Industrial Pollution Monitoring and Control System Using LabVIEW

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*Abstract-*The pollution monitoring systems have their major application in industries. Pollution control is the major factors that have to be considered in the industry. It is a great challenge to control the industrial pollution and to maintain the natural environment pattern. The main aim of our project is to design productive and powerful system to control the parameters that cause pollution and to reduce their effects without damaging natural environment. The proposed method is to monitor and inform the authorities whether the parameter goes larger than industry standards. Here we implemented LabVIEW software which will monitor the disturbance affecting the system and the pollution parameters are controlled by PIC16F877A microcontroller. The system level examines the pH in industry effluents, level of CO gas released during industry process and temperature of machineries. The monitored data is transferred to the PIC microcontroller through serial communication interface. In order to achieve this goal the PIC microcontroller used as smart active device which controls those pollution parameters by using separate relays.

*Keywords-***LabVIEW, Temperature sensor, pH sensor, CO sensor, PIC 16F877A**

I.INTRODUCTION

Due to recent technological advances, measuring and controlling of different parameters is essential for industries. An effective is to require to check or access the condition if any parameters (eg.CO, pH and temperature) goes than prescribed level. LabVIEW (Laboratory Virtual Instrument Engineering Workbench) programs contain front panel and block diagram. It is also called Virtual Instruments or VI. LabVIEW is the product of natural instrument and it is the powerful software that contains data acquisition, instrument control, data processing and data presentation. Front panel that consists of various controls and indicators and the block diagram has variety of function. The process of industrial pollution monitoring system is to evaluate the industrial quality with respect to the standard quality set by pollution control. So there should be a system to observe and evaluate the industrial pollution. The main attention is to check the factors which may affect human and natural system. Owing to the complexity of factors in determining the industrial quality large variations are found between various industries.

The aim of this work is to build a LabVIEW program that is used to monitor the level of gas released during industry process and to access the temperature, pH and CO levels of the machineries. The accessed data is transferred to PIC microcontroller through serial port communication.PIC is referred as Peripheral Interface Controller. It was developed by microchip technology. The advantage of using PIC controller is it has Analog to Digital converter in the board itself and the delay is minimum when compared to any other devices like Arduino and LabVIEW controllers. The accessed data is converted to a numeric value from standard decimal value using VISA in LabVIEW program itself.

The main goal of this work is to build a LabVIEW program that helps to keep checking the condition and to control in case of exceeding the prescribed level of parameters using various control parameters.

II.LITERATURE REVIEW

The designed system [1] which automatically sensedthe values of parameters such as CO, temperature and pH. Data accession board is used to obtain and analyze the signals from the sensors and transform the data to LabVIEW. LabVIEW software programs have been device in such a way in which it will run once data starts flowing into the DAQ device. The change happens in the various parameters that can be monitored and controlled by LabVIEW. In above proposed method, the DAC is used for only monitoring purpose. The pollution parameters are not controlled accurately due to inaccurate performance of the system this method is not much efficient. The work presented in [2] is the system which investigates level of pH in

industry emission, level of CO gas released during industry process and temperature of the machineries. Thus through this project the control of pollution can be taken into account and the data can be transferred through online. The paper concludes that the method is more accurate to derive the desired parameters. In this project [3] we have been done the detailed survey on the Wireless Sensor Networks as they are obtaining the ground in all sectors home of factories, traffic control to environmental monitoring. The air pollution examine system contains sensors to monitor pollution parameter in environment it develop the three air pollutants gases including Sulphur dioxide, carbon monoxide and carbon dioxide in air because these gases decides the degree of pollution level. This develop creates the awareness in people in the cities. The work implemented in the system [4] estimates the value of environmental parameters by using the adaptable and smart monitoring systems. The solution includes the technology of internet things. The existing model describes the original value of the environmental parameters with the help of sensor networks. The proposed model comprises of LCD displays or alarms which displays the executed value of the environmental parameters. In the system estimates the values compared with threshold or reference value. The acquired values are send to the cloud in a regular interval time. Thus the history of Acquired values will be maintained in the IOT cloud environment. The proposed model can be implemented in smart cities. The function of the system implements in [5] is track the effect of pollution on environment and health of individual and also it is important to record range of pollution in urban and suburban areas. The vital source of air pollution is low traffic emission which emits the 97% of CO and 75% of NO. For this reason air quality monitoring is must with view to contribute the useful information about pollution and can take proper measurements to mitigate the negativeconcussion wherever it is necessary. The aim of monitoring the air condition is not only to gather the data but also contribute the information which is required by policy makers, planners and analysts to make declaration on improving and managing the environment.

