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DRUNK AND DRIVE MONITORING AND VEHICLE CONTROLLING SYSTEM

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Abstract

The main aim of the project is to design an embedded system for implementing efficient alcohol detection system that will be useful to avoid accident. There are many different types of accidents which occurs in daily life. Most often accidents occurs due to over drunken person. Though there are laws to punish drunken driver they cannot be fully implemented. Because traffic police cannot stand on every road to check each and every car driver whether he/she has drunk or not. So there is a need for a effective system to check drunken drivers. Therefore in order to avoid these accidents we have implemented a prototype project. In our project, initially we check whether the driver has drunken or not by using the MQ3 GAS sensors. Earlier system were designed only to detect the presence of alcohol in vehicle, which leads to a false detection, even if the co-passenger or any of the person in the vehicle is consumed or if alcohol spilled on the driver, system is going to activate and vehicle will be controlled only if the driver is drunk. Here we have used two sensors one is breath sensor which a low sensitivity, high range sensor and other one is sweat sensor, which is high sensitivity, low range. Breath sensor positioned on the steering, and sweat sensor are positioned on the seat and seat belt. The microcontroller used in this prototype programmed in such a way that, if both sensors detect the presence of alcohol buzzer will start indication that the vehicle is going to shutdown in the set period of time. If only breath sensor detects the speed of the vehicle is going to decrease to safe speed limit. If only sweat sensor detects there will be no effect on the vehicle speed. By using this system we can exactly identify and control the vehicle if the driver is drunk, and false detection can be avoided.

Index terms: Microcontroller, MQ3GAS sensors, Breath sensors, Sweat sensors, Alcohol buzzer.

I. INTRODUCTION

Drunk driving is a big problem in every part of the nation. In 2009 alone, over 10,000 traffic fatalities were linked directly to drivers who had blood alcohol levels above the legal limit. Many accidents happen due to the carelessness on the part of driver. Many drivers drink and drive which is a criminal offence. Such drivers are a menace to society and should be apprehended quickly. Though the country has laws to check drunken driving but its effective implementation is still to be worked upon and in some cases even questionable. For such purpose we are designing a system which will assist the traffic police officers to determine whether he/she is fit to drive or not. Observation and experiences show that most of the accidents on the roads are caused due to the driver's carelessness one of them is the drivers drink Alcohol and drive the Vehicles which contributes a loss of life and property. Hence the aim of this Project is to design and develop an automated system which should detect the Alcohol drunk by the driver and automatically off the engine. This project has a universal application in checking of drunken employees, drink and drive test, security entry checks, hotels and restaurants, shipping industry, call centers malls. Medical Institutes, hospitals, clinical diagnostic centers.

Blood alcohol concentration (BAC) and liver metabolism rate:

Drinking isn't a guessing game—there are science-backed methods to understand how intoxicated you are based on your body type. Blood alcohol content (BAC) is the percentage of your bloodstream that's made up of pure alcohol. The blood alcohol concentration (BAC) *scale* shows how much of your bloodstream is pure alcohol. For example, if you have a BAC of .10, it means that 1% of your bloodstream is alcohol.

To calculate estimated peak blood alcohol concentration (EBAC), a variation, including drinking period in hours, of the Widmark formula was used. The formula is:

$$EBAC = \left(\frac{0.806 \times SD \times 1.2}{BW \times Wt} - MR \cdot DP \right) \times 10$$

where :

- 0.806 is a constant for body water in the blood (mean 80.6%),
- SD is the number of standard drinks containing 10 grams of ethanol,
- 1.2 is a factor to convert the amount in grams to Swedish standards set by The Swedish National Institute of Public Health,
- BW is a body water constant (0.58 for men and 0.49 for women),
- Wt is body weight (kilogram),
- MR is the metabolism constant (0.017) and
- DP is the drinking period in hours.
- 10 converts the result to permillage of alcohol

The scale looks like this:

- At .04, most people begin to feel relaxed.
- .08 is the legal intoxication level in most states. However, driving can be impaired by BACs as low as .02.
- At .12, most people feel the need to vomit.
- At .30, many people lose consciousness.
- By .40, most people lose consciousness.
- A BAC of .45 is usually fatal.

