



# Study of Biological Hazards of Poultry Waste Gases

S.Sujatha<sup>1</sup>, S.Santhoshkumar<sup>2</sup>, A.Mukila<sup>3</sup>, R.Sri Manoj Kumar<sup>3</sup>

Professor and Head, Department of EIE, Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India<sup>1</sup>

Assistant Professor, College of Poultry Production and Management, Hosur, Tamil Nadu, India<sup>2</sup>

UG Student, Department of EIE, Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India<sup>3</sup>

**ABSTRACT:** The gases that are eliminated from the poultry waste which is harmful to the poultry surface and the natural environment. This paper is briefs about the damages that is caused to the environment and to the human being by the poultry waste gases. This impact can be reduced by placing the gas sensors for alarming around the poultry farm. These sensors can be used to measure and monitor the gases which will indicate the harm to the human beings and to the environment. The gas sensor is connected to the alarm trigger that triggers ON when the toxic gases cross its safe level and GSM is used to send the alert message to the higher level authority to make the safe environment.

**KEYWORDS:** Awareness of toxic gases, poultry waste, gas sensor, USB to UART, GSM, Aduino, LabVIEW software.

## I. INTRODUCTION

The waste from the poultry farms is left to the environment directly, due to this the toxic gases are formed around the surface of poultry. The toxic gases that left out by the poultry waste, causes damage to the people and also to the chicks. The gases that come out from the waste product of poultry are CO<sub>2</sub> (carbon dioxide), NH<sub>3</sub> (Ammonia) and N<sub>2</sub> (Nitrogen) [1]. Among these gases, ammonia is the one which causes a lot of damages to human beings [2]. The production of ammonia gas among the poultry surface will increase the ammonia level in the blood of human is analysed. The level of ammonia in the poultry surrounding is measured. In this paper, using the gas sensor, sensing the level of ammonia and can be indicated using the LabVIEW software along with the ADUINO and USB to UART kit. In this paper, the chapter 2 consist of the biological hazards of poultry waste that shows the damages gone by the ammonia gas that is left out by the poultry waste and also shows the limited level of ammonia in blood of new born, child, and for adults. The chapter 3 is about the poultry waste has monitor system model development that is involved in this paper such as the first phase contains measuring of gases and the second phase consist of monitoring the gases using the LabVIEW software. Chapter 4 explains about the result and discussion. Chapter 5 concludes the study.

## II. BIOLOGICAL HAZARDS OF POULTRY WASTE

Ammonia is the major gas has a characteristic pungent odour at high concentration it is irritating to mucous membranes of respiratory tract and the conjunctive and corneas of the eyes. Damage to the mucous membranes of respiratory system increases the susceptibility of birds to bacterial respiratory infection, especially E.coli infection. High level also have a negative impact on overall liveability, weight gain, feed conversion condemnation rate at processing and immune system experimentally, broiler chickens kept in an environment with ammonia concentrations of 50ppm and 75ppm were shown to have reductions in body weight of 17% to 12% respectively at 7 weeks of age compared to broiler chickens kept in an environment with near 0 ammonia concentration [5]. In the US maximum levels of ammonia in poultry houses have been set at 25ppm by National Institute of Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) [6]. In India there is no international standard are followed in poultry. Consider 50ppm to be the lowest level to cause irritation to the eyes, nose and throat of the most sensitive individuals [7]. People can generally smell ammonia at concentration between 20 to 30ppm is described by standard of Occupational Safety and Health Administration (OSHA).



In this paper, a case study has been conducted in the poultry houses around Salem, Namakkal and Hosur region. The Table 1 gives gas levels in the poultry house

**TABLE 1.GAS LEVELS MEASUREMENT IN A POULTRY HOUSE**

Gas	Normal Level	Extreme Level
Carbon Dioxide(CO <sub>2</sub> )	Below 1%	Above 30%
Methane (Ch <sub>4</sub> )	Below1%	Above5%
Ammonia (Nh <sub>3</sub> )	Below40ppm	Above 500ppm

In the poultry surface, the level of ammonia is seems to be increased in blood level of human and also the hens. An ammonia test measures the amount of ammonia in the blood[8].

The normal level of ammonia in human blood as shown in Table 2, which has to be maintained correctly in healthy condition. The level of ammonia that has to be maintained is segregated according to stage of human being.

