



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATIC CAR FIRE EXTINGUISHER SYSTEM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree in Engineering Technology (Industrial Electronics) with Honours

by

MUHAMAD KAMIL BIN ABDUL WAHAB

B071110157

901025-07-5657

FACULTY OF ENGINEERING TECHNOLOGY

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Automatic Car Fire Extinguisher System**

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.....

(Project Supervisor)

ABSTRAK

Projek ini bertujuan membina sistem pemadam kebakaran kenderaan secara automatik. Statistik kebakaran yang dikeluarkan oleh Jabatan Bomba dan Penyelamat Malaysia pada tahun 2007 hingga 2011 menunjukkan peningkatan jumlah kebakaran kenderaan meningkat daripada tahun ke tahun. Selain itu, kes kematian akibat daripada kebakaran kenderaan perlu diambil perhatian kerana ia kemalangan yang boleh dielakkan. Punca kebakaran kenderaan antaranya adalah akibat daripada kemalangan, penyenggaraan kenderaan yang tidak sempurna serta pengubahsuaian kenderaan. Justeru itu, satu sistem pemadam kebakaran automatik dicadangkan di dalam tesis ini. Melalui pemadam kebakaran automatik ini, kehadiran api didalam kawasan enjin kenderaan dapat dipadamkan secara automatik. Pemadam kebakaran ini memiliki peranti elektronik yang menggunakan litar Arduino Uno, pengesan suhu dan pengesan cahaya yang ditempatkan di bahagian enjin kenderaan yang merupakan bahagian yang berisiko tinggi mengalami kebakaran. Pengesan suhu dan pengesan cahaya digunakan pada litar tersebut berfungsi untuk mengesan kenaikan suhu dan pertambahan cahaya di bahagian enjin kenderaan dan litar penguat pembanding akan mengaktifkan injap solenoid yang dipasangkan pada tangki pemadam kebakaran jenis debu kering. Debu kering akan disemburkan pada seluruh bahagian enjin. Pemadam kebakaran berunsur debu kering dipilih kerana ia merupakan pemadam kebakaran universal yang mampu memadamkan semua jenis kebakaran.

ABSTRACT

This project aims to build Automatic Car Fire Extinguisher System. Fire statistics released by Fire and Rescue Department, Malaysia in 2007 to June 2011 showed that the increasing the number of vehicle fire from year to year. In addition, the number of deaths from vehicle fire should be to take note because it was an accident that could have been avoided. Vehicle fire are cause a result of an accident, improper maintenance of vehicles and vehicle modifications. Hence, an automatic fire extinguishing system proposed in this thesis. In this automatic car fire extinguisher system, the presence of fire in the car engine area can be extinguish automatically. The extinguisher have electronic device that uses the Arduino Uno circuits, heat temperature sensor and flame sensor located on the engine that is the high risk of a fire due to accident. Heat temperature sensor and flame sensor used in this circuit to detect the increasing the temperature and increasing of light in the vehicle's engine area and the Arduino Uno circuit will activates the solenoid valve that is installed on the tank fire extinguisher dry powder type. Dry powder will sprayed on all parts of the engine. The fire extinguisher dry powder was selected because it is a universal that can to extinguish all types of fires.

DEDICATION

I want to thanks to my family, lecturer and friends that give me extra spirit to continue develop this project.

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In the name of Allah S.W.T, the most gracious and merciful, praise to Allah the lord of universe and may blessing and peace of Allah be upon his messenger Muhammad S.A.W. First, and foremost thank to Allah for giving me wellness and ideas to do this project. Without any of it, I surely cannot complete this project in the time given.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

VFES	-	Vehicle Fire Extinguisher System
LDR	-	Light Dependent Resistor
USB	-	Universal Serial Bus
A/D	-	Analog to Digital
MHz	-	Mega Hertz
DC	-	Direct Current
ICSP	-	In Circuit Serial Programming
HZ	-	Hertz
IC	-	Integrated Circuit
I/O	-	Input/Output
LED	-	Light Emitting Diode
MB	-	Mega Byte
IRED	-	Integration of Renewable Energy Sources and Distributed
PCB	-	Printed Circuit Board Assembly
PIC	-	Programmable Interface Controller
Rx	-	Receiver
Tx	-	Transmitter
UART	-	Universal Asynchronous Receiver Transmitter
UV	-	Ultra Violet
VB	-	Visual Basic

CHAPTER 1

INTRODUCTION

1.1 Project Background

According to fire statistics between 2007 to 2011 in Malaysia, released by the fire and rescue department of Malaysia, showed that the vehicle fire is the third highest after the fire the plantation and buildings fire. In 2008 the recorded number of vehicle fires is 2,208 cases and in 2011 the number of vehicle fires has increased to 3,102 cases. According to Megat Lutfi Megat Rahim (2012) the statistic show the number of vehicles fires in Malaysia increasing every year. The number of cases is a real concern because it involves the lives of individuals.

