

Industry Pollution Monitor and Control using LabVIEW

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Abstract: A like to the industrial revolution. Online Monitoring solutions of environmental The majority application of pollution monitoring system are in Industries .The control of the parameter which causes pollution and deteriorates and has received interest from industries especially in power plant With the advent of Labview based technologies; the overall industrial sector is amenable to undergo a fundamental and essential change polluting parameter using Labview techniques help us to gather the parameter values such as pH, temperature, and concentration of methane gas, etc. Using sensors and enables to have a keen control on the environmental pollution caused by the industries. This paper introduces a LabVIEW based online pollution monitoring of industries for the control over pollution caused by untreated disposal of waste. This paper proposes the use of an PIC 1650 microcontroller board which collects the temperature using LM35 and pH parameter from the Ph sensor, methane using MQ-2 gas sensor. For monitoring and controlling, A LabVIEW is hosted which will give a real essence of Monitoring and Controlling.

Keywords— PIC microcontroller, LabVIEW

1. INTRODUCTION

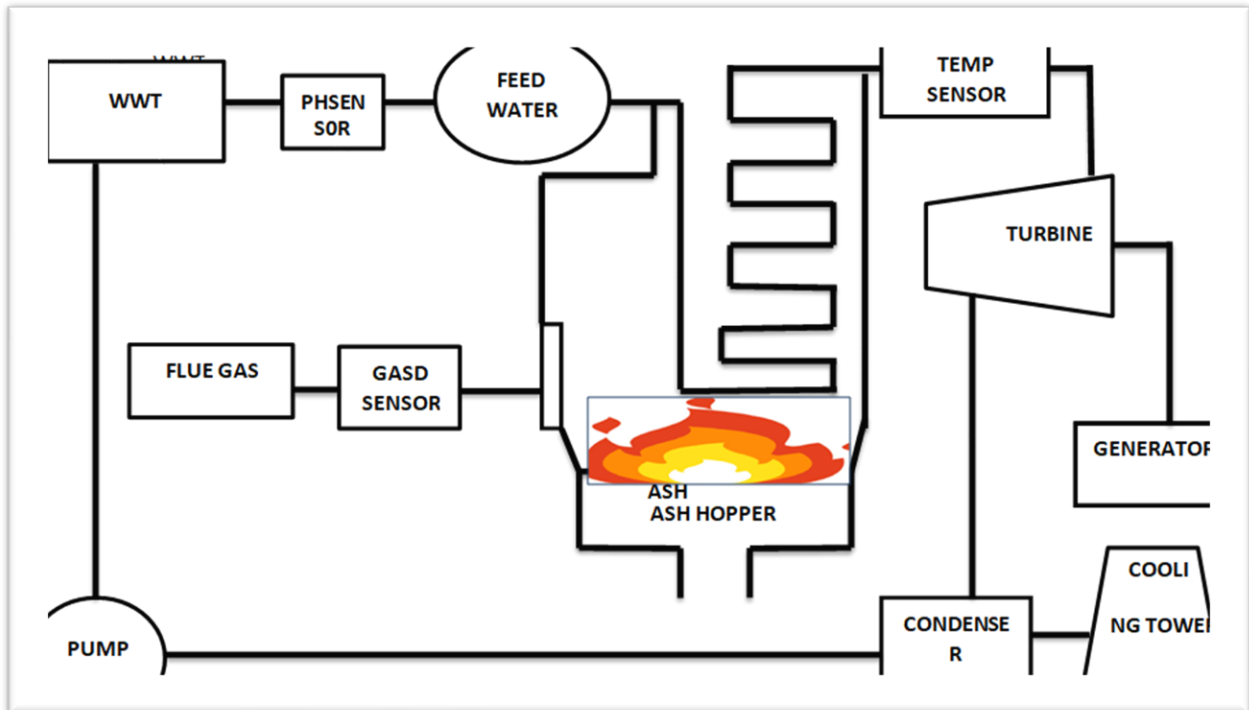
Through field investigation and research, at present the plant power plant production systems exist the following problems: geographic distribution is wide, power plant production points is much, workload is very big to connect the control system. With long relied on manual pickup, manual meter reading statistics, it is less access to production information , slow the transmission speed, long processing cycles, not conducive to the discovery of the hidden problem, at the same time it will cause fluctuations and energy waste in production. With the production process more and more complex, the factory workshop each other incomplete coordination is worsening contradictions. Online monitoring has been taken for the main equipment in the existing units in power plant, such as gas turbine, steam turbine, and generator. After data processing in mean way, once fault occurs, the machine will shut down immediately. The cause of the failure cannot be determined, and data can't be long-term preservation. This paper designs a set of power plant real-time remote monitoring system monitoring and the key data (Temperature, pH Level of water, concentration of the methane gas) of the main equipment of the unit based on PIC microcontroller. Remote real-time monitoring system designed in LabVIEW monitoring and controlling the key data (Temperature, pH level of the water, concentration of the methane gas) of the main parameter of the unit, as well as a failure occurs, it is convenient to call the historical data to determine the cause of the malfunction for engineering and technical personnel.