**TABLE 2.NORMAL LEVEL OF AMMONIA IN HUMAN BLOOD**

Stages of human	In microgram per decilitre	In micromoles per litre
Adults	9.5-49mcg/dl	7-35mcmol/l
Children	40-80 mcg/dl	28-57mcmol/l
Newborns	90-150 mcg/dl	64-107mcmol/l

### III. POULTRY WASTE GAS MONITORING SYSTEM

This project paper involves two phase of operation. The initial phase involves the measuring of gases from segregated poultry waste and there by interfacing them with the gas sensor for sensing the emission of gases from the segregate. Then the second phase involves the monitoring the gas is in the safe level. The measurement of NH<sub>3</sub> gas crossed safe level then the alarm is triggered as shown in figure (1).

#### PHASE 1(SENSOR)

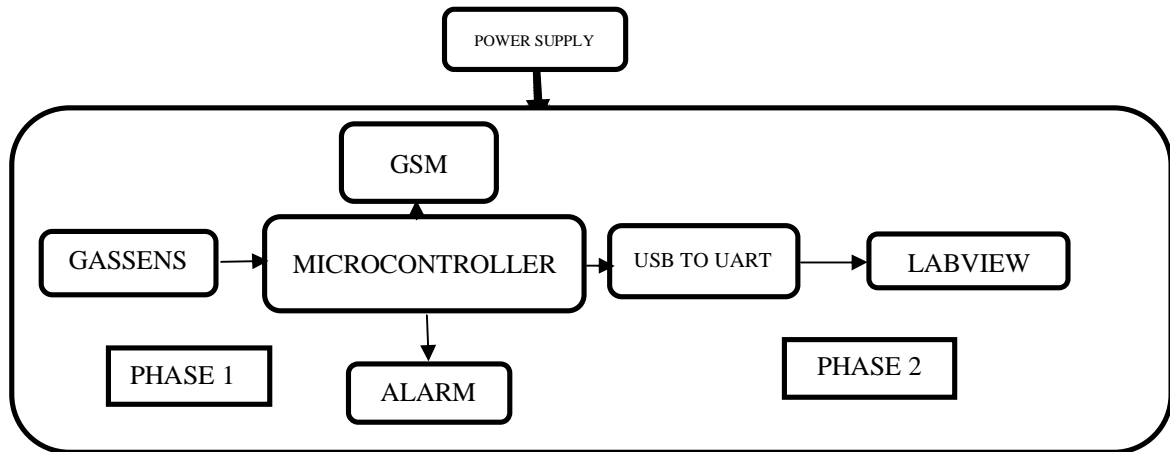
Gas sensor used here is a K-type, Non-contact type. (MQ135) .It is capable to detect a gas like NH<sub>3</sub>,N<sub>2</sub>, CO<sub>2</sub>. It will be configured to measure NH<sub>3</sub> due its more impact on the environment interface with a control system so a process can be automatically monitor the gas through theLabVIEW program .The alarm trigger that triggers ON when the toxic gases crosses its safe level.

#### MICRO CONTROLLER (ATmega 328)

ATmega 328 in a dual inline package (DIP).ATmega is a single chip micro controller created by ATmega and belongs to the mega AVR series consist of 32k bit ISP flash memory, 1kb of EEPROM, 2kb of SRAM. Serial port through UART. The device operatesin the range of 1.8-5.5 voltage level.

#### PHASE II(MONITORING)

LabVIEW is laboratory virtual instrument engineering workbench which is a system design platform and development environment for a visual programming language from national instruments. USB to UART is used to interface arduino with LabVIEW. By interfacing it can monitor the ammonia gas level. LabVIEW is the software which is used for real time implementation and to see the virtual part of the process.



## VI. RESULT AND DISCUSSION

The gas sensor is fixed in the poultry house along with monitoring system. Every 10 minutes sensor data is taken for analysis while analysing the ammonia concentration level exceeds the safe level of 20ppm then immediately an alert message SMS is sent through GSM. If  $\text{NH}_3$  concentration exceeds  $>25\text{ppm}$  immediately the monitoring system will send the alarm signal, to create awareness among the workers around the poultry house.

