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WI-FI BASED OPTIMAL AUTOMATION MONITORING AND CONTROLING SCHEME

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Abstract: Normally big and small industries have many big pipelines carrying different types of liquids, as well as the flammable liquids and acidic liquids. Here we must to control and monitor the flow rate of the liquid for enhancing the processes and to prevent the accidents. In this paper give a scheme to monitor and control the liquid flow in the pipeline of industry during working or not it will be supervised through web server. There are many systems to done by using different scheme here we done the same, but the monitor and control the flow of liquid using Internet with the help of CC3200 WI-FI launch pad. The liquid flow rate is monitored by Hall Effect based flow sensor. CC2300 MCU, a microcontroller development board get the pulses from the flow sensor and sends it to network processor, a microcomputer to control the electro valve which is connected to the pipeline. Web Server has to be setup by means of CC3200 WI-FI Launch Pad.

Keywords- Wireless fidelity (Wi-Fi); Microcontroller unit (MCU); CC2300 MCU; Advanced RISC machine (ARM); Wi-Fi protected access 2 (WPA 2);

I.INTRODUCTION

To Measure the flow of liquids is an essential need in many industries. Many automotive machines during working time, forced to monitor accurate flow measurements. Because it profit and loss will depend the accurate work. Another case, inaccurate flow measurements or failure to take measurements can made severe disastrous. Most of the liquid flow measurement instruments, has the flow rate is determined by measuring the liquid's velocity and the rate of change in kinetic energy. Velocity depends on the pressure differential that is forcing the liquid through a pipe. Since, the pipe's cross-sectional area is known and remains constant flow rate is mentioned or indicated by the average velocity. It is very important to know what a flow meter can able to done at the same time what it unable to done. Technically day to day new flow sensors arrived it's also must to consider. The satisfaction received with the product depends on the industry need to selecting and installing the device. Sometimes during installing time installer or the device not installed correctly. Every design has some parameter to identify the velocity conditions in the pipe [1]. If the device accuracy is not correct and performance will not be correct. The biggest problem is with metering. The values may not be clearly understood that is they may be in different parameters. Regularly the meters have to be calibrated. All the flow meters require initial calibration. The recalibration depends on how well the meter fits the application.

There are number of factors influence maintenance requirements and the life expectancy of flow meters. The major factor is matching the right instrument to the particular application. There are many other flow meters used in various places. They are monitored using the wireless computer systems. The person can notice the flow anywhere in the world with a particular application to monitor the flow. They can share this with other through that website. So that for monitoring only the person needs an individual

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computer. The [2] proposed system helps to monitor and control the flow of liquid through internet by mobile or computer.

II.PROPOSED SCHEME

The proposed scheme to monitor the flow of liquid basically consists of electro-valve, flow meter, and microcontroller microcomputer [3] and web server. The block diagram of the system is shown in the fig.1. To measure the flow rate of the liquid, Hall Effect sensor based flow meter is used. CC3200 Wi-Fi launch pad will act as a microcontroller and microcomputer respectively. The electro valve is physically connected to the pipeline in which the flow to be controlled. The electro valve is connected with the flow meter / flow sensor. The flow sensor measures the flow and generates analog pulse. The flow sensor/ flow meter is connected to jumper header in order to read the pulses from the flow sensor.

The CC3200 Launch pad reads the analog pulse from the flow sensor and sends the signal to the network processor which is the main component to control the electro valve. The Electro valve is electrically connected to the CC3200 Launch Pad, by which is to be energized to open or close the valve. The CC3200 MCU is programmed to read the analog signal and to control the electro valve. The network processor is also programmed to act as a Web server by which the electro valve is controlled using the, wireless internet connection. CC3200 launch pad is responsible for collecting the data from the flow meter and sends it to the PC. Flow meter is interfaced with CC3200 launch pad directly.

