

Review on Air Pollution Detection and Purification using Air filter

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Abstract- As on today Pollution is a major problem which all the countries are trying hard to reduce it. Air pollution is a major harmful pollution. Pollution leads to severe health issues. Major reason for air pollution is the release of harmful substances from the vehicles. This paper aims to give a detailed review about methods used to detect the pollutants from the vehicle emission and various ways to purify the same.

Keywords- Air pollution, Emission, Harmful, Purification.

I. INTRODUCTION

As of now, at present pollution has become one of major crisis and has turned out to be a disaster in human's life. The presence of harmful chemicals existing in the environment can be termed as pollution. The accuracy level of air pollution being caused in urban areas, gradually becoming more as plenty of vehicles go past the road. Emission such as CO, CO_x, NO_x can be considered as crucial cause for this type of pollution to occur.

Various traumas such as eye irritation, asthma, lung cancer and chronic respiratory diseases have been a major issue for the cause of 4.2 million deaths per year. Later certain action such as monitoring detection came into existence as monitoring helped in accessing level of pollution on the basis of air quality standards and detection helped in collecting information with regard to air quality and resolve quality issues of air. To add further, purification used HEPA technology in order to remove airborne allergens, china is one among the countries which generate large amount of motorcycle emission in the world and one of the measures taken in order reduce such emission was to use catalytic convertor. The output of this method was to mainly benefit quality of atmosphere but the drawback was as it couldn't able to meet emission requirement [1].

Further smoke detector, fuel injector, microcontroller was used. Smoke detector was used to identify pollutant, microcontroller was used to look after pollutant level as levels exceeded it dispatches signal to fuel injector where fuel injector reduces supply of fuel after certain time. The drawback of this method was tracking of vehicle wasn't possible enough in order to seize the vehicles [2]. This problem can be overcome by using MANET (mobile ad hoc network) as it used to nearly have 28 mobile nodes and could cover up to 300m of area in city and data related to vehicle was sent to driver's mobile as monitoring purpose [3].

Further automobile exhaust purification method was used to detect gas and make theoretical analysis by mainly focusing on the structure of vehicle [4].

II. LITERATURE SURVEY

Few researchers have approached in various different techniques in order to solve the problem of pollution detection in vehicles. In [1] Q Xiaoni et al., have proposed the idea of emission purification and investigation and they used catalytic exhaust to measure purification catalyst can be used as regeneration aid. Catalytic convertor plays major role on result. The software used to carry interior simulation of exhaust pipe is FLUENT. Combination of catalytic conversion and gasoline was used to decrease emission. Few of measurements were observed in this method are areas needed to install catalytic convertor was 29 to 40cm and inlet pressure is 131722.5pa. As a result combustion and purification of engine couldn't meet emission requirement.

In [2] Siva Shankar Chandrasekaran et al., have proposed this method to control air pollution in vehicles. This method mainly uses semiconductor sensors which detects pollutants level with meter. The entire execution is mainly dependent on microcontroller. Smoke detector microcontroller and fuel injector play major role in this method as smoke detector is used to identify pollutants microcontroller differentiates pollutants level given by government when level of pollutant crosses given limit signal is sent to the fuel injector. The fuel injector stops the functioning of engine for certain amount of time. The main use of this method is to benefit technology in such a way that environment stays free from emission and bring to constant when level of pollution is exceeded. As a result tracking of vehicles wasn't possible.

In [3] Suganya E et al., proposed this to monitor pollution detection using WSN. This method was

introduced to mainly focus on calculating level of gases and air contamination around cities. The routing algorithm being used here is MANET which stands for mobile ad hoc network and it comprises of 2 mobile nodes and covers area of 300m. Few sensors like humidity sensor, temperature sensor, CO sensors and NO2 sensors were used as monitoring device. Cloud network was mainly utilized to store large data related to vehicles so that it could be easily retrieved for future use as well the main advantage of this method was transmission speed, area covered, size of area was monitored. As a result it required too many sensors and it became hard and complicated to maintain those sensors as they were very expensive.

