

## A REVIEW ON INDUSTRIAL EMISSION MONITORING SYSTEM

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**Abstract:** Recently, the World Environment Day was celebrated globally, which reminds that to take proper control action for saving and maintaining the environment. According to WHO (World Health Organization), India ranked worst in the world in air and Ganga and Yamuna rivers are included among the world's 10 most polluted rivers. The major sources of environment degradation are: - Industrial emission, Vehicle emission, Fossil fuel burning and fire, Agricultural activities, Population etc. Rapid Industrialization is the main reason for each type of pollution. Toxic gas emission, waste water discharge, noise from industries are responsible for the degradation of the environment.

Sources of emission in industries have been identified and presented in this study. To reduce the toxic emission from industries various techniques are reviewed and presented in this paper. The considerable techniques are: monitoring of toxic gases like LPG (Liquified Petroleum Gas), CO<sub>2</sub> (Carbon-di-oxide), CH<sub>4</sub>(Methane), CO (Carbon Monoxide) etc. by using sensors and IoT technology, monitoring of water and noise from industries by WSN instead of using laboratory method. It was found that industrial emission can be reduced using various techniques and pollution controlling measures.

**Keywords:** - IoT (Internet of Things), WSN (Wireless Sensor Network), CO<sub>2</sub> (Carbon-di-oxide), CH<sub>4</sub>(Methane), CO (Carbon Monoxide).

### 1.INTRODUCTION

Environment is the prime need for each living creature. All living entities are directly or indirectly depending on the environment. Environment provides all the basic needs of all the living things. The whole world is depending only and only on environmental balance. If any one of the living entities is decreased or increased or lost from nature, it affects on food chain and therefore it becomes reason for environmental degradation. Therefore, protecting environment around us is the major responsibility of every person in the world. Today environmental degradation is the serious problem at global level. Everyone has to face the effects of loss of environmental quality. Population, land disturbance, pollution are the main reasons of environmental degradation. Pollution in any form i.e. air, water, noise, soil affected on environment as well as on human life also.

The major sources of air pollution are 1) Industrial emission 2) Vehicle emission 3) Fossil fuel burning and fire 4) Agricultural activities 5) Increasing population etc. Among all the above sources "Rapid Industrialization" is the main reason for each type of pollution. In other words, Industry is the main reason of environmental pollution. Toxic gases emission from industries causes air pollution. The waste water discharged from industries causes, water pollution. Heat and hot water discharge from industries causes' thermal pollution. The toxic gases emitted from industries are more responsible for air pollution. The gases that are released from industries are CO, SO<sub>2</sub>, H<sub>2</sub>S, NO, NO<sub>2</sub> etc. From above gases SO<sub>2</sub> and NO<sub>2</sub> are the primary causes of acid rain. The waste water discharged from industrial process directly into river or in any water source is the main reason of water pollution. Diseases like typhoid, cholera, dysentery and poliomyelitis are the effects of polluted water. Polluted water affects on human body as well as on environmental water sources thereby which affected on water animals, soil and on the trees. The heat discharged from machineries causes thermal pollution as well as the risk of destructive machines. The main reason for thermal pollution is heat and hot water which is discharged from industrial process.

Rapid development in Industries causes environmental deterioration. Modern technology in every field is the main reason of environmental degradation. Controlling the industrial pollution is one of the challenging tasks for protection of environment. In recent methods, the industrial pollution is monitored at specific regular interval as per government rule. So, there are more chances of fake results and corruption. It is safer to have a system that monitors and controls the industrial pollution automatically. By using various sensors, microcontroller, Wi-Fi module, internet such a system can develop. In order to reduce the industrial pollution, such system helps to pollution control unit.

## 2. LITERATURE REVIEW

[1] Supriya M. Wasnik, Prof. Sunil Gupta investigated 'A Cyber-Physical System for Industrial Air Pollution Monitoring using Raspberry Pi.' the author proposed a system which monitors the air pollutants CO, CO<sub>2</sub>, CH<sub>4</sub> and temperature using wireless sensors. It helps for monitoring the industrial pollutants released from industries, which are also available on Internet using Raspberry Pi and IOT.

[2] Anuja Dhole and et.al addressed 'The Industrial Toxic Gas Monitoring System using IOT and Raspberry Pi'. In this system, different Industrial toxic gases LPG, Smoke, CO, CH<sub>4</sub> and temperature are monitored using different wireless sensors. The sensors senses the different gases emitted from industries and output of sensors are connected to 10-bit ADC, which converts analog input to digital. Then the digital output of ADC is given to Raspberry Pi. Using Wi-Fi module we can receive the data on Web-page and also on the LCD screen.

[3] Lalit Mohan Joshi proposed 'The IOT based Air and Sound Pollution Monitoring System. The author proposed a system which monitors the air and sound pollution. The different sensors are used like dust sensor, CO gas sensor, smoke sensor and temperature sensor for detecting the level of air pollution and sound sensor is used for detecting the sound level. The analog output of sensor's node is connected to the ADC for the digital output. Then the digital output is applied to the microcontroller Xmega 2560. Then using Wi-Fi module ESP 8266, the data is shared on Internet which displayed changes in the parameter graphically.

[4] Arushi Singh and et.al. addressed 'The IOT based Air and Sound Pollution Monitoring System. The system uses sensors for air and sound pollution detection. The sensors detect the level of pollution in the air and sound. The sensors output is given to the Ardiuno and Raspberry Pi which compares the value with threshold value and transmits the data over the Internet. It is possible to monitor air and sound pollution level in different areas on Mobile Phones by using the application.