III.JUSTIFICATION OF RESEARCH

Industrial pollution monitoring and control is the most important as the development of industries maximize the degree of automation and simultaneously it maximizes the pollution. A PC based signal acquisition model is introduced by this work. Its evaluation can be productive using LabVIEW. It's a powerful method for industrialization pollution monitoring and control system.

IV.OBJECTIVES

The main purpose of our project is to model a virtual instrument set up to monitor temperature, pH level and CO level.Secondly to model hardware set up for pollution control and monitoring system. In hardware part three control mechanisms have been used and each control has its own operations to control the parameters.Finally interface the software with hardware model through serial communication. Another objective is to control the parameters if the values are maximized by the standard industrial value.

V.PROPOSED SYSTEM
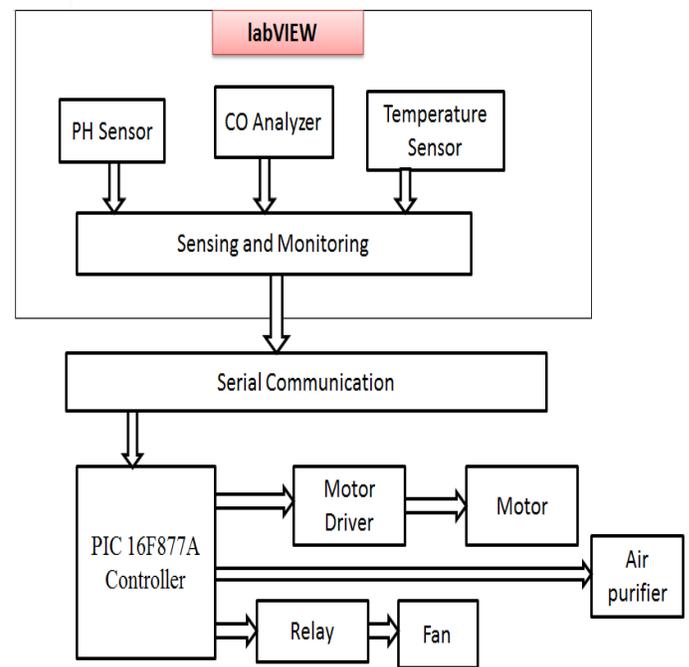
Fig. 1: Overall Block Diagram

The figure 1 shows the model of block diagram. Initially three sensors have been generated by using Virtual Instrument and also standard range limit has been set for each sensors. The changes happening in the various parameters can be monitored in LabVIEW and if any one of these values goes higher than standard range, led is used to indicate it as abnormal value.

Sensed datas are transferred to PIC microcontroller through serial communication interface. Before the datas are moved to the controller all the monitored datas are converted to a numeric value from decimal value by using VISA (Virtual Instrument Software Architecture) source code.

For signal processing a pic16f877a hardware is used. There are three control devices which are used to control the pollution parametes. Individual relays are used for each sensors and the control actions can taken place when there is abnormal indication in any of these sensors.

VI. MEASUREMENT OF PARAMETERS

1. Temperature Sensor

LM324 is a 14pin IC consists of four separate operational amplifier (op-amps) compensated in a single package. Op-amps are high gain electronic voltage amplifier with separate input and a single ended output. The output voltage is many times larger than the voltage difference between output terminals of an op-amp.These op-amps are operated by a single power supply LM324 and required for a dual supply is rejected. In LM324 conventional op-amp application can be implemented. The quad amplifier can operate at supply voltage as low as 3V or as large as 32V. The maximum value of temperature sensor is 400C.
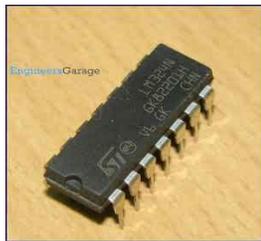
Fig.2: Temperature Sensor

2. pH Sensor

pH sensor is a scientific instrument that measure hydrogen ion activity in based solution, indicating its acidity or alkalinity. The pH sensor is used to extent the pH of the specimen water utilized and to change over it into voltage signals. pH sensor is digitized and can compare with PC and can therefore archive information for developed timeframe. The range of pH sensor is 6.5 and 7.5. When the pH value is between 6.5 and 7.5 there is an abnormality.



Fig.3: pH Sensor

3. CO Sensor

A carbon monoxide or CO is a device that recognizes the area nera of carbon monoxide gas to prevent carbon monoxide harming.A number of supporting resistance are utilized to stay away from the voltage drop. Resistance evaluation is adverse to separate sorts and different fixation gases. Thus when using these segments, the capacity to be affected alteration is extremly necessary. When the CO sensor indicates the value higher than 200ppm and it is accounted to be a contamination level.

