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REMOTE OIL FACILITIES MONITORING USING INTERNET OF THINGS

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ABSTRACT

This is an Internet of things (IoT) based project with Arduino uno microcontroller. As we know that getting accurate readings for the oil and gas facilities located at remote areas is difficult. So, this project is designed for monitoring, supervision and sensors are deployed for oil and gas facilities to measure the accurate reading value. The Arduino Uno mentioned, collects and communicates the data such as temperature, pressure and level of oil in the tank acquired from the temperature, flow rate, and level sensors to the software deployed on computer using IoT. The Arduino sends the sensor data through ESP8266 Wi-Fi module to the IoT website from the site. Also, a web-based graphical user interface (GUI) is created using IOT in the mobile app for collecting data so that the instantaneous data can be viewed at any time by anyone who has the access to the interface.

INTRODUCTION

Refineries make up the downstream segment of the oil industry that is responsible for the refining crude oil and distribution of its by-products. Even though they play an essential role in the oil market, these oil refineries are subjected to various risks and inefficiencies. As a sensitive industry that deals with fire hazards on a regular basis, the threat of oil-burning into fumes and possibilities of collateral damage are always high. Even minor faults can be very dangerous in such a hazardous environment as a single spark or shot wire could cause severe accidents. Hence, the oil industry requires a refinery monitoring solution that can help them to monitor their operations. IoT (Internet of Things), with its smart refinery monitoring systems, is helping refineries to get rid of their inefficiencies. These systems allow users to track real-time data and act on it based on past data references. It uses wireless sensors that are compact and easy to deploy, to provide real-time information to users for controlling and monitoring their processes.

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with

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unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Increasingly, organizations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business.

The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations.

IoT enables companies to automate processes and reduce labour costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions.

As such, IoT is one of the most important technologies of everyday life, and it will continue to pick up steam as more businesses realize the potential of connected devices to keep them competitive.

LITERATURE SURVEY

Kevin Ashton, co-founder of the Auto-ID Centre at the Massachusetts Institute of Technology (MIT), first mentioned the internet of things in a presentation he made to Procter &Gamble (P&G) in 1999. Wanting to bring radio frequency ID (RFID) to the attention of P&G's senior management, Ashton called his presentation "Internet of Things" to incorporate the cool new trend of 1999: the internet. MIT professor Neil Gerstenfeld’s book, When Things Start to Think, also appeared in 1999. It didn't use the exact term but provided a clear vision of where IoT was headed.

IoT has evolved from the convergence of wireless technologies, micro electro mechanical systems (MEMs), micro services and the internet. The convergence has helped tear down the silos between operational technology (OT) and information technology (IT), enabling unstructured machine-generated data to be analyzed for insights to drive improvements.

Although Ashton's was the first mention of the internet of things, the idea of connected

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devices has been around since the 1970s, under the monikers embedded internet and pervasive computing.

The first internet appliance, for example, was a Coke machine at Carnegie Mellon University in the early 1980s. Using the web, programmers could check the status of the machine and determine whether there would be a cold drink awaiting them, should they decide to make the trip to the machine.

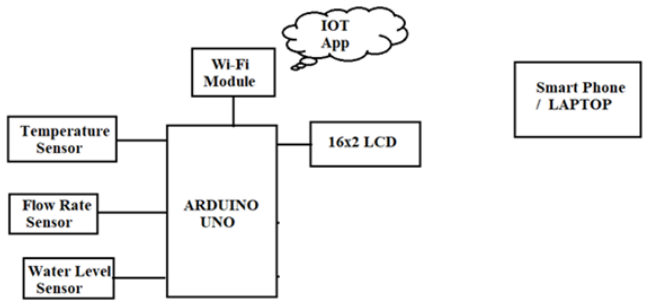
IoT evolved from M2M communication, i.e., machines connecting to each other via a network without human interaction. M2M refers to connecting a device to the cloud, managing it and collecting data.

Taking M2M to the next level, IoT is a sensor network of billions of smart devices that connect people, systems and other applications to collect and share data. As its foundation, M2M offers the connectivity that enables IoT.

The internet of things is also a natural extension of supervisory control and data acquisition, a category of software application programs for process control, the gathering of data in real time from remote locations to control equipment and conditions. Data Acquisition systems include hardware and software components. The hardware gathers and feeds data into website (IoT Webserver) using wifi modules installed, where it is then processed and presented in a timely manner. The evolution of Data Acquisition is such that late-generation systems developed into first-generation IoT systems.

The concept of the IoT ecosystem, however, didn't really come into its own until the middle of 2010 when, in part, the government of China said it would make IoT a strategic priority in its five-year plan.

BLOCK DIAGRAM



The above shown is the block diagram for the remote oil facilities monitoring using internet of things project. As we can see that there are 3 sensors used in the project. They are Temperature sensor – LM35 for measuring the temperature of the oil in facility, Flow Rate sensor which measures the pressure with which the oil flows and lastly, level sensor with which the level of oil is measured.

