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Design of Security Systems Cabin Car From Danger Gas CO (Carbon Monoxide) With SMS Gateway Information and Data Logger

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Abstract

Carbon Monoxide is the result of incomplete combustion motor vehicles. CO gas is formed when there is a lack of oxygen in the combustion process. Such conditions pose a danger to human life for those who inhale hinga result in acute respiratory disease cause of death. It often happens is causing a person dies in a private car in an engine and AC (Air Conditioner) life due to leakage of CO gas from the rest of the engine exhaust into the car cabin. With the phenomenon takes detector gas leak poisonous CO which can automatically detect a gas leak CO, the tool works by activating the gas sensors detector, opening the car window to neutralize the air inside the cabin of the car, the alarm system will sound with the information SMS Gateway sent to car owners with information on the data records in the internal memory microcontroller data logger when air conditions approaching danger, danger, and very dangerous. This tool is controlled using microcontroller ATMega32 using Gas sensor TGS 2442 and TGS 2600, equipped with a Buzzer, LCD (Liquid Crystal Diplay), the DC motor driver circuit, and powersupply as a power generator and a voltage range of tools.

Keywords : *Carbon Monoxide, Microcontroller ATMega32, SMS Gateway, Data Logger*

1 INTRODUCTION

The growth of the automotive industry in the world, especially Indonesia is very fast. Indonesia is the biggest consumer of motor vehicles, namely two wheels and four wheels. According to the statistical center in 2013 the number of motor vehicles amounted to 104 118 969 (one hundred four million one hundred eighteen thousand nine hundred and sixty nine) [1]. The continued development of motor vehicle very rapidly, so there are many who will come out the exhaust gases from combustion vehicles. Exhaust gas in vehicles is the rest of the products of combustion such as carbon monoxide (CO). Gas CO (carbon monoxide) is very dangerous for those who inhale it continuously because the CO gas will follow the blood circulation and will prevent the entry of oxygen that will be required by the body and can cause acute respiratory illness and even death.

1.1 The Phenomenon of the Occurrence of Carbon Monoxide Poisoning

Many cases of death when the victim rest in the car, and gas poisoning CO (carbon monoxide). Usually leaks are coming from the AC line. Each owner must be alert to the condition of AC, to prevent leakage. Owner and technicians spesiaslis car air conditioner repair shop in Umara Auto Car Market Kemayoran, Abu, explains, CO leaks usually occur at air conditioner hose. The reason for the lack of attention and care of the owners on the condition of the car. "Usually the leak because it rarely cared for and the owners still feel cold air-conditioning [2].

1.2 Car

Cars is a very important means of transportation that is widely used by humans and produce exhaust CO. Today many car equipped with several facilities as well as AC (Air Conditioner), Power Windows, which can provide comfort to the car. Of the facility does not mean the technology is without error. Especially is AC (Air Conditioner). If the engine combustion is not perfect and will generate CO gas, gas will enter through the hole AC (Air Conditioner) in the event of a leak in hole AC (Air Conditioner). This gas is very dangerous because it is colorless, odorless, and tasteless. This condition is very dangerous to humans because it can cause people poisoning weak to cause death. Carbon monoxide, chemical formula CO, is a gas that is colorless, odorless, and tasteless. It consists of one carbon atom is covalently bonded to an oxygen atom. In this bond, there are two covalent bonds and coordinate covalent bonds between the carbon and oxygen atoms. Carbon monoxide is produced from the incomplete combustion of carbon compounds, often occur in combustion engines. Carbon monoxide is formed when there is a lack of oxygen in the combustion process. Carbon monoxide is highly flammable and produces a blue flame, producing carbon dioxide [3].

1.3 Microcontroller ATmega32

8-bit microcontrollers of the family Atmel AVR output. This microcontroller is designed based on the AVR RISC architecture (Reduced Instruction Set Computer) which executes one instruction in one clock cycle so as to achieve the execution of instructions by 1 MIPS (Million Instructions Per Second) every 1 MHz clock frequency of the microcontroller used. Used clock frequency can be set via the fuse bits and crystals used. If a crystal is used by 16 MHZ so that its clock frequency of 16 MHz, the execution reached 16 MIPS instructions [4].