Fire can occur due to various factor such as improper vehicle maintenance, accidents and engine malfunction. In most accidental fires, the fire begins in the engine compartment. Most vehicle fires are not caused by engineering defects but they are caused by improper maintenance reported by the Toyo Land (n.d). In addition, there are about half a dozen flammable liquids associated with a vehicle. There are an additional number of flammable solids, or “solid propellants,” that contribute to fire and depending on the vehicle, any number of hoses and pumps that move flammable materials past hot areas of the engine. Any leak in a hose or pump will allow flammable liquids to flow onto hot engine block or electrical systems. Accident is also caused by vehicle fires may also occurs vehicles collision. It also unexpected especially one resulting in damage or harm. Fire can occur at any time when oxygen, fuel and heat are present. When all three of these elements come together, combustion is the result.

Only one of these elements is removed, the threat of fire can be stopped. Thus, if oxygen, heat or the fuel supply can be removed, there is minimal risk of fire (IFSTA, 2008).



Figure 1.1 Newspaper writing of a vehicle coalition resulting in a fire at KM 231.6 Nort-Sout Expresway

Figure 1.1 show newspaper articles by myMetro (2012) Fire and rescue tried to extinguish the fire from the trailer that caught fire after being hit from the back by a car in KM231.6 the North-South Expressway heading north near Pedas Toll Plaza.

Furthermore, the vehicles fire also can occur when there is cause from engine malfunction due to overheating. It is because the user of vehicle does not know when their car or vehicle occur to overheat. Overheating can damage all the component or wire part at the engine and the fire can fire their vehicle. The Fire and Rescue Department Malaysia advised all of the vehicles owner, to keep at least one fire extinguisher in vehicles as a safety measure. However, not all of the vehicle owner know how to use the extinguisher. So, if vehicle owners just only have the fire extinguisher and do not know how to use it, it does not help. In addition, in situation such as vehicle coalitions there is no time to pick up the fire extinguisher and put out

the fire. And in most cars passengers are not even able to move much to pick up the extinguisher. Therefore, the automatic car fire extinguishing device is expected to be used in these situation.

Table 1.1 shows the statistic from Fire and Rescue Department Malaysia, according to the number of fire breakout by type in Malaysia from 2007 to 2011. In 2007, the number of vehicle fire is 2,052 case and increased to 156 case in 2008. The statistic indicates the number of vehicle fire increase every year and are very worrying because fire is one involving sacrifice of life.

Table 1.1 Statistic from Fire and Rescue Department Malaysia

Jadual 4.10: Bilangan kebakaran mengikut jenis kebakaran, Malaysia, 2007-2011
Table 4.10: Number of fire breakouts by type, Malaysia, 2007-2011

Jenis kebakaran <i>Type of fire breakout</i>	2007	2008	2009	2010	2011
Jumlah <i>Total</i>	20,225	21,524	29,417	29,052	28,741
Bangunan dan isinya <i>Buildings and its contents</i>	3,447	3,556	5,067	5,240	5,689
Kenderaan <i>Vehicles</i>	2,052	2,208	2,483	2,726	3,102
Mesin dan alat perkakas lain <i>Machinery and other equipment</i>	1,123	1,186	1,168	1,102	1,375
Petrol dan bahan kimia <i>Petrol and chemicals</i>	35	28	24	29	26
Gas	659	783	645	683	678
Kebun/hutan/beluka/lalang <i>Plantation/jungle/weed/bush</i>	7,056	7,525	11,926	11,386	8,731
Gerai <i>Stalls</i>	75	83	183	216	146
Kapal terbang <i>Aeroplane</i>	-	-	3	4	2
Kapal laut <i>Ship</i>	22	25	37	31	22
Lain-lain <i>Others</i>	5,756	6,130	7,881	7,635	8,970

Sumber: Jabatan Bomba dan Penyelamat Malaysia
Source: Fire and Rescue Department, Malaysia

Automatic car fire extinguisher is a safety device in a vehicle. This device works to automatically extinguish fire in the presence of fire in case where fire occur in the engine due to various factor such as accident and engine malfunction. The device uses two sensor, heat temperature sensor and flame sensor to detect the heat and brightness of the fire. Automatic car fire extinguisher system will spray dry powder around the engine when the sensor will detect the fire at the engine area. This system is expected to help to reduce tragedies cause by fire in vehicles.

1.2 Objective Of Project

The objective of the project is to design in the event where fire occur in the vehicle's engine, two device will automatically and efficiently to extinguish the fire.

1.3 Problem Statement

According to the Head of Operations Management Branch Fire Department, Fire and Rescue Department Malaysia, Yahaya Madis (2012), case involving the car on fire in this country is increasing every year achievements in 2006 with 1,811 cases and the record of vehicle fires following the year is 2,052 case and in 2008 the number of vehicle fire increase again to 2,101 case. He also explained the cause of the vehicle fire are by accidents and poor maintenance. In addition he advised private vehicles in the fire to keep their vehicles as a safety measure. He also advised all user of vehicle not to panic in the situation of a fire, but to act quickly to save lives and control the fire.