The flow meter works on the principle of Hall Effect sensor. The Hall Effect sensor is a transducer whose output voltage varies in response to a magnetic field. As the [10] liquid flows through the flow meter, Hall Effect sensor senses the liquid flow and sends the corresponding data to CC3200 MCU through the interface. The next part involves the uploading of data that has been received from the CC3200 MCU to Network processor. CC3200 Microcontroller unit which is of light weight that runs on embedded c programming capable of handling various hardware interfaces. CC3200 Launch pad is directly connected to the Universal Serial Bus port that is available in network processor to PC. The embedded is used as a primary coding language by the CC3200 wi-fi launch pad to receive the data from the serial port and uploading it to the server and also running the server. The flow rate of the liquid can be controlled by electro valve activated by the microcontroller unit in the launch pad through the internet. CC3200 MCU is capable of controlling hardware using the GPIO pins (General Purpose Input/output pins) it has. The electro-valve is connected to the GPIO pins and is accessed through internet. The step down transformer and bridge rectifier are capable of supplying power. This flow sensor will interrupt the liquid flow until 5v power supply is given. The power supply to the wi-fi launch pad is given by means of bridge rectifier and step down transformer and controls it from the web server.

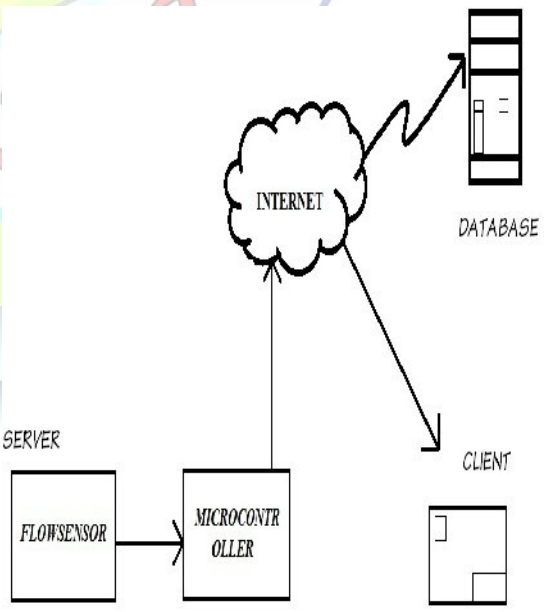

Fig-1 WI-FI Automation

III.HARDWARE

The major components used in the proposed have

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been discussed briefly.

3.1 Hall Effect Flow Sensor

The flow rate of the liquid is measured with the help of Hall Effect sensor type flow meter. Hall Effect type flow sensor is shown in the fig.2.A Hall Effect sensor is a transducer that varies its output voltage in response to a magnetic field. The Hall Effect [1,4] is the production of a voltage difference across an electrical conductor, transverse to an electric current in the conductor and a magnetic field perpendicular to the current Hall Effect sensors are used for proximity switching, positioning, speed detection, and current sensing applications. The flow meter is capable of measuring 1-30 Liters per minute. It can withstand the pressure of water less than or equal to 2.0 Mpa. The flow sensor is connected to a ½ inch pipe. It senses the flow of liquid in the pipe and sends the corresponding analog signal to CC3200 Wi-Fi launch pad.

Fig-2 Flow sensor

IV CC3200 WI-FI LAUNCH PAD

The high performance CC3200 is the industry's first single-chip Microcontroller (MCU) with built-in Wi-Fi connectivity for the Launch Pad™ ecosystem. Created for the Internet of Things (IoT), the Simple Link Wi-Fi CC3200 device is a wireless MCU that integrates a high-performance ARM® Cortex®-M4 MCU allowing customers to develop an entire application with a single IC. With on-chip Wi-Fi, internet and robust security protocols, no prior Wi-Fi experience is needed for faster development. The CC3200 Launch Pad is a low-cost evaluation [5] platform for ARM® Cortex™-M4F-based microcontrollers. The Launch Pad design highlights the CC3200 Internet-on-a-chip™ solution and Wi-Fi capabilities. The CC3200 Launch Pad also features programmable user buttons, RGB LED for custom applications and onboard emulation for debugging. The stackable headers of the CC3200 Launch Pad XL interface demonstrate how easy it is to expand the functionality of the Launch Pad when interfacing with other peripherals on many existing Booster Pack add-on boards such as graphical displays, audio codec, antenna selection, environmental sensing, and much more.