In power plant certain level of pH is maintain in water eg (8-9.5) to monitor the pH level we can test the pH in waste water treatment by using the pH sensor , we can monitor flow of flue gas(concentration of methane) by MQ-2 gas sensor and by using LM35 we can measure the outlet steam of the boiler ,remote monitoring and controlling by using the LabVIEW.

2. BLOCK DAIGRAM

The following diagram consist of Thermal Power Plant which is used is converter of fossil fuel energy to electricity in which during a cycle, steam is used to spin a turbine driving electrical generator to produce electricity. In the power plant a steam engine drove 24 dynamo generators. Power plant cycle The condenser is a heat transfer device or unit used to condense a substance from its gaseous to liquid state , typically by cooling in it . In doing so, the latent heat is given up by the substance and will transfer to the condenser coolant. by adding the smart industry system in the power plant we can monitor the flow the flue gas by gas level sensor ,and also we increase the efficiency of the plant by avoiding the not present of the flue gas in the combustion system in the boiler ,the water plays very important role in the power plant industry ,In industry water ph value maintained in (8-9)so we can monitor the pH level of the water from the outlet of the waste water treatment plant (wwtp) by maintaining the ph value e can provide the boiler from the corrosion ,erosion and many problem that reduce the efficiency of the boiler and the last parameter is temperature in the power plant industry they maintain the steam in the certain temperature so they can feed the steam in the turbine in

proper manner that avoid the damage of the rotor equipment in the turbine by fixing the temperature sensor we can get the sequential temperature flow from the steam that Feed into the turbine and we can monitor and control these parameter by uses of LabVIEW. A USBTTL is to interface the LabVIEW to monitor all the collected data in the laptop monitor and controls the system actuators via the microcontroller. An assembly program is written on the microcontroller board to scan and acquire all required data from sensors, transfer it to laptop for monitoring and then storing it for PV system documentation. The experimental results show that the proposed monitoring system is very robust and the control signals are very accurate. The system is very reliable, precise, cheap and more flexible for use in large scale photovoltaic power plant monitoring



Process of the block diagram

3. HARDWARE DISCRPTION

3.1. pH SENSOR:

- A pH Meter is a device used for potentiometrically measuring the pH, which is either the concentration or the activity of hydrogen ions, of an aqueous solution. It usually has a glass electrode plus a calomel reference electrode, or a combination electrode.
- pH meters are usually used to measure the pH of liquids, though special probes are sometimes used to measure the pH of semi-solid substances. The pH sensor working in 5v DC supply and the output of the pH sensor is Analog.



FIG 3.1 PH Sensor

3.2. Gas sensor:

- This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple all you need to do is power the heater coil with 5V adds a load resistance and connects the output to an ADC.

- MQ-2 Gas Sensor is designed with sensitive material of SnO_2 , which with lower conductivity in clean air. When the target combustible gas exists, the sensor's conductivity is higher. Signal conditioning circuit is used to convert the change of conductivity to correspond output signal with the input gas concentration. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

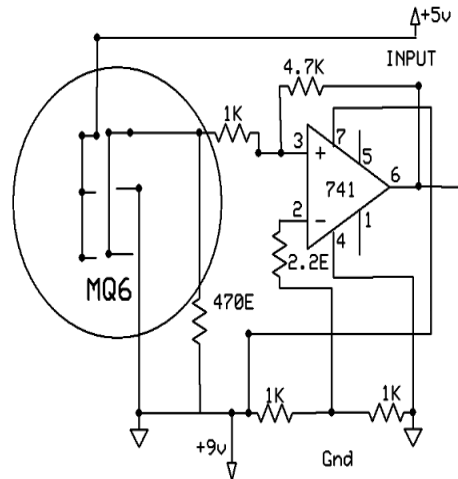


Fig.3.2.1.Gas Sensor.

