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# ANALYSIS OF SMELL PRINTS FOR QUALITY DETERMINATION OF COSMETICS

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**ABSTRACT**

Quality of the product which is used in our day-to-day life is important to be analyzed. When the level of chemicals increases exceeds day by day then it may cause quality of the product to be low and causes side effects for the person. The sensitivity of the human nose varies according to the unique characteristics of persons. By using E-Nose technology, the array of sensors is placed for sensing the alcoholic content in the samples injected. E-Nose is a simple, rapid and gives accurate result. MOS gas sensors are preferred more than other gas sensing system in the sensory array, it extracts the VOC's present in the samples. The E-Nose consisting of six MOS gas sensors was used to identify the various smell print. The main purpose of this paper is to identify the various cosmetics products which has alcoholic component with the designed prototype of E-Nose setup which is used in normal day-to-day activity and to identify the various smell print for the product.

**Keywords:** cosmetics, VOC's identification, MOS, healthcare application, E-Nose.

## 1. INTRODUCTION

Quality of the product is the most important for any person. If the quality is low then more volatile organic compounds (VOC) will be added to the product. When the VOC increases it can cause damage to the skin or where ever the product is used. The product quality must fulfill the expectations of the customer. There must not be any side effects in presence of VOC content.

Gas sensing technology plays an important role in the field of medical, industry, environmental gas monitoring, healthcare applications etc [1]. MOS gas sensors are preferred since it has large number of advantages and has the capacity to detect the selective VOC. MOS gas sensors have better performance by evaluating the parameters such as sensitivity, selectivity, response time, base line response, recovery time, working temperature, fabrication cost and size.

The daily using products was tested to check the quality. Mouth wash is used by many persons but they are not aware whether the alcoholic content is present or not. It may cause irritation and high sensitivity to mouth. Because of Nail polish smell many person gets addicted to smell it often. Chemicals enter the body through that way and it is quickly absorbed by the stomach and small intestine, and spread by the blood throughout the whole body. Its contaminated effects vary depending on person to person, gender, body weight, consumption time and total amount consumed.

Various papers have undergone research related to the products which are used in every day. Guang Lei Zhang *et al* (2014) designed a portable E-Nose system which detects accurately and quickly the VOC content [2]. Jacek gebicki *et al* (2014) identified the volatile organic compounds with classical sensory analysis and E-Nose technique [3]. Treenet thepudom *et al*. (2012) undergone health care E-Nose to detect beer odor in breath after drinking [4]. Fauzan Khairi Che Harun *et al*. (2010) presented a portable E-nose system for to detect and classify the VOCs of perfume [5]. Chatchawal Wongchoosuk *et al* (2009) designed an E-Nose setup which detects the human body odor [6].

The main objective of this work is to analyse and differentiate the smell print of various products which are used in day to day activity by the designed prototype setup with MOS gas sensors.

## 2. EXPERIMENTAL SETUP

The prototype of the E-Nose designed has the way for the sample delivery array, sensory array, signal conditioning circuit, DAQ and computing system.

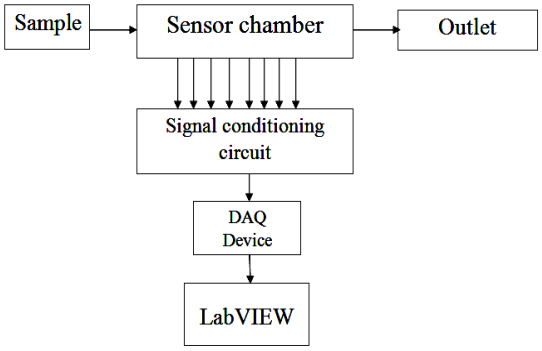


**Figure-1.** Designed prototype of E-Nose setup.

The samples from various products are given to the sensory array. From the sensory array the sensor sense the particular volatile organic compounds and gives the values in non-readable format. By signal conditioning circuit the format is converted into analog format. Then the value is given to the data acquisition system with the help of D/A convertor the values are obtained in digital format. From the LabVIEW program designed the various data sheet for various components are collected. Figure-1 shows the prototype designed for E-nose system.