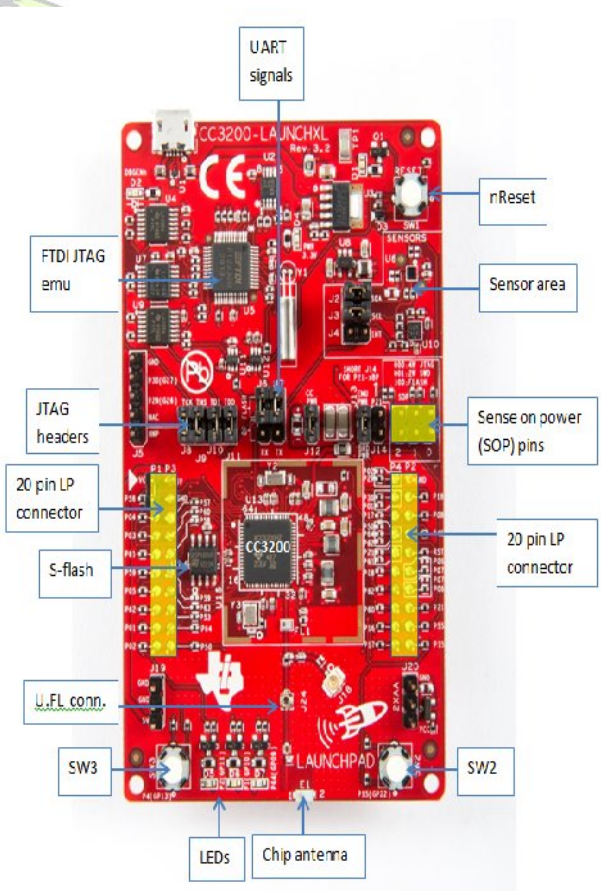

Fig-3 WI-FI Launch pad

4.1 CC3200 Hardware and Software:

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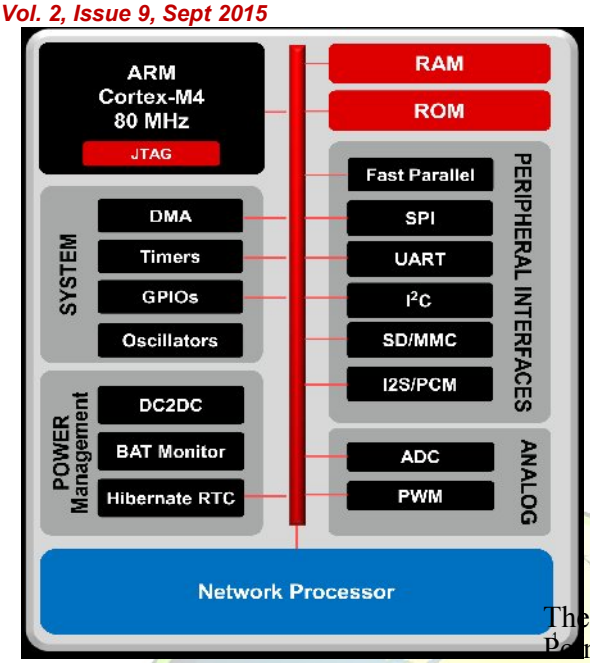
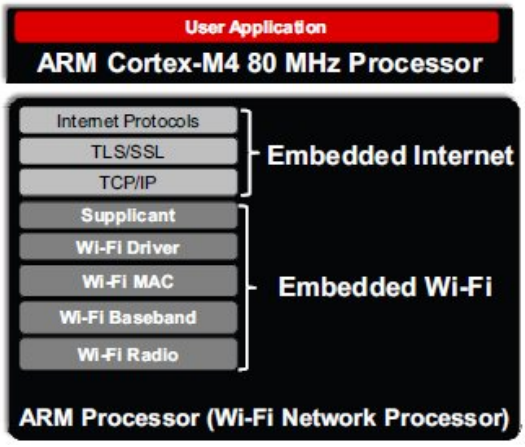


Fig-4 Hardware block



. Fig-5 Software block

V. IMPLEMENTATION OF THE SYSTEM

The CC3200 device is a complete platform solution including software, sample applications, tools, user and programming guides, reference designs, and the TI E2E™ support community. The device is available in a QFN package that is easy to layout. The applications MCU subsystem contains an industry-standard ARM Cortex-M4 core running at 80 MHz. The device includes a wide variety of peripherals, including a fast parallel camera interface, I2S, SD/MMC, UART, SPI, I2C, and four-channel ADC. The CC3200 family includes flexible embedded RAM for code and data and ROM with external serial flash boot loader and peripheral drivers. The Wi-Fi network processor subsystem features a Wi-Fi Internet-on-a-Chip and contains an additional dedicated ARM MCU that [6,7,9] completely offloads the applications MCU. This subsystem includes an 802.11 b/g/n radio, baseband, and MAC with a powerful crypto engine for fast, secure Internet connections with 256-bit encryption.