1.4 Gas sensor TGS 2600

The Taguchi Gas Sensor (TGS) 2600 (Figaro Engineering Inc., Osaka, Japan) is a low-power consumption highsensitivity gas sensor for the detection of air contaminants such as those typical for cigarette smoke [5]. TGS 2600 sensor is used to detect the contaminated air, gas sensors feature uses a low voltage (low power consumption), has a high sensitivity to contaminated air, and small size. These sensors are included in the class of analog sensors, this means that the gas sensor has a value varied figaro. This sensor has a value of Rs will change when exposed to the gas, and also has a heater (heater) which is used to clean the room sensor of contamination outside air. In order to detect the CO gas sensor connected to ADC microcontroller in port A with a voltage of 5 volts DC the ADC range 0-1023. For the

detection of CO gas is determined that the maximum value of the sensor for detecting CO gas is 30 ppm [6]. The provisions of the CO gas obtained membership function for the value of the membership function with a range of 0-30 ppm. So in order to scale the membership function in accordance with 30 ppm then the ADC value must be divided by 34 which can be searched by the following equation.

$$ADC\ devider\ value = \frac{1023}{30\ ppm} \tag{1}$$

Description:

- ADC divider value = 34
- ADC value: 1023
- Gas CO (ppm): The maximum

2 RESEARCH METHODOLOGY

2.1 Planning and Design

Steps being taken in this research is the method of planning and design. The planning stage is to establish a system that will be made and know the working principles to facilitate the process of making tools. The next step is to create a block diagram of the system itself so that it can describe the processes that will be done in the design tool. Here is the design tool of CO gas detection using ATMega microcontroller 32 [7].

CO gas leak detector will work using TGS sensor is a sensor that detects the exhaust gas in the air in the form of CO gas. If the CO gas has been detected, the sensor TGS will give input (insert) to the microcontroller, then from the microcontroller has three outputs namely LCD, buzzer (alarm) and a DC motor for moving the windshield automatically. By using two sensors, namely TGS 2442 and TGS 2600. Both these sensors have different sensitivity. TGS 2442 sensor is used to detect air pollution comes from vehicle exhaust, such as a car or motorcycle exhaust fumes. While TGS 2600 sensor is used to detect the level of air pollution by gases CO (carbon monoxide). If the polluted air around the sensor then the second sensor will immediately react to detect the air disekitanya [3]. In determining the air condition then used the data logger to record the condition of the value of the levels of CO gas reading in ppm with the size stored in the EEPROM memory. If the LCD displays the words "Safe status", it means that the content of CO gas in the car is in a safe condition. However, if the LCD displays the words "danger Status" then the air inside the car has gas contains CO which is very dangerous because it has exceeded the maximum threshold of air that has been set. Then the buzzer will sound indicating that a dangerous gas leak CO followed by a windshield that opens automatically. When the air inside the car slowly started to be counteracted, it will automatically be buzzer will die, then other output will adjust, such as the display on the LCD will change to "safe status". Motor driver serves as a link or an additional device for connecting between microcontroller with a DC motor which is driving an automatic car windows open.

Driver serves as an additional liaison to connect between microcontroller with a buzzer and a fan. Explanation of the flow diagram of CO gas detection equipment in the car with the SMS Gateway and Data Logger Figure 1 below:

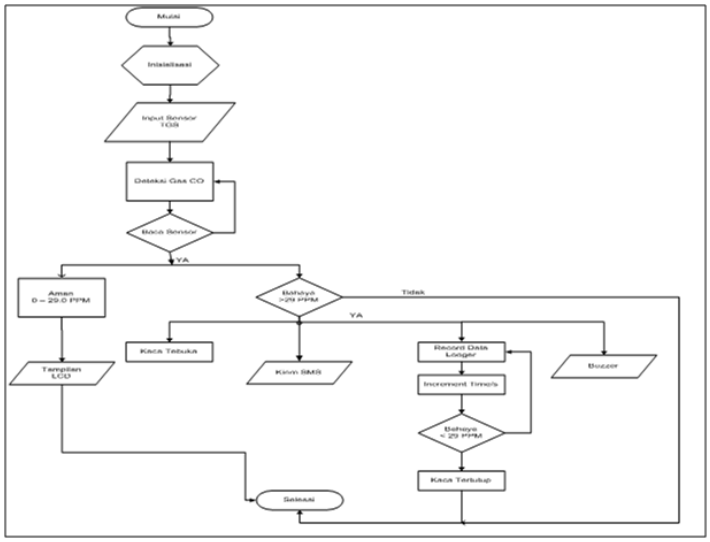

Figure 1: Flowchart Systems CO Gas Detection Equipment

As for the plot and the workings of the flow chart is first initializing serial input was last seen on the CO gas sensor, which will appear in gas levels. Then the sensor will work based falutan smoke is detected by the sensor and sensor TGS 2442 TGS 2600. If CO gas from 0 to 29.0 ppm, the LCD will display "safe status", the buzzer is off, and the windshield does not open automatically. If the CO gas is greater than¿ 29.0 ppm, the LCD displays "Status danger", active buzzer, followed by active DC motor automatically open car windows, the system will send an sms conditions approaching danger, danger and very dangerous to the user manual vehicle car. Where all work towards palutan smoke sensor CO gas will be stored in the internal memory EEPOM Data Logger. Once this is done then the working flowchart of a microcontroller system back repeated from the beginning of the program.

To detect CO gas sensor connected to ADC microcontroller port D with a voltage of 5 volts DC with ADC range 0-1023 for its ADC value. For the detection of CO gas is determined that the maximum value of the sensor for detecting CO gas is 30 ppm [6]. The provisions of the CO gas obtained membership function for the value of the membership function with a range of 0-30 ppm. So in order to scale the membership function in accordance with 30 ppm then ADC value is divided by 34:

$$ADC\ devider\ value = \frac{ADC\ value}{CO\ (ppm)} \tag{2}$$

Description:

- CO (ppm) levels of CO gas = maximum desired
- ADC value = 1023, then ADC divider value = 34

3 RESULTS AND DISCUSSION

3.1 Measurement and Testing Results Work Sensors Gas Co and Data Logger

Here is a table of test results using the CO gas sensor readings TGS 2600 is to detect pollutants smoke in a car with a data logger for data storage that can be measured in ppm as much as 20 times the measurement in a safe condition:

Table 1: In circumstances Approaching Danger Allocation Recording EEPROM

No	Data Eeprom to	The reading of CO concentration value (ppm) in a state approaching danger	Value readings V out Sensor (Volt)
1	1	10.89	0.87
2	2	13.45	1.075
3	3	13.53	1.081
4	4	13.24	1.058
5	5	14.12	1.128
6	6	14.23	1.137
7	7	14.81	1.183
8	8	14.29	1.142
9	9	14.96	1.195
10	10	15.87	1.268
11	11	16.27	1.3
12	12	18.35	1.466
13	13	18.34	1.465
14	14	18.92	1.512
15	15	19.58	1.565
16	16	19.34	1.545
17	17	19.29	1.541
18	18	19.78	1.581
19	19	19.76	1.579
20	20	19.23	1.537
		328.25	
	Average	16.4125	

The following Figure 2. Graph Results The CO gas concentration readings In Danger Approaching the following circumstances:

Figure 2. The graph of test results using the CO gas sensor readings TGS 2600 is to detect pollutants smoke in a car with a data logger for data storage that can be measured in ppm as much as 20 times the measurement in conditions approaching danger shows that the value of sensor readings reach close to 20 ppm. From the test results using a CO gas sensor readings TGS 2600 is to detect pollutants smoke in a car with a data logger for data storage that can be measured in ppm as much as 20 times the measurement in conditions of Danger:

The following Figure 3 Graph Results The CO gas concentration readings In a State of

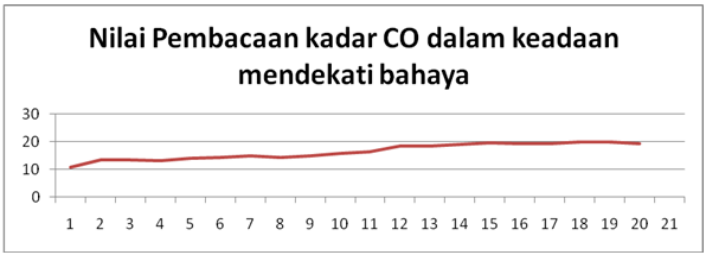

Figure 2: Graph CO gas concentration readings Value In circumstances Approaching Danger

Table 2: In the State of Emergency Allocation Recording EEPROM

No	Data Eeprom to	The The reading of CO concentration value (ppm) in danger	Value readings V out Sensor (Volt)
1	24	21.21	1.695
2	25	21.34	1.705
3	26	21.34	1.705
4	27	21.43	1.712
5	28	21.46	1.715
6	29	21.89	1.749
7	31	22.45	1.794
8	32	22.57	1.804
10	34	23.56	1.883
11	35	23.56	1.883
12	36	24.58	1.964
13	37	24.92	1.991
14	38	24.89	1.989
15	39	24.99	1.997
16	40	25.45	2.034
17	41	25.65	2.05
18	42	24.65	1.97
19	43	24.56	1.963
20	44	25.11	2.007
		469.07	
	Average	23.4535	

Emergency following:

Here are the results of testing the CO gas sensor readings using TGS 2600 is to detect pollutants smoke in a car with a data logger for data storage that can be measured in ppm of 20 times measurements in extremely dangerous conditions:

The following Figure 4. Graph Results The CO gas concentration readings In Case It Danger below:

Figure 4. The graph of the test results using a CO gas sensor readings TGS 2600 is to

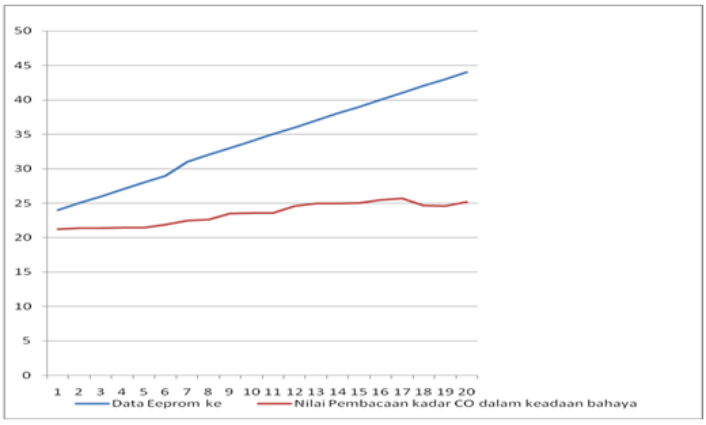

Figure 3: Graph Value CO gas concentration readings In a State of Emergency

Table 3: In the circumstances Highly Danger Allocation Recording EEPROM

No	Data Eeprom to	The reading of CO concentration value (ppm) in a state of very dangerous	Sensor reading out the value of V (volt)
1	51	25.54	2.041
2	52	25.38	2.028
3	53	25.67	2.051
4	54	25.98	2.076
5	55	26.67	2.131
6	56	26.73	2.136
7	57	26.79	2.141
8	58	26.58	2.124
9	59	27.52	2.199
10	60	27.54	2.201
11	61	27.56	2.202
12	62	27.54	2.201
13	63	27.54	2.201
14	64	27.69	2.213
15	65	27.68	2.212
16	66	29.45	2.353
17	67	29.54	2.361
18	68	29.48	2.356
19	69	29.47	2.355
20	70	29.45	2.353
		549.8	
	Average	27.49	