**Fig.4: CO Sensor**

VII. EXPERIMENTAL RESULT

FRONT PANNEL DIAGRAM
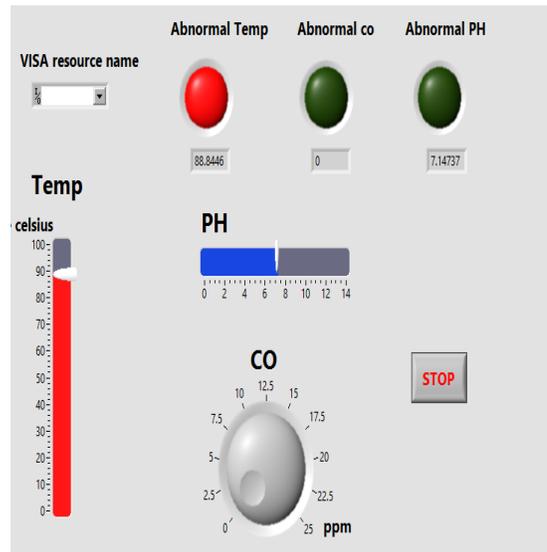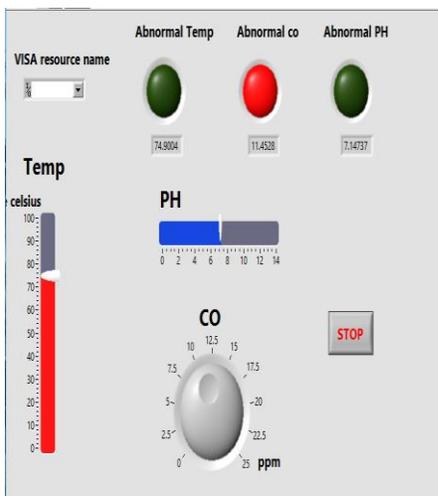

Fig.5: Temperature Sensor

Fig.5 shows the front pannel design for temperature sensor. Forthis sensor we have set range as 85degree celcius. It's a normal temperature value in industry and it will be the same in

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all type of industries. In case this value gets changed by any parameters which causes pollution the control action has taken placed. We have used indicator to intimate whether the value is normal or abnormal. If this value goes higher than 85degree standard value than indicator will indicates us abnormal value in red colour, otherwise it will indicate as normal value in green colour
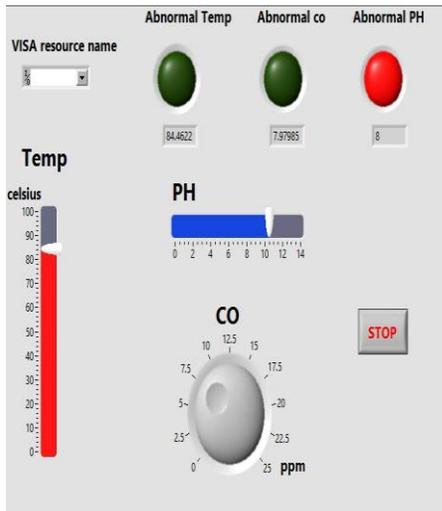
Fig.6: pH Sensor

Fig.6 shows the front pannel design for pH sensor. For this sensor we have fixed the value range between 6 to 7. If a value goes higher than 7 and lower than 6 it will intimate the values as abnormal, Otherwise it will be in normal condition. pH measurement can be used in water level and paper indutries.

Fig.7: CO Sensor

Fig.7 shows the front pannel design for CO sensor. For this sensor we have set range as 9. Because if CO level gas higer

than this then it will the affect normal environment condition and causes health issues to the human. So if the goes above 9 then it will intimate abnormal value. All the indication and measurement of pollution parameter were analyzed in VI measurement.

Fig.8:Hardware Setup

Fig 8 shows the hardware setup. For temperature sensor the range has been set as 85degree celsius. If the range goes higher than 85degree, the cooling fan is used to control the temperature untill it becomes normal. For pH sensor the range has been set as 6ppm to 8ppm. If the range goes lower than 6pm or higher than 8ppm, the pump is used to dilute water. For CO sensor the range has been set as 9ppm. If the range goes higher than 9ppm air purifier is used to remove the contaminated air.

VIII. CONCLUSION

The field of pollution monitoring and control is very extensive and this project is an experiment to reduce the problem of cost and regular inspections by the utility of Global System for Mobile Communication. Advanced LabVIEW is used for relieving these problem. The performance and powerful of the pollution monitoring and control system can be further developed by implementing sensors for controlling dust, noise, smoke, moisture and other parameters, thereby develop the industrial and natural environment.

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