In [4] Huang Mengtao and Feng Zunxiang., proposed this method to purify exhaust based on ARM. This method uses electrostatic control system which purifies exhaust and absorbs particles of pollution exhaust purification uses gas detection feedback and high pressure feedback scheme for detecting concentration of vehicle exhaust purification system was mainly classified into four parts. Which are power module, detection module, control module and dust precipitation module, power supply consist of +12V battery and later converted into +5v and +3.3v. As a result this method used to make theoretical analysis in exhaust and focus on purifying system.

In [5] Pasi Pyykonen et al., have proposed an idea of camera based smoke and exhaust detection method to mainly identify those vehicle which emit lot of smoke and further HSU were implemented to observe performance of vehicles. If range of HSU is less than 50 then the smoke particles weren't clearly visible. And if range of HSU was more than 90 then smoke particle were clearly visible and further high resolution imaging was obtained to detect smoke levels using machine vision solution. As a result thermal camera was incorporated in order to do accurate analysis.

In [6] B. Ravi Subrahmanyam et al., proposed a method in which purification of air was done with the help of distilled water without including any chemical substance and when passing of air is done through water pollutants residing inside comes out as a clean air. The main purpose of this method was to eliminate hazardous pollutants. For this suction pump of 3cfm with approximately 150 watt, magnet of 10^{-3} to 10^{-5} and 5 billion L of purified air was used. As a result even though all these method was implemented but still the condition of air quality still remains stagnant.

In [7] P Arun Mozhi Devan et al., have proposed this monitoring and alerting system in which each country started to implement their emission standard based on their area and resources available but in between most of them started to follow UNFCCC standard the united nations frame work convention on climate change (UNFCCC) idea was to reduce emission by 5% to ensure climate

remain safe under 2 degree celsius. As a result hazardous chemicals affected human with certain disorder.

In [8] Vladimir Shakhov et al., and Olga Sokolva et al., proposed this idea of wireless sensor network with mobile sensor. Where wireless network were mainly implemented to monitor air pollution and public transport was used as carrier for mobile sensor but main aim of this method was to differentiate sensor data of public transport vehicle along with data of various other monitoring device. As a result this method was helpful in accordance with relevance as it was helpful in calculating minimum time of detection or wanted little number of vehicles with sensors placed and installed on them. It was also helpful in growing various methods for enhancing cast of monitoring system.

In [9] Abhi B Amin et al., proposed this method in which ppm of gas is measured and alert message is given to user when gases emitted exceed threshold value limit. Detection of nearby obstacle within given range enacted like alert message for user. A gas sensor named MQ135 was mainly used to detect and identify pollutants. The main aim of this method was to detect obstacles and alert user in order to avoid accident. As a result even though it assisted in controlling pollution it wasn't able to identify and stop collision as detection range was restricted to short range.

In [10] Vladimir Shakhov et al., proposed this method to monitor pollution using gas sensor network as it produces perfect measurements and new approach was to use sensor with additional mobility and this helped mobile sensor to take measurements in vast areas but it faced issues related to cost. So as a result various computational methods were offered and cost was optimized in order to estimate quality of sensor.

Title	Author	Method Used	Advantages	Disadvantages
Investigation on motor cycle exhaust emission purification	Qi Xiaoni and Guo Qianjian	They used catalytic exhaust to measure purification.	<ul style="list-style-type: none"> •Combination of catalytic conversion and gasoline was used to decrease emission. •The software used to carry interior simulation of exhaust pipe is FLUENT. 	<ul style="list-style-type: none"> •Combustion and purification of engine couldn't meet emission requirement.