BAC charts make it easy to see what a healthy range is for you. The charts are separated by male and female, as the male body tends to have more water and therefore a higher alcohol tolerance. Women also have significantly less of the enzyme that breaks down alcohol in their stomach than men do.

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<u>What happens during an alcohol test</u>

There are two types of alcohol tests you may be asked to take, such as in a police investigation or as part of an alcohol treatment program. There are also different types of tests for different parts of your body, and each one has multiple uses. For example, if you're being tested in a medical setting for intoxication, doctors are more likely to take a blood sample. In a legal setting, such as after an accident or a suspected DUI, you're likely to be given a breath test.

Alcohol can be detected in urine, blood, saliva, sweat, breath, and even your hair follicles.

Regardless of what part of the body the test is for, though, most alcohol tests are looking for one of two chemicals: *ethanol* or *EtG*.

<u>The ethanol test</u>

While 92-98% of alcohol is metabolized in the liver, the remaining 2-8% leave the body through urine, sweat, and breath. Ethanol is beverage alcohol that can be detected in urine up to one or two hours after the alcohol has left the body.

Ethanol urine tests:
When it comes to ethanol urine tests, there's going to be a bit of a lag as the body filters the alcohol from the blood into the bladder. It can take up to 2 hours for alcohol to show up in your urine.

But once it's there, a single ounce of pure alcohol is detectable for about 1.5 hours. If you reach a higher BAC, the alcohol will be detectable for longer, up to roughly 12 hours.

How ethanol tests are used:
Ethanol urine tests are not the most accurate, partly because the alcohol concentration in urine tends to lag behind the actual concentration of alcohol in the blood. Also, ethanol is also created naturally in the body by bacteria.

If you have diabetes or a yeast infection, your body can naturally create enough ethanol to trigger a *false* positive. This is especially true if the urine sample is left out at room temperature, where the microorganisms can continue to ferment glucose and create more alcohol.

To combat inaccurate readings, you might be asked to give a second urine sample a half hour after the first one. This serves as a comparison to give a better picture of how long the alcohol has been in the bladder.

Sweat test:

According to a research conducted by NCBI, sweat patch test successfully distinguished the person who ingested alcohol from teetotalers.

Sweat test has not only been used to detect ethanol; but also other drugs, including PCP, nicotine, morphine, methamphetamine, methadone, cocaine and amphetamines.

II. LITERATURE SURVEY

A literature review of published studies on alcohol and traffic injuries in developing countries was undertaken to examine evidence of the prevalence of alcohol. 16 studies were identified through electronic database searches from 1966 to 1994. The studies employed different measurement methods and cut-off levels of blood alcohol concentrations (BACs). 8 fatality studies reported varied BACs in drivers ranging from 33.3% to 63.2%, measured by blood analysis. In four of the studies, alcohol prevalence, tested in less than 50% of the study population, varied from 17.3% to 46%. No clear selection criteria were stated, and the representativeness of those tested could not be ascertained. In eight non-fatality studies, the proportion of intoxicated subjects, determined by blood analysis, breath tests and interviews, were considerably lower and varied widely, from 7.7% to 28.4%. Alcohol prevalence was consistently higher amongst drivers (33.3% - 69.2%) than in other road users, and over 95% of intoxicated drivers were male (95%-100%). 50% of alcohol positive subjects were aged between 20 and 30 years.

From this review, evidence of the influence of alcohol in traffic injuries in developing countries is limited. Due to variable measurements and threshold BAC levels applied, direct comparison of results is inappropriate. The true prevalence of alcohol-related traffic injuries remains unknown. There is need for a standardized methodology, reliable BAC measuring devices and a uniform cut-off level.

