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MEASURING TOOLS OF ALCOHOL LEVELS IN MICROCONTROLLER-BASED SOLUTIONS

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ABSTRACT

In the community there are so many controversies about alcoholic products that some people doubt the halal nature of the Islamic religion. Alcoholic drinks are classified as intoxicating drinks or also called khamar, then what about perfume. The use of alcohol as a mixture for perfume is well known, many perfumes circulating in the community have alcohol levels that are too high. Therefore we need a tool to be able to identify alcohol levels in perfumes that can be displayed digitally. This alcohol level identification tool consists of a minimum ATMega microcontroller system that functions as a system control center, mq-3 sensor to determine the alcohol level contained in a perfume which is then displayed on the LCD as an information displayer. This study aims to measure alcohol level in perfumes used in everyday life. This tool works by utilizing the characteristics of the MQ-3 sensor which has a change in the output voltage in the form of an analog signal, where the output voltage is proportional to the change in alcohol gas levels detected. The alcohol values that is processed in digital form then displayed on the LCD.

INTRODUCTION

Measurement is an activity carried out to determine the physical magnitude of an object or certain symptoms. Measurement becomes one of the activities that humans always carry out in their daily lives. Various measurement instruments have also become an inherent part of the activities of human life. [1]

Alcohol is a substance that is widely used in everyday life. in chemistry, alcohol is a general term for any organic compound that has a hydroxyl group (-OH) attached to a carbon atom and a hydrogen atom [2]. Alcohol is contained in drugs, perfumes, solvent or materials used in laboratories, the chemical industry and others. Measurement of alcohol level is still mostly done manually, this method is considered to be less accurate and efficient. [3]

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The use of ethanol or alcohol as a perfume is well known. Perfume is sold in the form of body freshener and air freshener. The composition of substances in perfume are ethyl alcohol (50-90%), aqua (5-20%), and fragrance (10-30%). The functions of ethyl alcohol in this composition as a solvent.

In perfume, in addition to ethyl alcohol as a solvent are often added substances such as: acetone, benzaldehyde, benzyl acetate, benzyl alcohol, ethyl acetate, etc. these substances have negative effects to health. Acetone can cause dryness of the mouth and throat, damage to the vocal cords, drowsiness, and depression. Benzaldehyde has a narcotic and irritating effect on the skin, eyes, mouth and throat. Benzyl acetate is carcinogenic, the liquid can seep into the body system through the skin, and the vapor can irritate the eyes. Benzyl alcohol causes irritation of the upper respiratory tract and decreased blood pressure. Ethyl acetate is like narcotics, damages the liver, and causes anemia. Alcohol level that can be accepted by the skin in a prolonged period is around 15% -25%. [4]

Until now, alcohol measuring devices are very rare. Its used limited to industrial needs and laboratory research and the price is not affordable by the community. In the tools used the Gas Chromatography (GC) analysis method, High Performance Liquid Chromatography (HPLC) analysis method, specific gravity method uses a pycnometer and hydrometer alcohol method.

Currently there is no measuring tool for alcohol level in perfume, therefore in this study designed an effective and efficient tool in measuring alcohol level in perfume. The system planning process is carried out by changing analog data from sensors into digital data then transmitting the data to the microcontroller and displayed via LCD (Liquid Cristal Display). [5]

Similar research have been done by some researches, among them use AF63 alcohol gas sensor by Umar (2009), use TGS822 alcohol gas sensor by Budiastra (2009), use TGS2620 sensor alcohol gas sensor by Simatupang (2015), and use Arduino Uno by Setiawan (2017). This research uses MQ-3 alcohol gas sensor, with consideration of a lower price compared to other alcohol sensors, but the level of sensitivity is nearly same. MQ3 gas sensor is a gas sensor that has high sensitivity and fast response in detecting alcohol, has good resistance to smoke and steam. [6][7][8][9]

Based on the above explanation, we try to design a tool to measurement the alcohol level in a perfume liquid using a gas sensor. Thus a scientific paper was compiled with the title Measuring Alcohol Content in Microcontroller-Based Solution.

METHOD

Measurement tool of alcohol level design method consists of hardware design and software design. Hardware design including MQ-3 sensor circuit design, ATMega8535 microcontroller circuit design, Liquid Crystal Display circuit design, The design of the overall system for detecting alcohol level.

The following figure is a block diagram of an alcohol meter measuring perfume, which explains the workings of the overall tool system which consists of an MQ 3

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sensor that has been designed so that it can read the alcohol substances in the perfume to be sprayed. Then the ADC as a signal reader sent by the MQ 3 sensor then enters the ATmega 8535 Microcontroller to be processed so as to produce a logic output that will be displayed on the LCD.

