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IoT Based Industrial Level Sensor Data Acquisition & Monitoring

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Abstract - *Internet of Things (IoT) is an emerging domain that promises ubiquitous connection to the Internet, turning common objects into connected devices. The IoT paradigm is changing the way people interact with things around them. It paves the way to creating pervasively connected infrastructures to support innovative services and promises better flexibility and efficiency. Such advantages are attractive not only for consumer applications, but also for the industrial domain. Over the last few years, we have been witnessing the IoT paradigm making its way into the industry marketplace with purposely designed solutions .This paper represents the implementation & result of Liquid or solid objects level monitoring and data acquisition using industrial level sensor and has been displayed on dashboard as well as from remote location using wireless network.[1]*

Key Words: IoT, Level Sensor, Data acquisition, Remote monitoring, Wireless Network.

1. INTRODUCTION

Data acquisition is method of gathering and organizing the information. In this, using analog to digital converter sampled signals are converted into digital form and these signals can be analysed, displayed and stored in computer. It is also process of measuring the physical or electrical terms like voltage, current, pressure, temperature, sound etc. with the help of computer. In this project, by using industrial level sensor which is work on radar principle, we calculate the level of liquid or solid objects and percentage of reservoir filled and distance of medium from sensor device, these distance can be calculated with the help of electromagnetic waves Emitted by sensor device, as a result of this we get an exact level of reservoir filled.

Following are the components used in this project:

1.1 Level Sensor

This is basically radar sensor which uses the principle of reflection, but it is slightly different from normal radar sensor used in industry. This is the first 80GHz radar developed according to international safety standard. It is based on frequency modulation continuous wave method. It measures the level by using frequency difference i.e. difference between emitting wave and reflected wave frequencies.

This type of sensors are mainly used in non-contact level measurement of liquids, pastes and slurries and because of its higher frequency it comes under W band. Therefore it is perfect technique for high frequency radar. It not get affected by medium changes, temperature variation, gas blankets and vapors.

This sensor works with the HART communication. Because of industrial sensor, it gives the output in the form of current i.e. in between 4 to 20mA. These data can be displayed on computer by using HART communication device. From that we can see the distance, level and temperature of the device.

1.2 I to V Convertor(4-20mA to 1-5V)

The main advantage of a two-wire loop is that it minimizes the number of wires needed to run both power and signal. The use of a current loop to send the signal also has the advantages of reduced sensitivity to electrical noise and to loading effects. The electrical noise is reduced because the two wires are run as a twisted pair, ensuring that each of the two wires receives the same vector of energy from noise sources, such as electro-magnetic fields due to a changing current in a nearby conductor.

The circuit compliance to handle a given voltage drop from additional loop devices depends on the transmitter output circuit and on the power supply voltage. The typical power supply for industrial transmitters is +24 VDC. Where the current loop signal is connected to the main receiving equipment or data acquisition system, a precision load resistor of 250 ohms is normally connected. This converts the 4 to 20 mA current signal into a 1 to 5 volt signal, since it is standard practice to configure the analog-to-digital converter of the receiving equipment as a voltage-sensing input.

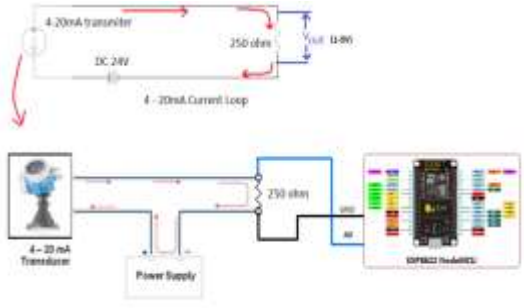

Fig -1: I to V conversion

2. IoT commissioning

2.1 ESP8266 NodeMCU

The Internet of things (IoT) is the extension of Internet connectivity into physical devices and everyday objects. Embedded with electronics, Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled.

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS.

Table -1: ESP8266 NodeMCU Pins

I/O index	ESP8266 pin
D0[*]	GPIO16
D1	GPIO5
D2	GPIO4
D3	GPIO0
D4	GPIO2
D5	GPIO14
D6	GPIO12
D7	GPIO13
D8	GPIO15
D9	GPIO3
D10	GPIO1
D11	GPIO9
D12	GPIO10

NodeMCU provides access to the GPIO (General Purpose Input/Output) and a pin mapping table is part of the API documentation. [*] D0 (GPIO16) can only be used for GPIO read/write.

It does not support open drain/interrupt/PWM/I^2C or 1-Wire.