III. EXPERIMENTAL SETUP

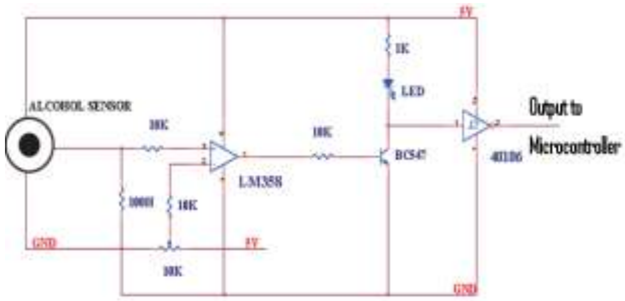

Figure :1. Alcohol sensor

Alcohol Sensor for use to detect the presence of alcohol vapors. This sensor unit offers very high sensitivity, combined with a fast response time. The unit will work with a simple drive circuit and offers excellent stability with long life.

This circuit is mainly designed to sense the present of alcohol in the human Respiration. The alcohol is sensed by the alcohol sensor. The alcohol sensor is the one type of transducer which produces the voltage signal depends on the alcohol level. Then the voltage signal is given to inverting input terminal of the comparator. The comparator is constructed by the operational amplifier LM 741. The reference voltage is given to non inverting input terminal.

The comparator compares with normal reference signal and produces the corresponding output error signal. Then the output voltage is given to microcontroller in order to determine the alcohol content is present or not in the atmosphere or human respiration.

Key ignition system:

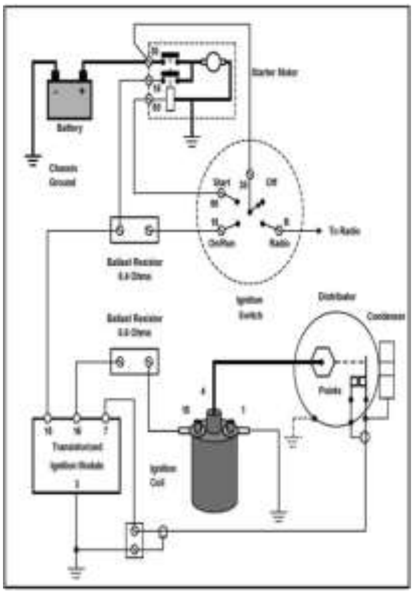

Figure:2.Key ignition circuit

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Working of key ignition system:

When the ignition switch is closed and engine in cranked, as soon as the contact breaker closes, a low voltage current will flow through the primary winding. It is also to be noted that the contact beaker cam opens and closes the circuit 4-times (for 4 cylinders) in one revolution. When the contact breaker opens the contact, the magnetic field begins to collapse. Because of this collapsing magnetic field, current will be induced in the secondary winding. And because of more turns (@ 21000 turns) of secondary, voltage.

Working principle:

Figure :3.Device

A 220 volt alternating current is supplied to a step down transformer where the current is converted to 12 volts and using the rectifier alternating current is converted into direct current of 12 volt.

From there the current is transferred to capacitor from there it is connected to another circuit which consists of relay and alcohol sensor. When the current reaches this circuit a green light starts blinking which indicates the heating of alcohol sensor, when the green light glows it indicates that the alcohol sensor is ready for operation. There is an IC and capacitor and regulator used in this circuit to perform specific operation to control the relay and current. When the alcohol sensor senses alcohol smell the relay switch breaks the connecting point and cuts the power supply to engine or dc motor hence the engine does not start due to no current supply which is required to start the engine. When a red led glows it indicates that the alcohol has been detected and the engine is turned off and when the smell of alcohol content fades away the relay again come back to ON position and starts the engine or dc motor without any trouble. A key ignition system is used to start the engine or dc motor which is connected to battery from there to the dc motor. The project including dc motor is just a prototype .this project can be used to any vehicles and prevent the drink and drive and save lives of humans.

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Specifications of MQ3 Sensor:

Structure and configuration of MQ-3 gas sensor is shown as Fig. 1 (Configuration A or B), sensor composed by micro AL_2O_3 ceramic tube, Tin Dioxide (SnO_2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-3 have 6 pin ,4 of them are used to fetch signals, and other 2 are used for providing heating current.