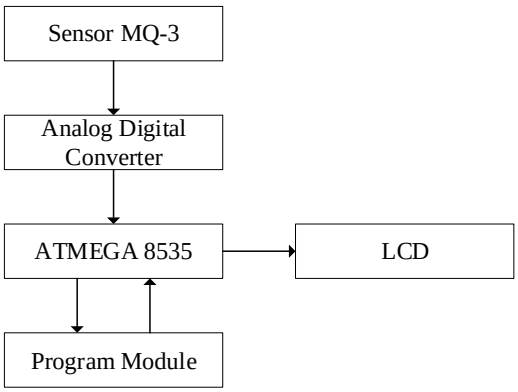

Image 1. Block diagram of alcohol measuring with MQ3 sensor

Flowchart program for detecting alcohol level in perfume can be seen in the figure below.

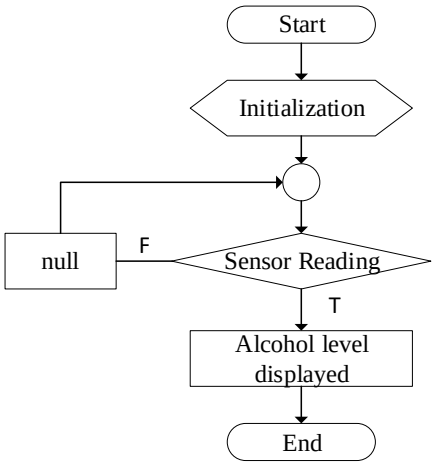

Image 2. Flowchart Program

RESULT AND DISCUSSION

Software Design

The software used is the CAVR programming language. The program that has been designed is then inserted into the microcontroller using a downloader. To find out if there is an error in the program then the compile process is carried out.

Hardware Design

To ensure that the hardware that is designed is functioning properly, a tool test is performed. This hardware testing starts from testing the microcontroller circuit, testing

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the MQ3 sensor, testing the power supply, and testing the LCD.

Microcontroller testing is done by programming it using the C AVR language, to find out whether the microcontroller is working properly or not. the voltage from the power supply supplied to the microcontroller varies, then a voltage measurement is made at one of the output / input ports on the VCC and ground pins. The following table shows the results of microcontroller measurement experiments.

Table 1. Minimum System Testing (ATMEGA 8535)

No	Input Voltage (AC)	Output Voltage (DC)
1	12 V	5
2	9 V	4.5
3	6 V	3.5

ADC circuit is used to convert analog input data from sensors into digital data, so that it can then be processed by a microcontroller.

Before use, MQ-3 sensor needs to be calibrated first. The calibration process can be done by placing the sensor in a closed room (tube-shaped) with a distance of 2 cm from the liquid alcohol to be tested. The goal is that the measurement of alcohol content can be conditioned and with this distance testing is not done by direct contact with the alcohol element[6]. MQ-3 sensors are assembled with 200 kΩ variable resistor, which is the recommendation of the MQ-3 sensor manufacturer. The large output voltage range of the MQ-3 sensor circuit is adjusted by adjusting the variable resistor's resistance[10]. For testing the MQ-3 sensor circuit a multimeter is needed. This sensor circuit testing is done by measuring the output voltage to ground. MQ-3 sensor is given a VCC and ground voltage source, the pin (output) is connected to the multimeter the positive probe section (red wire) and the negative probe (black cable) is connected to the ground section.

The power supply used is a full wave power supply. Power supply testing is done by providing alternating input voltage (AC) which varies by using AC voltage regulators to tap 0 and 220. For the output voltage of the trafo that has been connected to the power supply circuit, measurements are taken for the 12-CT-12 tap on the power supply voltage output. Because only 220 Volt input voltage is there because a tool to decrease the input voltage (Regenerator) to 215 Volts and so on until 205 Volts is not yet available. This table shows the test results on the power supply.

Table 2. Power Supply Testing

No	Input Voltage (AC)	Output Voltage (DC)
1	220 V	12
2	215 V	-
3	210 V	-
4	205 V	-
5	200 V	-

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The LCD used in this discussion is the 16x2 character. Which in this discussion LCD functions as a media displaying the results of the measurement or detection of alcohol level in perfume, which is then the measurement results are controlled via a microcontroller. LCD is connected to the digital pin on the microcontroller. The source code on the microcontroller contains the LCD display command.

As a whole this device consists of a power supply circuit, sensor circuit, microcontroller circuit and lcd circuit that is connected as a whole. After the sensor is working to detect the presence or absence of alcohol level, the sensor provides input voltage to the microcontroller which will then be displayed on the LCD.

CONCLUSION

MQ 3 sensor can detect alcohol levels both in drinks and perfume and even other liquids. Alcohol level detection system based on AVR ATMEGA 8535 microcontroller can display the percentage of alcohol content on the LCD in accordance with the program that has been designed. With this simple tool can help us determine the type of perfume that we will use not only based on the aroma but can consider the alcohol content contained.

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