Automated control system for air pollution detection in vehicles	Siva Shankar Chandra - sekaran Sudharshan Muthukumar and Sabesh Kumar Rajendran	Semiconductor sensor was used to detect pollutant level with meter.	<ul style="list-style-type: none"> Smoke detector microcontroller and fuel injector was used to benefit technology in such a way where environment stays free from emission and bring to constant when pollution is exceeded. 	<ul style="list-style-type: none"> Tracking of vehicles wasn't possible. Voice announcement wasn't possible to vehicle owner.
Smart vehicle monitoring system for air pollution detection using WSN	Suganya E and Vijayashanthi S	The routing algorithm being used is MANET which stands for mobile ad hoc network.	<ul style="list-style-type: none"> Cloud network was utilized to store large data related to vehicles so that it could be used for future as well. 	<ul style="list-style-type: none"> It did require too many sensors and maintenance of those sensors were very expensive.
Automobile exhaust purification system research based on ARM	Huang Mengtao and Feng Zunxiang	Electrostatic control system was used to purify exhaust and absorb particles of pollution.	<ul style="list-style-type: none"> Exhaust purification uses gas detection feedback and high pressure feedback for detecting concentration of vehicle. 	<ul style="list-style-type: none"> It just focused on theoretical analysis in an exhaust and in purification of exhaust ability to decrease particles.
Multi camera based smoke detection and traffic pollution analysis system	Pasi Pyykonen Pertti Peussa Matti Kutila and Kok WeiFong	HSU (hart ridge smoke unit) was implemented to observe performance of vehicles.	<ul style="list-style-type: none"> High resolution imaging was obtained to detect smoke level using machine vision solution. 	<ul style="list-style-type: none"> Thermal camera was further needed to make analysis accurate.
Air purification system for street level air pollution and roadside air pollution	B Ravi Subrahmanyam Avanish Gautam Singh and Dr Prabhakar Tiwari	Purification of air was done with help of distilled water without including chemical substance.	<ul style="list-style-type: none"> Suction pump magnet and purified air was used to eliminate hazardous pollutants. 	<ul style="list-style-type: none"> Even though all these methods were implemented but condition of air still remains stagnant.
IOT based vehicle emission monitoring and alerting system	P Arun Mozhi Devan Fawhizu Azmadi Hussin Rosdiazli Ibrahim Kishore Bingi and M Nagaraja Pandian	Gas sensor was used and installed in system by indicating values in LCD(liquid crystal display).	<ul style="list-style-type: none"> The United Nations framework convention on climate change (UNFCCC) idea was to reduce emission by 5% and ensure climate remain safe under 2degreeC. 	<ul style="list-style-type: none"> Hazardous chemicals affected human with certain disorders.
Towards air pollution detection with internet of vehicles	Vladimir Shakhov and Olga Sokolova	Wireless network were used to monitor air pollution.	<ul style="list-style-type: none"> Public transport was used as carrier for mobile sensor and differentiates sensor data along with various other monitoring device. 	<ul style="list-style-type: none"> It was helpful in calculating minimum time of detection but it was useful for only few no of vehicles.
Iot based vehicle anti collision and pollution control system	Abhi B Amin Harsh P Patel Suken P Vaghela and Prof Ronak R Patel	Ppm of gas is measured and alert message is given to user using display.	<ul style="list-style-type: none"> Gas sensor MQ135 was used to detect and identify pollutants. 	<ul style="list-style-type: none"> It wasn't able to detect and stop collision as range was restricted to short range.

On modelling air pollution detection with internet of vehicles	Vladimir Shakhov and Olga Sokolova	Gas sensor network was used to find perfect measurement.	•Sensor with additional mobility helped mobile sensor to take measurement in vast areas.	•Various computational methods were offered but due to high cost quality of sensor was not estimated.
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III. CONCLUSION

An elaborative study about various methods for air pollution detection in vehicles is done and presented in this paper. As per our study we found out various methods to detect pollution and purify pollutants. At beginning semiconductor sensor was used to detect pollutants level, smoke detector, microcontroller and fuel injector played major role in it but it wasn't able to track vehicles so next method used to overcome this problem was detection of pollution using WSN (wireless sensor network) where cloud could store large data of vehicles.

Most of researchers have done research in air pollution detection in vehicles and they have found out high resolution imaging can be used to detect smoke but they needed thermal camera to get accurate results UNFCCC (united nations framework convention on climate change) made idea to reduce emission by 5% and ensure climate remain safe under 20 degree C further wireless network were used in calculating minimum time detection of vehicles but as it wasn't able to give accurate measurement gas sensor network was used to find perfect measurement and gas sensor MQ135 was used to detect and verify pollutants.

Further research was carried out for purification of vehicles of. At start catalytic exhaust was used to measure purification but it wasn't able to meet emission requirement so to overcome this problem electrostatic control system was used to purify exhaust and to add further distilled water was used along with suction pump and magnet to purify air and remove hazardous pollutants from environment.

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