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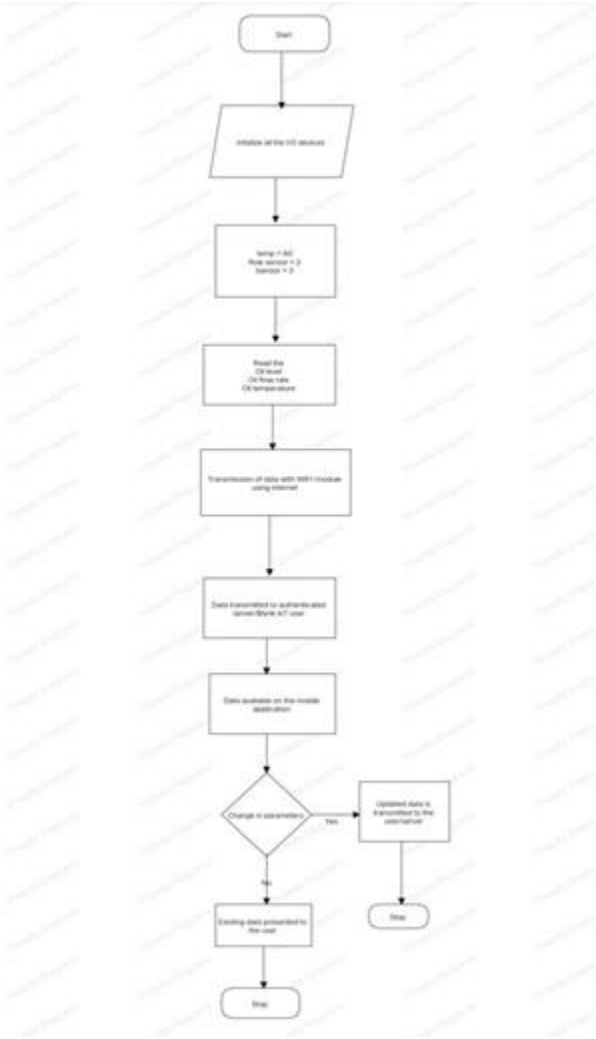
Apart from these there is a Wi-Fi module used in the project which is ESP8266 for data transmission. The Arduino uno communicates with the sensors and using IoT, it transmits the data to the laptop, smartphone or a computer.



The Hardware components used in the project are:

1. Arduino Uno
2. ESP8266 WIFI module
3. Temperature sensor
4. Liquid level sensor-float switch
5. Flow rate sensor
6. RPS circuit

The Software used to display the readings is Blynk IOT app.

HARDWARE IMPLEMENTATION

1. Firstly, the supply to the Arduino uno is given through the regulated power supply which takes an ac input converts into dc with right value and degree of stabilization.
2. Then, the dc supply of 5v is given to the Arduino through the power jack through which all the sensors are activated and starts detecting the parameters.
3. The temperature sensor detects the rise in temperature of oil and returns an analog value to the Arduino.
4. Similarly, the flow rate sensor gives the pressure output and communicates to the Arduino.
5. Oil level sensor detects the oil level in the facility and gives output as 1 and 0 depending on the level of oil.

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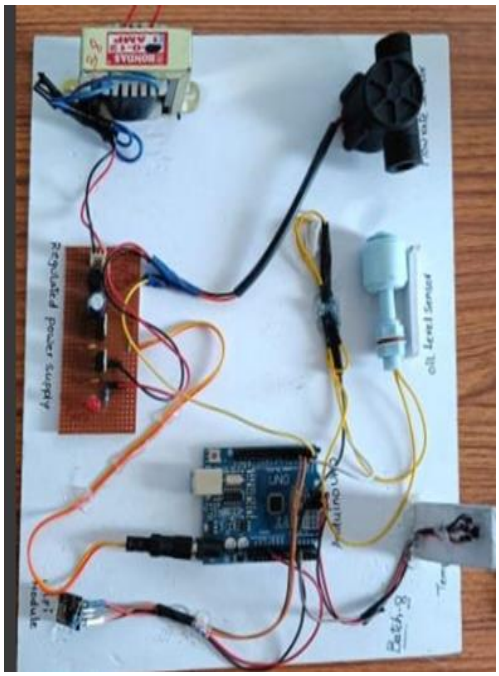
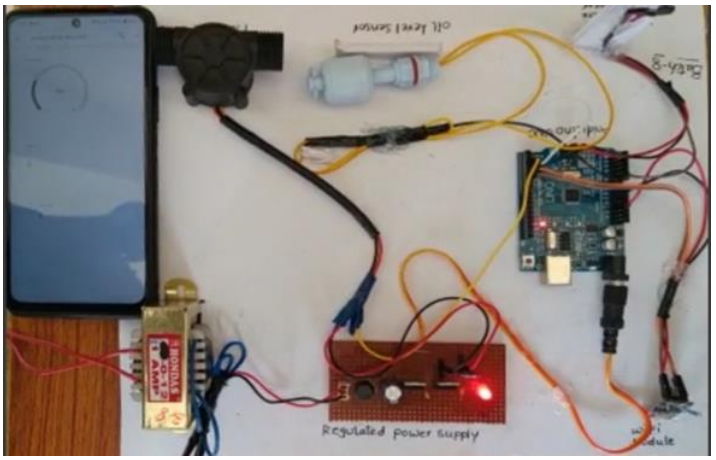
6. This data acquired from sensors is communicated to Blynk IoT app using ESP8266 WIFI module.
7. These outputs are monitored using the Blynk IoT app which is a web based graphical user interface to show accurate readings.

The features of Arduino uno are:

1. The operating voltage is 5V
2. The recommended input voltage will range from 7v to 12V
3. The input voltage ranges from 6v to 20V
4. Digital input/output pins are 14
5. Analog i/p pins are 6
6. DC Current for each input/output pin is 40 mA
7. DC Current for 3.3V Pin is 50 mA
8. Flash Memory is 32 KB
9. SRAM is 2 KB
10. EEPROM is 1 KB
11. CLK Speed is 16 MHz

RESULT





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CONCLUSION

Using this model, we can monitor the aspects in oil facilities like pressure, temperature and flow rate. we are using internet of things so we don't need personnel and manual monitoring as we can access the IoT server. And the parameters are obtained using Blynk IoT web application.

FUTURE SCOPE

We can employ an alarm system so that we can get an alert to the manually controlling team.

We can employ a cooling system whenever there is increase in temperature detected through temperature sensor.

We can employ a relay system to control the speed of flow in the flow rate sensor.

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