");
Serial.print(totalMilliLitres);
Serial.print("mL / ");
Serial.print(totalLitres);
Serial.println("L");

display.setCursor(0,45);  //oled display
display.setTextSize(2);
display.setTextColor(WHITE);
display.print("V:");
display.print(totalLitres);
display.setCursor(100,53);  //oled display
display.setTextSize(1);
display.print("L");
```

```
  display.display();
 }

 if (client.connect(server, 80))     String postStr = apiKey;
    postStr += "&field1=";
    postStr += String(float(flowRate));
    postStr += "&field2=";
    postStr += String(totalLitres);
    postStr += "\r\n\r\n";

   client.print("POST /update HTTP/1.1\n");
   client.print("Host: api.thingspeak.com\n");
   client.print("Connection: close\n");
   client.print("X-THINGSPEAKAPIKEY: " + apiKey + "\n");
   client.print("Content-Type: application/x-www-form-urlencoded\n");
   client.print("Content-Length: ");
   client.print(postStr.length());
   client.print("\n\n");
   client.print(postStr);

 }
   client.stop();
}
```

Mathematical Calculation to Measure Flow Rate & Volume

We have determined flow rate by a change in velocity of the water. The water velocity depends on the pressure that forces the through pipelines. The cross-sectional area of the pipe is known and remains constant, thus we calculate the average velocity that indicates the flow rate.

Let us consider Q is the flow rate/total flow of water through the pipe, V is the average velocity & A is the cross-sectional area of the pipe. In such a case the basis relationship for determining the liquid's flow rate in such cases is Q=VxA

Sensor Frequency (Hz) = 7.5 * Q (Liters/min)
Litres = Q * time elapsed (seconds) / 60 (seconds/minute)
Litres = (Frequency (Pulses/second) / 7.5) * time elapsed (seconds) / 60
Litres = Pulses / (7.5 * 60)

Chapter4: APPLICATIONS AND BENEFITS TO THE SOCIETY

We started working on this project with a basic application of it in our minds that this project would allow the user to switch on/off the water flow remotely from anywhere having internet connectivity with the proper idea about the water. Our project provides an easy and convenient way of informing about the flow rate and total volume and how to control using our phones.

Now this basic application provided by this project can be extended to various fields with a wide variety of usage. Wherever there exists a problem relating to the flow measurement and its control automatically, this project can be employed to get rid of that problem by adding some other functionality but the basic idea remains the same as that applied in his project and thus automating various processes and gain efficiency and comfort at work.

For example:

We all know the present day need to preserve water is dire and measures need to be taken to prevent wastage of water. Many environmental campaigns are there to make people realize the importance of water management but still a huge junk of population seems to ignore the seriousness of this. People fail to save water at their homes and this is the result of the current water billing system and, regardless of the amount of water used, the overall bill is always divided into the entire property. If there can be a way to way to measure the amount of water utilized by a single house then the billing system can be changed and can be based on the amount of water utilized. This way every person will have to think once before wasting even a single drop thus helping in the cause. Our project can successfully measure the amount utilized and can generate all these information on a portal that can be used to calculate personal bills.

This project can also be used in giving information like leakage of water in pipelines, the flow sensor will sense any water flow where is not supposed to be and this can be informed to the dealing authorities through our iot server.

Soft Drink Industries and Chemical industries must constantly measure and quantify the liquids that they are handling during this automation process, and the most common sensor used to measure the flow of a liquid is a Flow Sensor. By using a flow sensor with a microcontroller like NODEMCU, we can calculate the flow rate, and check the volume of liquid that has passed through a pipe, and control it as required.

Apart from manufacturing industries, flow sensors can also be found in the agriculture sector, food processing, water management, mining industry, water recycling, coffee machines, etc.

Further, a water flow sensor will be a good addition to projects like Automatic Water Dispenser and Smart Irrigation Systems where we need to monitor and control the flow of liquids.

This project has a time saving edge to it as it allenes the work to control the flow while sitting at one place unlike other present-day devices that do tell when to take action, but it requires physical movement.

Chapter5: CONCLUSION AND FUTURE WORK

The project explains the design and function of the Flow meter and how it can be used for Automatic Meter Reading using IOT. In this project, we developed a code to interface the flow sensor and the OLED display to the ESP8266 so as to read the rate of water flow and the total volume of water passed not on, on the OLED but also on our phone or laptop screens.

The motivation behind choosing this project was realizing the need to conserve water and find ways to make this job easy for everyone. The implementation of water conservation approaches and technologies that promote the conservation and management of water is all that we need. Working on this project helped us strengthen our concepts and knowledge on the various principles and gave us the opportunity to do hands on work thus strengthening our

REFERENCE

1) https://how2electronics.com/iot-water-flow-meter-using-esp8266-water-flow-sensor/
2) https://www.academia.edu/43007338/IoT_based_Water_Monitoring_and_Alerting_System
3) https://www.hobbytronics.co.uk/yf-s201-water-flow-meter