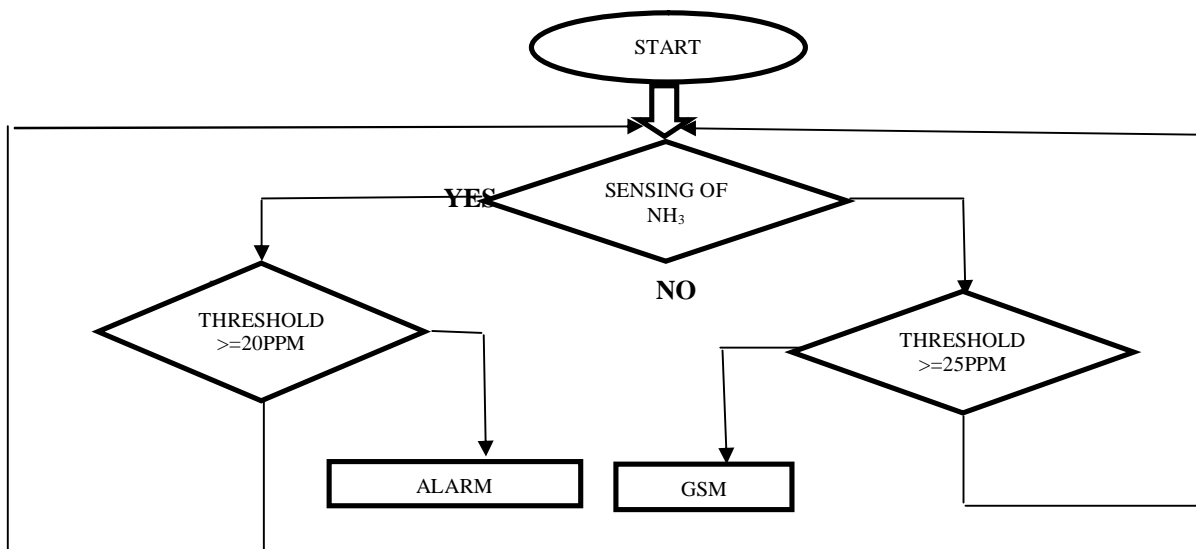


Figure 2: Sequence of the operation of monitoring system

The operation sequence of the paper is shown in figure 2. When the gas sensor starts to sense the gas. There are two threshold values: 20ppm and 25ppm. When the ammonia level crosses 20ppm, the condition becomes true, then the alarm triggers. If the ammonia level crosses 25ppm, then the GSM sends a message.



## **VI.CONCLUSION**

This paper gives the study of biological impact of ammonia gas in poultry house. It creates awareness among the people. The measuring of ammonia gas alerts the surrounding where high level of ammonia is present. The LabVIEW software which is used to interface the monitoring part that helps to show the level of the gases and also used to make an awareness report to the public.

## **REFERENCES**

1. Carlie F. S., "Ammonia in Poultry Houses": A Literature Review. World's Poultry Science. 40:99-111,1984.
2. Gürdil G. A. K., Confined Space Hazards: "Air Contaminants in Livestock House". In: Sborník referátů z mezinárodního vědeckého semináře. Nové poznatky v technologických zařízeních v zemědělských a potravinářských provozech (International Scientific Seminars: New Knowledge in Technological Equipment in Agricultural and Food Operations). TF ČZU. Praha, 2-3 Zář, p. 13-15,1998.
3. Xin H., Berry I.L., Tabler G.T., " Minimum Ventilation Requirement and Associated Energy Cost For Aerial Ammonia Control in Broiler Houses", Trans. of the ASAE vol.39 (2):645-648,1996.
4. "National centre for manure and animal waste management north Carolina state university ,releigh,n.c. August 12, 2002
5. Aziz.T and Barnes.J.K: Harmful effects of ammonia on birds-2010
6. "National institute of occupational safety and health (niosh) and occupational safety and health administration (osha.)".
7. Dr.m.logeshwaran " Gas levels in the poultry house"new delhi 2007
8. "The normal level of ammonia in human blood"by Claudia.s. Dunkley, department of poultry science university of Georgia.
9. Sichula.J., Makasa.M.L.,Nkonde.G.K.,Kefi.A.S and Katongo.C,"Removal of ammonia from aquaculture water using maize cob activated carbon",2011
10. Yamauchi.K.,Ruttanavit.J. and takenoyama.S," Effects of dietary bamboo charcoal powder including vinegar liquid on chicken performance and histological alterations of intestine".
11. Carlie F. S.,"The effect of hot climate on concentrations of  $\text{nh}_3$  in broiler and laying-hen houses"A Literature Review. World's Poultry Sc. 47:08-54,1994.
12. [www.ijstr.org](http://www.ijstr.org)
13. [www.rhydolabz.com/index.php?main\\_page=product\\_info&product\\_id=1115](http://www.rhydolabz.com/index.php?main_page=product_info&product_id=1115)
14. [www.perfectbiowaste.in](http://www.perfectbiowaste.in)
15. [www.thepoultrysite.com/poultrynews/33127/poultry-waste-greenhouse-gas-emissions](http://www.thepoultrysite.com/poultrynews/33127/poultry-waste-greenhouse-gas-emissions)
16. [http://www.aphis.usda.gov/animal\\_health/birdbiosecurity](http://www.aphis.usda.gov/animal_health/birdbiosecurity).
17. <http://www.cdc.gov/Features/SalmonellaPoultry>