The sensor chamber designed has 10 cm x 10 cm x 10 cm dimensions which is an airtight Perspex glass [7] sheet. The total volume of the box is 1000 cm³. Six metal oxide semiconductor sensors (Figaro USA, Inc) and temperature sensor were mounted on the board and fixed into the floor of the sampling chamber. The fan is controlled with the help of the microcontroller. When the sample is placed inside the fan will be in OFF condition till the sample spread evenly after some seconds it will be turned ON. The reason for covering with Perspex glass sheet is the samples present inside the chamber will leave out after some minutes. So there is no chance of samples decaying in the sensor.

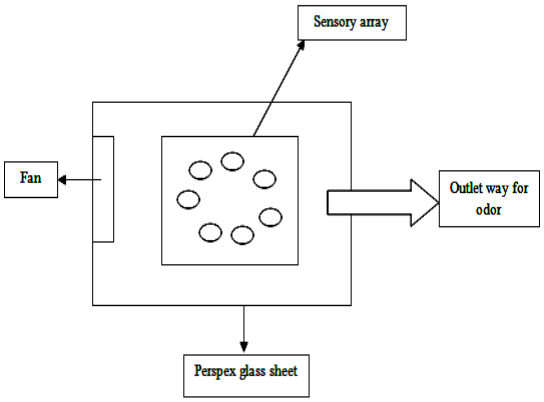


**Figure-2.** Sensor chamber.

## 3. SIGNAL CONDITIONING CIRCUIT

The outputs of sensors are connected to the measuring circuit. Measuring circuit convert the value into analog format and that is further given to the computing system.

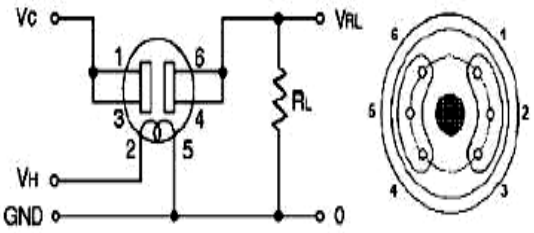


**Figure-3.** The measuring circuit for the MOS gas sensors [7]

5V supply is given as VCC to the circuit and 10kΩ resistor is placed.

## 4. INSTRUMENTS AND SOFTWARE

USB data acquisition device is used for connecting the sensor chamber to the system.

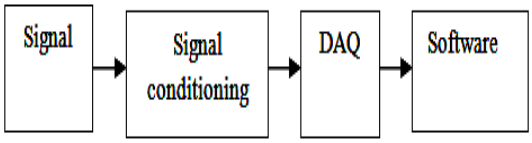


**Figure-4.** Block diagram of DAQ.

VU DAS 100 was used for data acquisition. It has many features like converting analog to digital, DAC, timing, pulse width modulation etc.

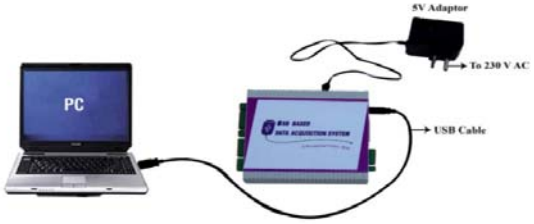


**Figure-5.** DAQ device connection.

The output of the DAQ card is given to the LabVIEW. The program designed gives the continuous data and it is stored in. lvm file format. The various smell print can be obtained by placing waveform chart in the front panel of the LabVIEW.

## 5. PROCEDURE TO OBTAIN SMELL PRINT

Various steps have been undergone to design the block diagram in LabVIEW. The working procedure of the prototype E-Nose system is

1) The sensors in sensory array are selected depending on the application.
2) Signal conditioning circuit is designed since the sensor values will not be in a readable format so with signal condition circuit it can be converted to analog format.
3) Signal conditioning circuit is connected to the DAQ device.
4) The values from sensors are stored in an array format in LabVIEW. Graph indicated the various smell print when main health hazard chemicals are present in the product.

## 6. RESULT

The sensitivity of the smell print get varies depending on the human nose. E-Nose has the capacity to detect even a small amount of alcoholic chemical content present in the samples, when the quality is low it may cause side effects. Smell prints are obtained for various products which are used in day-to-day activity. The smell print shows three stages baseline, sampling time and the baseline recovery time. The output varies according to the products. There are more products which has alcohol content mixed with it. Some products are tested with the

designed prototype. Various data sets are collected to check it accuracy. MOS gas sensors are used for rapid process and the samples will not get contaminated on the surface.

