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ALCOHOL CONCENTRATION DETECTOR IN LIQUOR BASED ON MICROCONTROLLER

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ABSTRACT

Has made an alcohol concentration detector based on microcontroller that can detect alcohol concentration in liquor is accurate, fast, stable and has a high sensitivity. In this research, use traditional liquor of Moluccas *"Sopi"*, and liquors on the market. An alcohol concentration detector was built based on microcontroller ATmega16 which can receive and process data from the sensor MQ-3 in a form that can be converted into the form of an electrical signal and the output is displayed on the LCD. Calibration of the sensor MQ-3 shows that the greater the value of resistance sensor, the smaller the value of an alcohol concentration. The correlation of resistance sensor to alcohol concentration is plotted in a graph of linearity with R^2 = 0,9982. The results of liquor on the market and *Sopi* (premium quality) had alcohol concentration ranging between 3 – 5% per mL, while an alcohol concentration of *Sopi* (regular quality) is below 3% per mL.

Keywords: *Alcohol, Microcontroller ATMega16, Sensor MQ-3, Sopi*

1. INTRODUCTION

Alcohol is a solvent compound which is usually used at liquors. One of the compounds contained in alcohol is ethanol. Etanol is used as a solvent drugs, cosmetics, materials liquors, wines and whiskeys. *Sopi* is a traditional liquor of Moluccas which have a high enough concentration of alcohol. When consumed in large quantities can lead to heavy drinking. It comes from water leads palm trees so that people can easily cultivate traditional liquors. *Sopi* is used only for the ceremony in the Moluccas, but in time it has been consumed freely by the public. When consuming liquor in a long period of time, it

can cause a decrease in the immune system, impaired function of the heart and other diseases.

In general, many people don't know how much level of alcohol contained in the liquors specifically for *Sopi*. Therefore, we need a detector that can detect alcohol concentration in liquor is accurate, fast, stable and high sensitivity. In this research, used a gas sensor MQ-3. Gas sensor MQ-3 is very sensitive to detect alcohol, so that it can be used in detecting alcohol concentration in liquors [**1**]. With the ability of digital technology in the field of electronics, it can be built a microcontroller based detection system. A system that can collect, aggregate and store data from the gas sensor MQ-3 in a form that can be converted to the form of electrical signals. The results of the microcontroller ATMega16 will be displayed on the LCD screen [**2, 3**]. The detector is designed in the form of mobile making it easy to use.

2. EXPERIMENTAL METHOD

In building an alcohol concentration detection system required two part design of the system, namely: hardware and software design. Hardware design which is making the circuit as the microcontroller or processor information processing center (μC). In addition, made a circuit to detect alcohol concentration used gas sensor MQ-3. The next part is making the program on BASCOM AVR software to be installed into a microchip microcontroller by means of download. The design of this software can be carried out in accordance with the purpose of the research is good for the sensor output and interface. **Fig. 1** shows a block diagram of detection system.

Figure 1. Block Diagram of Detection System of Alcohol Concentration.

Alcohol gases contained in nature or objects will be detected by the gas sensor MQ-3 and then sends the analog signal to microcontroller on port A. Then, this signal converted being digital signal using a digital to analog converter (A/D converter) which

incorporated elements of sampling. The digital signal will be sent at control element namely microcontroller ATMega16 [**3, 4**]. On this element, signal will be processed and forwarded on output element LCD to shows alcohol concentration in liquors.

3. RESULTS AND DISCUSSION

3.1. Characteristic of Alcohol Concentration Detector

Has made detection system of alcohol concentration (**Fig. 2**) using a gas sensor MQ-3 that is sensitive to alcohol, microcontroller ATmega16 to record, store and convert the signal generated and is displayed through the LCD. To test the performance of this detector, so gas sensor MQ-3 must be calibrated.

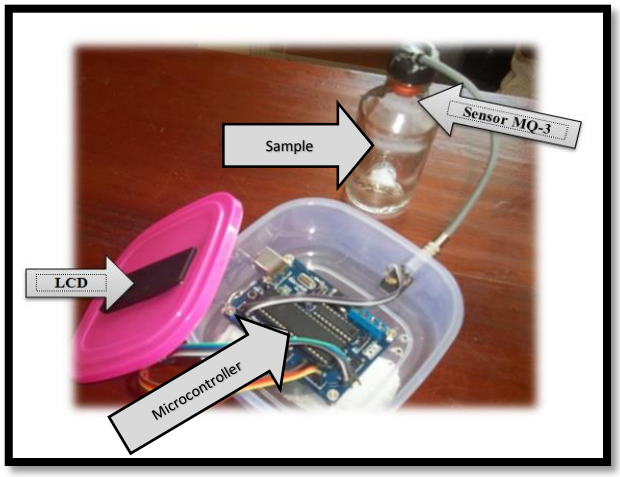

Figure 2. Detection System of Alcohol Concentration.