Electric parameter measurement circuit is shown as Fig.2

E. Sensitivity characteristic curve

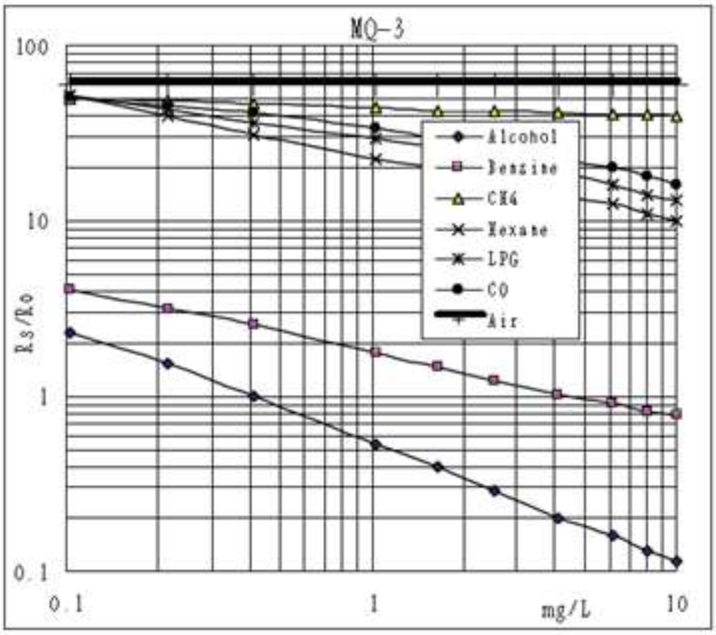

Fig.2 sensitivity characteristics of the MQ-3

Fig.3 is shows the typical sensitivity characteristics of the MQ-3 for several gases.
in their: Temp: 20℃、
Humidity: 65%、
O_2 concentration 21%
RL=200kΩ
Ro: sensor resistance at 0.4mg/L of Alcohol in the clean air.
Rs: sensor resistance at various concentrations of gases.

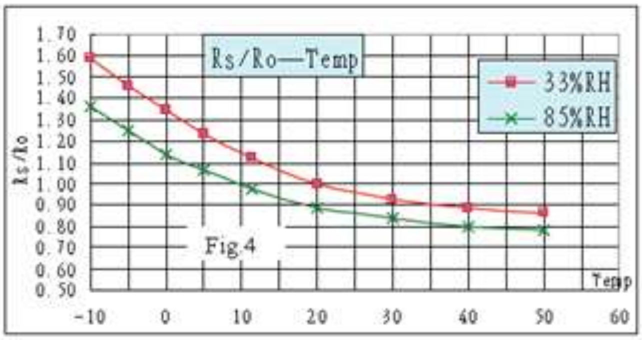

Fig.4 is shows the typical dependence of the MQ-3 on temperature and humidity.
Ro: sensor resistance at 0.4mg/L of Alcohol in air at 33%RH and 20 ℃
Rs: sensor resistance at 0.4mg/L of Alcohol at different temperatures and humidities.

SENSITVITY ADJUSTMENT

Resistance value of MQ-3 is difference to various kinds and various concentration gases. So when using this components, sensitivity adjustment is very necessary. we recommend that you calibrate the detector for 0.4mg/L (approximately 200ppm) of Alcohol concentration in air and use value of Load resistance that(R_L) about 200 KΩ(100KΩ to 470 KΩ).

When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence.