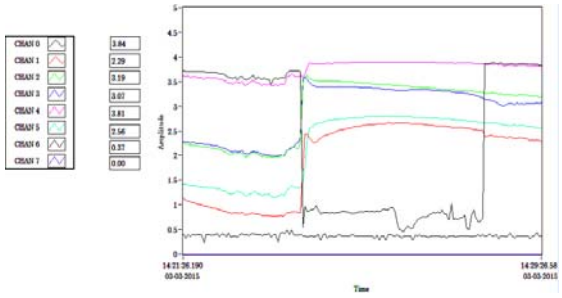


**Figure-6.** Waveform for the signal from the sensor chamber for mouthwash which affect the health.

Figure-6 shows the variation on the sensor values when the ingredient content in mouthwash gets interacted with the sensors. In Figure-7 no alcohol content was present in ingredient the values are maintained.

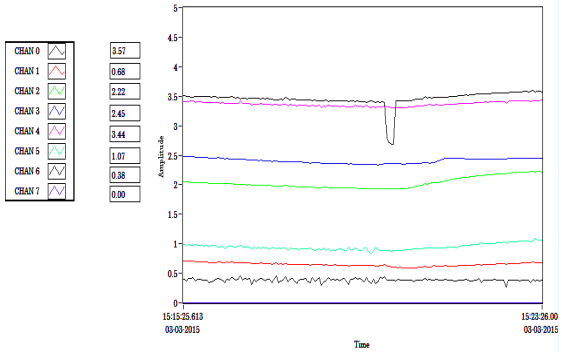


**Figure-7.** Waveform for the signal from the sensor chamber for mouthwash which has no alcoholic content in ingredient.

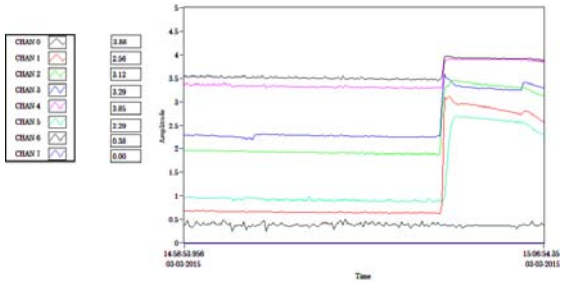


**Figure-8.** Waveform for the signal from the sensor chamber for nail polish.

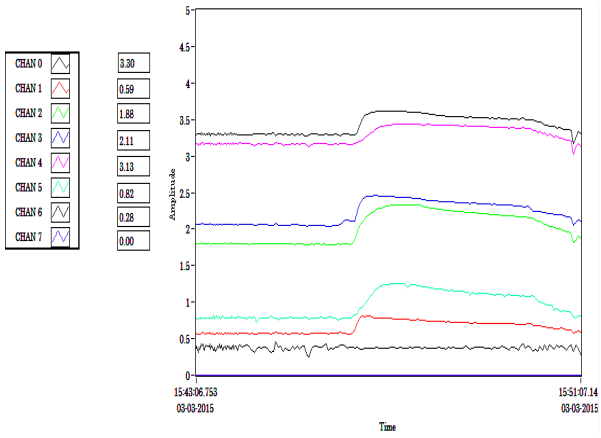


**Figure-9.** Waveform for the signal from the sensor chamber for inhaler.

## 7. SUMMARY

From the paper, it is well-known that electronic nose technology increases in the field of clinical diagnosis, environmental monitoring, healthcare applications, spoilage of food, etc. It is preferred since the sensitivity is high than the humans. And also when the chemicals are tested by human it cause health problems. By E-Nose technology the classification of smell prints for various products which affect health is easily classified so it gradually increases in the field of research. The quality of the product varies depending on many factors such as standard, price, etc.

## 8. CONCLUSION AND FUTURE SCOPE

The designed prototype of E-Nose has the capacity to detect the quality of various cosmetics products which causes side effects. The prototype has the block of sensory array, data acquisition and the computing system. The sensor chamber was designed with Perspex glass sheet and six MOS gas sensors and temperature sensor are mounted on the chamber. Signal conditioning circuit was placed outside the chamber. With LabVIEW software signals can be read in digital format. The designed system has the ability to differentiate the smell print for various cosmetics products. In future, the obtained smell prints must be given to the pattern recognition system which can differentiate the products without alcohol from the alcoholic product. The system is mainly used for detecting the quality of the cosmetics which are used in normal activity.

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