Calibration of the sensor needs to be done to see changes in the output voltage of sensor is generated against alcohol gas detected. After measuring the voltage V_c, it can be calculated resistance sensor (R_s) and resistance sensor in clean air (R_0). Then, in table (1) shown a correlation of resistance resistor (R_s/R_0) against alcohol concentration (%). Concentration of alcohol used is an alcohol dilution standard. From the calculation results in Table 1, show that the greater the value of resistance sensor (R_s/R_0), the smaller the value of the alcohol concentration (%). Conversely, when the greater the value of resistance sensor (R_s/R_0), the smaller the value of the alcohol concentration (%). Then, created linearity graphic obtained from the correlation of resistance resistor (R_s/R_0)

against alcohol concentration (%) with R^2 = 0,9982. This proves that these two variables have a very strong correlation (**Fig. 3**).

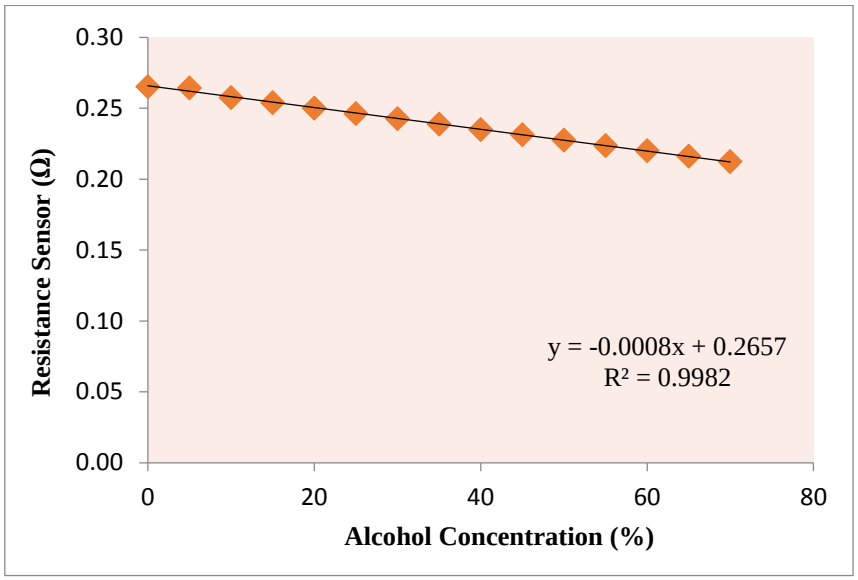

Figure 3. Behavior of linearity curve of resistance sensor versus alcohol concentration.

3.2. Alcohol Concentration in Liquors

To measure alcohol concentration of liquors, it can compare resistance resistor (R_s/R_0) each sample with resistance resistor (R_s/R_0) already known from the dilution of alcohol (see **Table 1**). The results of the measurement of the alcohol concentration for each sample shown in table 2. Based on **Table 2**, samples of liquor on the market (like Beer) has alcohol concentration ranging between 3-5 % per mL, which is in line with the data sample liquor listed on the packaging. For *Sopi* (premium quality) has alcohol concentration ranging between 4-5 % per mL, while *Sopi* (regular quality) alcohol concentration is below 3 % per mL. *Sopi* (regular quality) have a lower alcohol concentration due to the manufacturing process have been mixed with water. From the measurement results of each samples showed that alcohol concentration detector are functioning properly. Thus, when the consumption of excessive alcohol will have a negative impact on human health.

Table 1. Correlation of Alcohol Concentration with Resistance Sensor.

Alcohol Concentration (%)	Resistance Sensor (Ω)
0	0,2651
5	0,2643
10	0,2575
15	0,2538
20	0,2500
25	0,2463
30	0,2425
35	0,2387
40	0,2350
45	0,2312
50	0,2274
55	0,2237
60	0,2199
65	0,2161
70	0,2124

Table 2. Alcohol Concentration in Liquors.

Sample	Resistance Sensor (Ω)	Alcohol Concentration (%)
Sample 1	0,19	5,12
Sample 2	0,26	3,75
Sample 3	0,20	4,99
Sopi mayang (regular 1)	0,30	3,28
Sopi kelapa (regular 2)	1,72	0,58
Sopi mayang (premium 1)	0,22	4,52
Sopi kelapa (premium 2)	0,21	4,82

4. CONCLUSION

From the research that has been done, it can be concluded that:

1. Making an alcohol concentration detector include: the creation microcontroller circuit, circuit gas sensor MQ-3 as an alcohol gas detector, making the program on BASCOM AVR software to be installed into a microchip microcontroller by means of downloading and the output is displayed on the LCD. Then, the calibration of the sensor MQ-3 which shows that the greater the value of resistance sensor (R_s/R_0), the smaller the value of the alcohol concentration (%). From the result of linearity graphic, proves that these two variables have a very strong correlation.
2. The samples of liquor on the market (like Beer) has alcohol concentration ranging between 3-5 % per mL, which is in line with the data sample liquor listed on the packaging. For *Sopi* (premium quality) has alcohol concentration ranging between 4-5 % per mL, while *Sopi* (regular quality) alcohol concentration is below 3 % per mL.

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