The CC3200 device supports Station, Access Point, and Wi-Fi Direct modes. The device also supports WPA2 personal and enterprise security and WPS 2.0. The [8] Wi-Fi Internet-on-a-chip includes embedded TCP/IP and TLS/SSL stacks, HTTP server, and multiple Internet protocols. The power-management subsystem includes integrated DC-DC converters supporting a wide range of supply voltages. This subsystem enables low-power consumption modes, such as the hibernate with RTC mode requiring less than 4 µA of current.

VI.RESULTS

The prototype model to control the flow of liquid through server is shown in fig.6.Water is used as the liquid to test the setup. Snapshot of the water flow setup is shown in fig.7. According to flow meter sensor's data sheet *5600 pulses = 1 liters*. The program is written to send the data *every second.* First of all, a small tank with low pressure was used. The data was like this (The liquid used here is *water*) 258 L/hour, 321 L/hour, 278 L/hour, 345 L/hour etc. The water flow was very slow. But even when the water is turned OFF there were some reading like 20L/hour, 31L/hour, etc. indicating zero error. All the components were checked carefully, it was found to be loose connection between the interrupt pins in flow sensor or hardware, sending blank pulses to the serial port and has been rectified. Now the connections are checked again and the water flow is switched ON.

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Fig-6 Hardware Implementation

Now there is no error and the data it shows is perfect when the water is switched OFF it correctly shows 0 L/hour the fig.8 shows the monitoring of the liquid flow through the Smart phone. 12v of power supply from step down transformer is converted to 5v through ac to dc bridge rectifier and regulator. Then 5v power supply is given to the wifi launch pad and should not give more than 5v. The electro-valve needs minimum of 12-15 PSI to work.

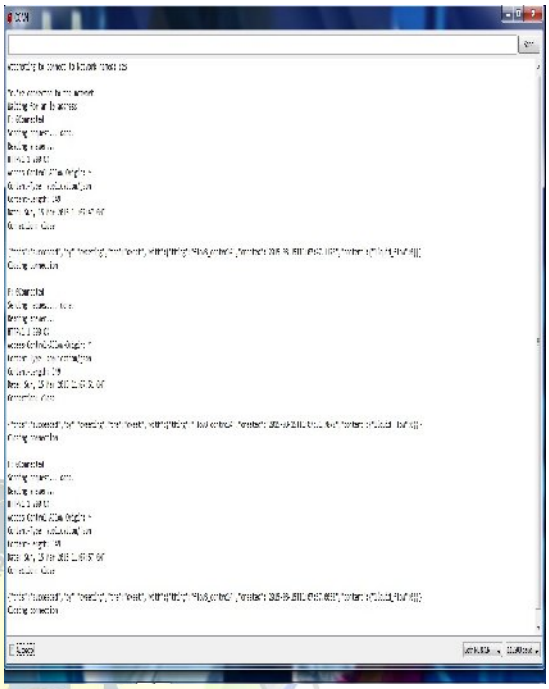

Fig-7 simulated result

VII.CONCLUSIONS

Finally, the electro-valve was connected to the small tank (low pressure), when triggered it does not open properly. Small tank that we used for flow meter did not suffice. So overhead tank has been used. After doing the plumbing connections, the electro-valve was triggered and it worked fine In order to open the server in any browser the IP (internet protocol) address of the server need to be known... The HTML page designed uses java script, so whatever the browser is used, it must be installed with java plug-in or else the data will not be displayed properly. For security reasons we have assigned username and password for the user to monitor the data, to enter the website. When the web page opens, there will be two options Flow data and Control. The required option shall be selected.

The Liquid flow can be monitored and controlled from anywhere in the world using internet through personal computer or Smartphone. The system has been tested for water as a flowing liquid successfully. The work can be extended to liquids that are used in various industries with careful considerations of parameters like pressure, temperature, corrosion, etc with appropriate use of flow sensors and WI-FI Launch pad.

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