3.3. Temperature Sensor:

- LM35 is a temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The advantage of LM35 over thermistor is it does not require any external calibration. The coating also protects it from self-heating. Low cost (approximately \$0.95) and greater accuracy make it popular among hobbyists, DIY circuit makers, and students. Many low-end products take advantage of low cost, and greater accuracy and used LM35 in their products
- the working principle of LM35 temperature sensor we have to understand the linear scale factor. In the features of LM35, it is given to be +10 mills volt per degree centigrade. It means that with an increase in output of 10 mills volt by the shoutout pin the temperature value increases by one. For example, if the sensor is outputting 100 mill volt at v out pin the temperature in centigrade will be 10-degree centigrade. The same goes for the negative temperature reading. If the sensor is outputting -100 mills volt the temperature will be -10 degrees Celsius.

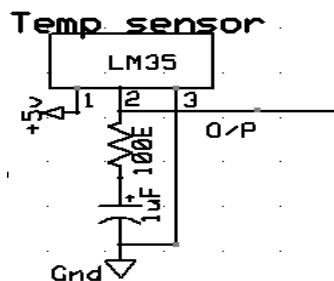


Fig.3.3.1.Temperature Sensor.

3.4. PIC Micro-controller:

- PIC is a family of Harvard architecture micro-controllers made by Microchip Technology, derived from the PIC1640. Originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Programmable Interface Controller".
- Micro-controller is a general purpose device, which integrates a number of the components of a microprocessor system on to single chip.
- It has inbuilt CPU, memory and peripherals to make it as a mini computer.
- A micro-controller combines on to the same microchip:
- CPU core

o Memory (both ROM and RAM)

Pin Description: PIC16F877A consists of 40 pins enclosed in 5 ports. Each port holds 8 pins which are bidirectional input/output pins.

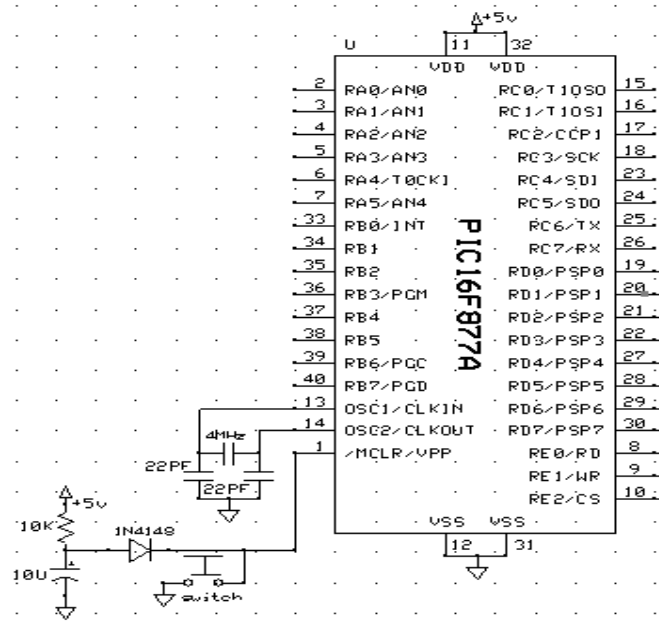


Fig.3.4.1 PIC Micro-controller.

3.5. Darlington relay:

- A relay is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb (or anything else) connected to the 220v mains supply.
- The current needed to operate the relay coil is more than can be supplied by most chips (op. amps etc), so a transistor is usually needed.