2.2 IoT Cloud

We have to create a new account at AskSensors. Then create a new Sensor to store data in. AskSensors supports communication with all networkable micro-controllers, bridges and materials with internet connection capability such as Arduino, ESP8266, Raspberry Pi and more.

how to create and set up a new Sensor so we will be able to write data to this sensor. Here are the main steps:

- Click on 'New Sensor' to create a communication channel with unique ID and Api Keys. Give a name and description to your sensor.
- Add a module for the data you will be plotting.
- Copy down the Api Key In value.
- For connecting to network we have to write WiFi SSID and Password as well Api Key into ESP8266 program code.
- It connects the ESP8266 to wireless network as HTTPS client, and then push data to AskSensors.
- For data visualization click on 'visualize' and 'Show Graph' to view your sensor. we can cross-check the graph readings with the values being printed on our Arduino Terminal.

3. System development

3.1 Proposed System block Diagram

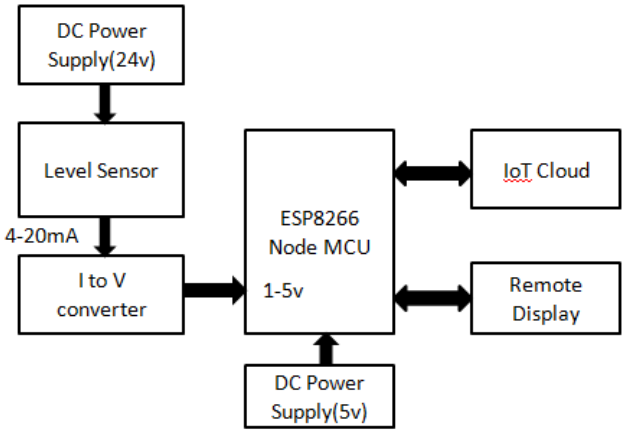

Fig1. Block Diagram of system

Above fig. shows system block diagram of proposed model. In this, there are three measure devices used for the purpose of data acquisition and remote monitoring system. These are all industrial device only used for industrial purpose. We cannot used these devices for experimental purpose because these are high cost devices, so it needs to be handle carefully.

There is one level sensor used, in which data from sensor will monitored remotely. For remote monitoring purpose we have used IoT cloud server and Computer or any device which having internet facility for visualization.

So this device can monitor data comes from industrial sensor and pass this data to NodeMCU and then it goes to

cloud via wireless network, where data can be seen by any person from any location.

The output on dashboard look like shown in figure below:

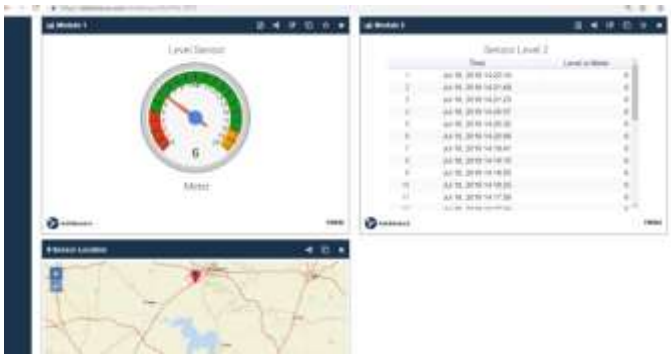

Fig 2.Dashboard

3. CONCLUSION

In this paper, we have discussed the implementation of industrial level sensor data acquisition and monitoring system using IoT. By using these types of sensor we get higher accuracy and consistency for proper monitoring of system. This is very much suitable for large scale as well as small scale industries, where these sensors are used. Also used in industries like chemical, food etc. and with high temperature and vacuum conditions.

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REFERENCES

[1] E. Sisinni, A. Saifullah, S. Han, U. Jennehag and M. Gidlund, "Industrial Internet of Things: Challenges, Opportunities, and Directions," in *IEEE Transactions on Industrial Informatics*, vol. 14, no. 11, pp. 4724-4734, Nov. 2018.

[2] Suyash Lad, Bhushan Mahajan, Roshan Mandkulkar, Vishal Pugaonkar, Mrs. K.Sailakshami 2017,"Data Acquisition system using LABVIEW", volume:4 Issue:4,Apr 2017,IRJET

[3] Pratiksha Sarma, Hidam kumarjit Singh, Tulshi Bezboruah 2018, "A real time data acquisition system for monitoring sensor data", volume: 6 ISSUE: 6, June 2018, IJCSE.

[4] Neelam V Tambe, Prof.R.R.Itkarkar 2015, "Remote data monitoring system with android application", e-ISSN: 2278-2834, (NCIEST-2015), IOSR-JECE.