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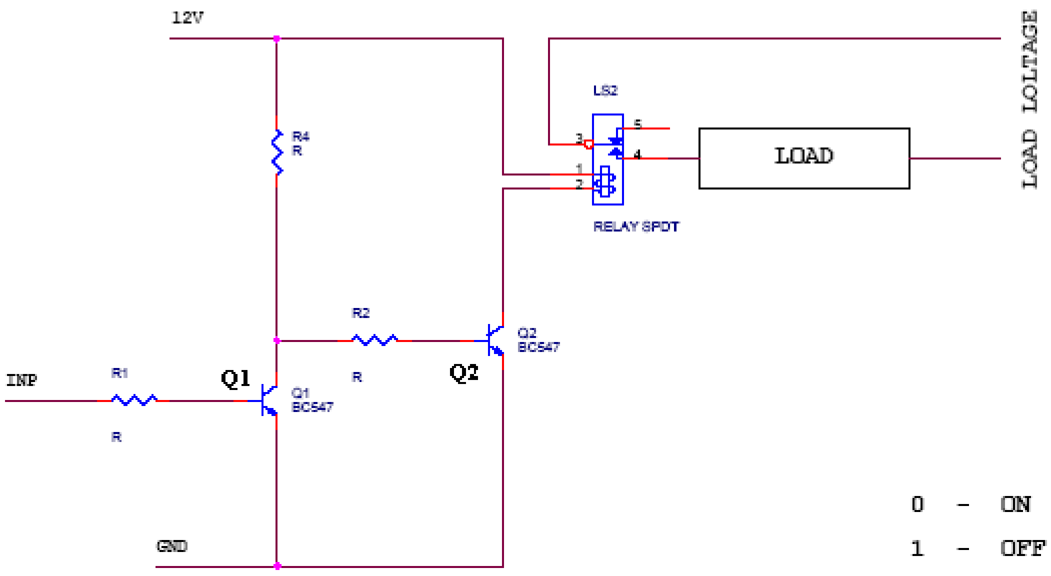

Figure :4.Relay Circuit

This circuit is designed to control the load. The load may be motor or any other load. The load is turned ON and OFF through relay. The relay ON and OFF is controlled by the pair of switching transistors (BC 547). The relay is connected in the Q2 transistor collector terminal. A Relay is nothing but electromagnetic switching device which consists of three pins. They are Common, Normally close (NC) and Normally open (NO).

The relay common pin is connected to supply voltage. The normally open (NO) pin connected to load. When high (5 Volt)pulse signal is given to base of the Q1 transistors, the transistor is conducting and shorts the collector and emitter terminal and zero (0 Volt)signals is given to base of the Q2 transistor. So the relay is turned OFF state.

When low pulse is given to base of transistor Q1 transistor, the transistor is turned OFF. Now 12v is given to base of Q2 transistor so the transistor is conducting and relay is turned ON. Hence the common terminal and NO terminal of relay are shorted. Now load gets the supply voltage through relay.

IV. RESULTS AND DISCUSSION

We conducted experiments by preparing water and surgical spirit (contains 70% of alcohol) blends as per the percentage of alcohol presence in breath and sweat. It is observed that the device shown only red LED glowing while breath sensor alone exposed to the alcohol or sweat sensor alone exposed to the alcohol. It means driver either haven't consumed or it would be 10 – 12 hrs after consumption. But when both sensors were exposed the device shown indication of blue LED, which means driver is consumed alcohol within 4 – 5 hrs from the time of detection.

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V. CONCLUSION

This is a developed design to efficiently check drunken driving. By implementing this design a safe journey is possible by decreasing the accident rate due to drinking. The main drawback of this system is, it cant detect until the alcohol reaches out through sweat, which takes a minimum time of 4 -5hrs. The sensor used in this device is not highly sensitive to detect quickly and more accurately in very low range.

Further developments can be done by replacing MQ3 sensor (sweat sensor) by a sweat patch sensor.

REFERENCE

[1] "Principal of Electronics", by V.K.Mehta
[2] "Electrical Technology", by B.L. Theraja
[3] "Alcohol detection system in car", by vivekanand.
[4] "A sweat-patch test for alcohol consumption: evaluation in continuous and episodic drinkers", https://www.ncbi.nlm.nih.gov/pubmed/7004238
[5] "How Long Does Alcohol Stay in Your System? Wanna Know? ",https://thelifesquare.com/how-long-does-alcohol-stay-in-your-system-8571306/
[6] "Award-Winning Wristband Measures Blood Alcohol Content Through Sweat | Mental Floss", http://mentalfloss.com/article/80425/award-winning-wristband-measures-blood-alcohol-content-through-sweat
[7] "Detecting blood alcohol content with an electronic skin patch - American Chemical Society", https://www.acs.org/content/acs/en/pressroom/presspacs/2016/acs-presspac-september-21-2016/detecting-blood-alcohol-content-with-an-electronic-skin-patch.html