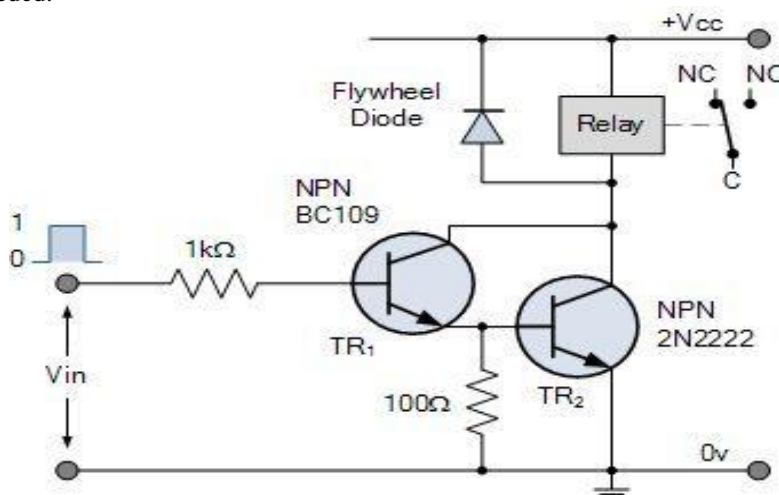


Fig.3.5.1.Darlington relay

3.7. Step-down Transformer:

- A step-down transformer is a type of transformer that converts the high voltage (HV) and low current from the primary side of the transformer to the low voltage (LV) and high current value on the secondary side of the transformer. The reverse of this is known as a step up transformer.
- A transformer is a type of static electrical equipment that transforms electrical energy (from primary side windings) to magnetic energy (in transformer magnetic core) and again to the electrical energy (on the secondary transformer side). A step-down transformer has a wide variety of applications in electrical systems and transmission lines.

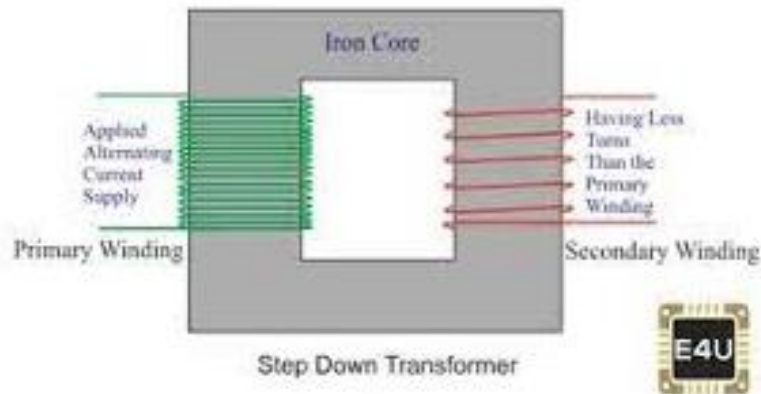


Fig.3.7.1.Step-down transformer.

3.8. LCD – UI Display:

- An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix displays is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.
- Command register stores various commands given to the display. Data register stores data to be displayed. The process of controlling the display involves putting the data that form the image of what you want to display into the data registers, then putting instructions in the instruction register. In our project Liquid Crystal Library simplifies this for you so you don't need to know the low-level instructions. Contrast of the display can be adjusted by adjusting the potentiometer to be connected across VEE pin.

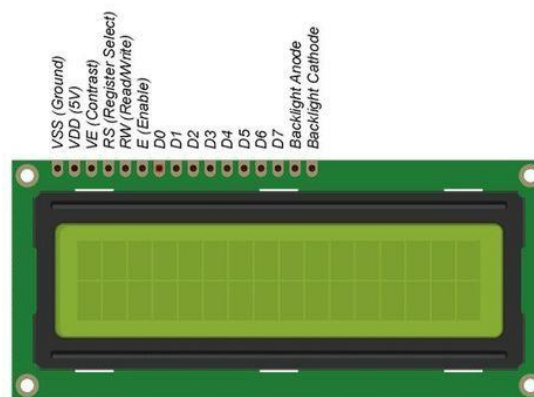


Fig.3.8.1. LCD – UI Display.

3.9. USB TO TTL:

The USB TTL Serial cables are a range of USB to serial converter cables which provide connectivity between USB and serial UART interfaces. A range of cables are available offering connectivity at 5V, 3.3V or user specified signal levels with various connector interfaces