[5] Chandana B and et.al. investigated 'The Pollution Monitoring using IOT and Sensor Technology. The proposed system monitors the air pollution level using IOT and Sensor Technology. In the discussed system, different gas sensors are MQ-135, MQ-5, MQ-4, MQ-8 and MQ-9 used for sensing the pollutants Ammonia, LPG, Methane, Hydrogen and Carbon Monoxide respectively. The sensor's output is in analog form so it is converted in digital using ADC. Then the output of ADC is applied to the microcontroller. The microcontroller compares this value with the predefined threshold value. If it is below the threshold value then the system continuously read the data. If it is above the threshold value then the data will send on the Internet and storage purpose. Using GPS, the system also sends the location which is useful for authorities to take action for controlling the pollution.

[6] Y. Justin Dhas, P. Jeyanthi proposed 'Environmental Pollution Monitoring System using Internet of Things (IOT). This proposed model is for monitoring pollution level in the atmosphere. MQ-3 sensor is used for smoke level determination and using MCP 3008 ADC the output is in digital form. Raspberry Pi is used for further processing and processed data is sent to the cloud. The data can be available for the user from mobile application.

[7] Sugapriya, Sand et.al. proposed 'Smart Water Quality Monitoring System for Real Time Applications'. In this method, water quality is measured using different types of sensors such as turbidity, pH, temperature, electric conductivity. The sensor's data is processed using microcontroller. Then the processed data is transferred through Wi-Fi module to the cloud. Using mobile application user can view the data in real time which is transmitted by microcontroller.

[8] Jayti Bhatt, Jignesh Patoliya presented 'IOT based Water Quality Monitoring System'. In this system, for determining water quality several sensors are taken into consideration. The parameters such as pH, temperature, conductivity, dissolved oxygen, turbidity measure the quality of water. For processing the sensor's data, the microcontroller is introduced in which the data is processed and make compatible for transmitting over cloud. Using Web- Browser application, user can monitor the data on the internet.

[9] Isha Gupta Rashpinder Kaur proposed 'Design and Development of Industrial Pollution Control System using Labview'. In this system, they design a system which monitors the humidity, pH, and CO and temperature level using sensors. The data is processed using (p89v5rd2) microcontroller. If the parameter's value exceeds above the threshold value then the sms will send to the authority using GSM.

### 3. PROPOSED SYSTEM

In most of the techniques, air and water pollution monitoring systems are developed. Most of the researchers worked on air and water pollution monitoring system separately. There is need to work on a complete combined wireless pollution monitoring system which is monitor the air water and thermal pollution level in the industry.

The proposed system helps to monitor the industrial emission. Using different types of air quality, water quality and temperature sensors the system can monitor the pollution level from industry. The following fig. shows the block diagram of the proposed system.

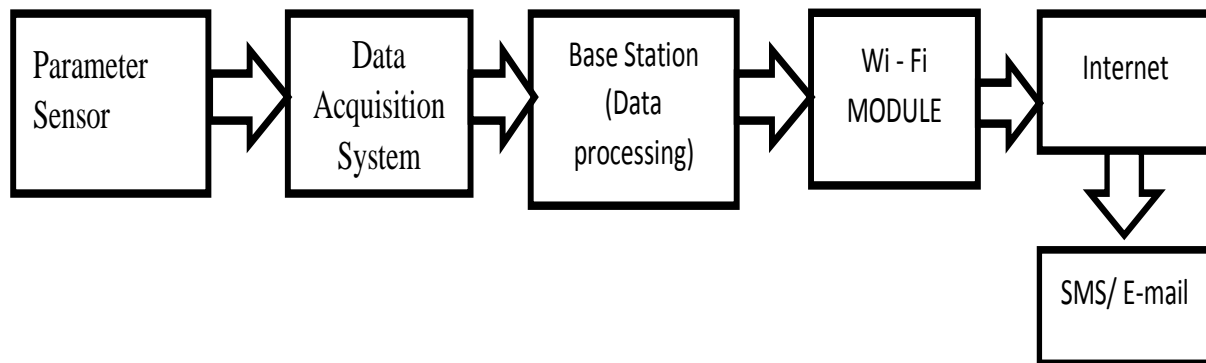


Fig.1 Block diagram of the proposed system.

### 4. METHODOLOGY

#### 4.1 Data Acquisition and Parameter Sensation Using Wireless Sensor Nodes.

Using sensors, the data will be captured from industrial environment. Then the measured analog signal by the sensors will be digitized by an ADC and transmitted to microcontroller for further processing and communicating with the base station. For reporting the specific observed quantity accurately and reliably to the base station each sensor node will cover a certain area.

In this way, the sensor nodes will be designed for different types of pollutants and industrial machines.

#### 4.2 Data Processing and Sharing

The base station will compare the database set of sensors with the predefined standard limit of each pollutant. The comparison will be generating by permissible emission level by Prevention and Control of Air Pollution Act 1981. Here, the base station will detect the increased level pollutants accurately and share this data on cloud using Wi -Fi module.

### 5. CONCLUSION

The proposed IoT based Industrial Emission Monitoring System is seems to be effective as it will monitor the air, water and thermal pollutants. The system is integrated with air, water and sound pollutant detecting sensors. The combined system will help to monitor the industrial toxic emission thereby immediate control action can be performed. In order to reduce the industrial pollution, such type of system helps to take proper control action.

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