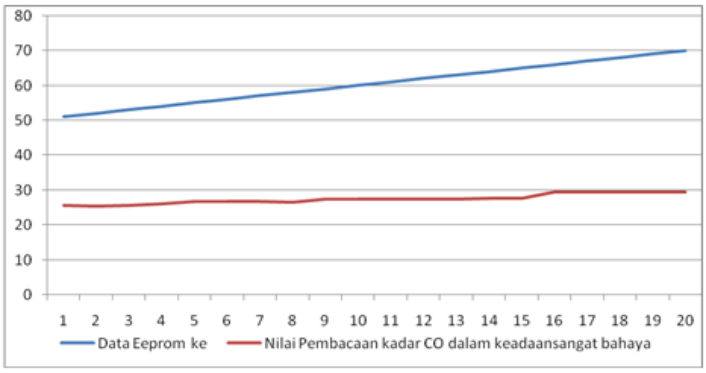

Figure 4: Graph Value CO gas concentration readings In a State of Emergency

detect pollutants smoke in a car with a data logger for data storage that can be measured in ppm of 20 times measurements in extremely dangerous conditions indicate that the value of sensor readings reach close to 30 ppm and storage of data logger showed 70 ppm.

3.2 Discussions

In the measurement value sensor work against palutan CO gas can be seen that under the terms that have been made in controlling the levels of CO gas in a closed car is seen that the greater the level of gas that can be detected by the sensor, the greater the value of the voltage generated by each sensor , Based on test results by conducting 20 trials in reading EEPROM Data Logger is the importance of the value of the average measurement of gas detected by the CO gas safety is an average value of 4.3265 ppm. Approaching conditions Danger average value 16.4125 ppm, Danger condition average value 23.4535 ppm and very dangerous conditions with an average value of 27.49 ppm. As for the output voltage of each gas is a CO gas sensor safe condition average value of 0.34535 V, 1.3114 V condition of approaching danger, Danger Conditions 1.87425 V, and a very dangerous condition 2.188526 V.

4 CONCLUSIONS AND RECOMMENDATIONS

Based on the formulation of the problem, the results of research and discussion presented earlier can be concluded as follows:

1. The results based on testing that was done on the leak detector toxic gases CO in cars using SMS Gateway and Data Logger, the authors conclude with the obtained condition when active sensor levels of CO gas is detected indicates output ¡29.0 ppm, the LCD will display "clear status" and if the levels of CO gas is detected achieve¿ 29.0 ppm, the LCD displays "status danger" and the buzzer lit followed by a DC motor that drives down the windshield automatically.

2. For the average margin of error gas output obtained when a value of 4.3265 ppm and 27.49 ppm safe condition when hazardous conditions.

References

[1] Badan Pusat Statistik. Perkembangan Jumlah Kendaraan Bermotor Menurut Jenis tahun 1987-2013. Available: *http://www.bps.go.id/linkTabelStatis/view/id/1413*

[2] A. Ferdian. (2014). Awas Kebocoran Gas Karbon pada AC Mobil. Available: *http://otomotif.kompas.com/read/2014/08/07/Awas.Kebocoran.Gas.Karbon.pada.AC.Mobil*

[3] Figaro USA Inc., 2007, *TGS 2442-for the detection of Carbon Monoxide*, ed.

[4] A. Winoto, 2008, *Mikrokontroler AVR ATmega8/16/32/8535 dan Pemrogramannya dengan Bahasa C pada WinAVR.* Bandung: Informatika.

[5] W. Eugster and G. Kling, Performance of a low-cost methane sensor for ambient concentration measurements in preliminary studies, *Atmospheric Measurement Techniques*, vol. *5*, pp. 1925-1934.

[6] E. Sari Rahma, *Toxic Gas Leak Detector tool CO By Car Using Array Sensor with Fuzzy Controller.* Palembang: Computer Engineering Department, Polytechnic Sriwijaya.

[7] A. Bejo, 2008, E*ase Secret C and AVR Microcontroller C language in ATMega8535.* Yogyakarta: Graha Science.

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