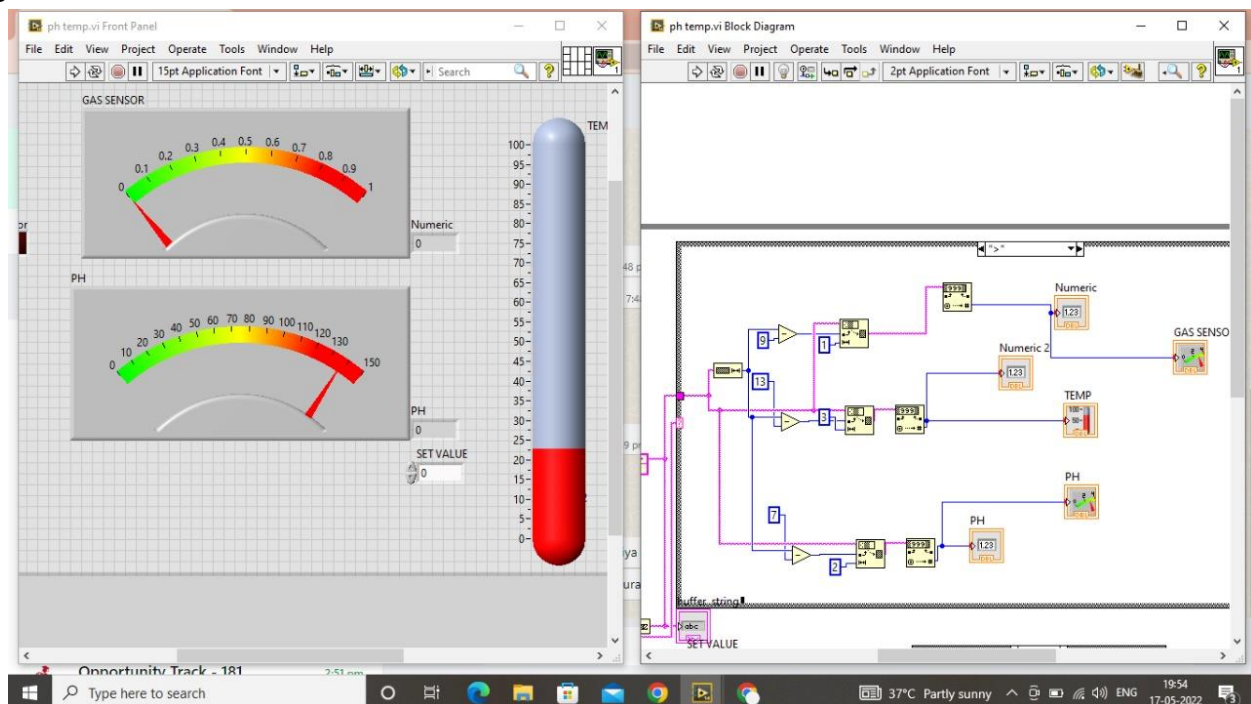


FIG 3.9 USB to TTL

4. SOFTWARE DISCRPTION

4.1. LabVIEW Software:

- LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphical programming environment which has become prevalent throughout research labs, academia, and industry.
- It is a powerful and versatile analysis and instrumentation software system for measurement and automation. It's graphical programming language called G programming is performed using a graphical block diagram that compiles into machine code and eliminates a lot of the syntactical details.
- LabVIEW offers more flexibility than standard laboratory instruments because it is software-based. Using LabVIEW, the user can originate exactly the type of virtual instrument needed and programmers can easily view and modify data or control inputs.
- The popularity of the National Instruments LabVIEW graphical data-flow software for beginners and experienced programmers in so many different engineering applications and industries can be attributed to the software's intuitive graphical programming language used for automating measurement and control systems.



4.1.1. Front and Block Diagram Window of LabVIEW Software.

5. RESULT:

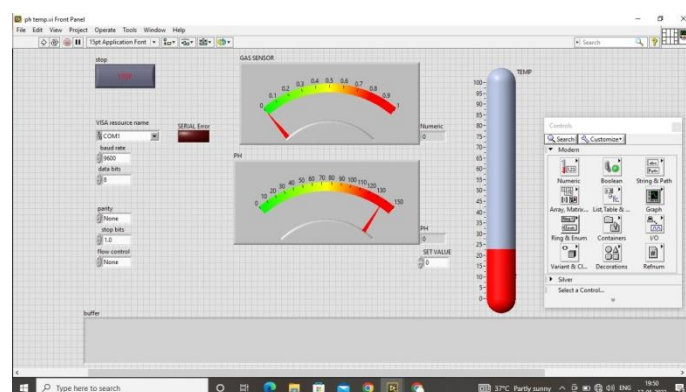


Fig.6.1.1. Real time Output in LabVIEW

- time monitoring the physical parameters like Temperature, Gas and pH values using IoT module and its also access by any were at any time

- .From Fig.6.2.1,its an output of LabVIEW Software its used for monitoring the System using Personal Computers
- In this project we developed smart industry monitoring system, from Fig.6.1.1 it shows Real

6.CONCLUSION

This project is made with pre planning, thus it provides flexibility in operation. Thus a cost effective and user-friendly system has been developed to monitor the pollutants in the industry effectively. There by limiting the pollution in the environment. The data set which we have utilized in this model is for a short period that restricts the prototype's ability. So, the utilization of data which have longer periods with unimportant data gaps is suggested for farther improvise. We can initiate more effective elements such as precipitation, maximum and minimum temperature, PH sensor, and gas sensor, for future work to increment the exactness of the system.

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