Figure 1.3 show newspaper articles as report by Megat Lutfi Megat Rahim (2012) the number of vehicle fire increase at every year. According Branch Chief of Fire Operations Malaysian, the user must to keep fire extinguishers in their vehicles, he also reminds all vehicle owners to remain to keep calm to meet the situation of an emergency, because in an emergency situation of those affected if having to fear and hard to be put out the fire. This factor can be seen through media reports of fires that occur in Malaysia. Results from investigation and interviews carried out on victim of a horrific experience and dismay, the conclusion can be made that the early action can save their lives and property. So, from the conclusion is a main factor to make the project automatic car fire extinguisher system.

"Jika melihat kepada bilangan kes, ia meningkat setiap tahun. Walaupun peningkatannya tidak mendadak, ia perlu diberi perhatian serius kerana ia melibatkan nyawa," katanya.

Ujarnya lagi, punca utama kebakaran kereta disebabkan oleh kemalangan iaitu pelanggaran kereta dengan kereta atau jentera berat lain. Selain itu, kebocoran minyak petrol juga menjadi punca.

Menyentuh mengenai lokasi kejadian, Tuan Yahaya tidak dapat memberi penjelasan yang spesifik kerana kemalangan yang melibatkan kebakaran kereta boleh berlaku di mana-mana sahaja sama ada di lebuhraya, jalan persekutuan mahupun jalan kampung.

"Tetapi peratusan kes kemalangan kebakaran kereta yang menyebabkan kematian tidak tinggi. Namun saya menasihati setiap pemilik kereta persendirian supaya menyimpan alat pemadam api di dalam kenderaan masing-masing sebagai langkah keselamatan.

"Bukan mahal, beli alat pemadam api jenis natrium hidrogen karbonat/amonium sulfat seberat tiga kilogram pada harga antara RM60 hingga RM80.

"Situasi mungkin panik tetapi sekiranya kita bertindak pantas ___ ia dapat menyelamatkan jiwa dan juga harta seseorang," ujarnya.

Figure 1.3 Comment from Branch Chief Fire Operation

1.3.1 Experience Emergency Victims of Vehicles Fire

Figure 1.3.1 show the newspaper article as report by Norrasyidah (2012) reported an incident that occurred in 2012, the report made by Harian Metro the Fire and Rescue Department Malaysia aims to bring awareness to all vehicle user about the importance step of safety in vehicles. In this case, the victim are able to ask for help from the public to rescue victims trapped in a accident and vehicle fire, but people are not able to help and getting the fire was flaming and killed the victims trapped in the vehicle. They also has confirmed the incident that occur from internal engine system.

Takut kereta meletup

Lelaki cemas nampak api bawah kereta milik ibu lari belakang perhentian stesen bas

>>Oleh Norrasjidah Arshad
an@hmetro.com.my

SHAH ALAM: "Selepas nampak api di bawah kereta, saya terus melarikan diri ke belakang perhentian bas berhampiran kerana takut kereta meletup dan mencederakan saya," kata Mohd Khairul Zaman, 37, Mohd Khairul yang memandu kereta Perodua Kembangan ibunya dalam perjalanan ke Masjid Negeri berdepan saat cemas selepas kereta dipandu tiba-tiba terbakar, jam 1 tengah hari kelmarin.

Beliau berkata, sebelum kejadian, dia baru keluar dari Plaza Alam Sentral (PAS) bagi menguruskan pendaftaran syarikatnya.

Katanya, tidak sampai lima minit memandu, dia menghidu bau hangit dan mendapati hadapan kereta mula mengeluarkan asap yang banyak secara tiba-tiba.

Bimbang keadaan lebih buruk berlaku, dia terus keluar memeriksa punca asap ter-

babit dan mendapati api menyala di bawah kereta selain beberapa komponen kereta mula terbakar.

"Api tidak terlalu besar dan saya memang boleh memadamkannya. Tapi saya bimbang sekiranya berlaku letupan besar memandangkan kebakaran berlaku berdekatan enjin dan potensi meletup adalah tinggi.

"Panik dengan keadaan kereta terbakar, saya segera menghubungi bomba dan melihat saja kereta itu terbakar," katanya.

Dia yang juga seorang peniaga berkata, kebakaran berkenaan memusnahkan barangan berharga milik ibunya seperti kasut, cermin mata dan pakaian satu kerugian bernilai RM15,000.

"Saya bersyukur kerana nyawa masih selamat biarpun hampir 95 peratus bahagian kereta terbakar.

Sementara itu, jurucakap bomba berkata, mengesahkan kejadian dan kebakaran dipercayai berpunca kerosakan sistem dalaman enjin.



HANGUS...anggota bomba memeriksa kereta dipandu Mohd Khairul (kiri) yang terbakar, semalam.

Figure 1.3.1 HarianMetro 7 December 2012

Figure 1.3.2 show Kosmo newspaper that reported a vehicle fire incident in Kuala Lumpur on 23 September 2012. Incident involving a driver who suffered damage to the vehicle and the vehicle is blocking the traffic. The police are getting complaints about the traffic congestion in the area to giving some helping to remove the damaged vehicle. However, suddenly the vehicle catch the fire, but the woman managed to escape. The fire brigade rushed to the scene after receiving the report and managed to extinguish the fire, but the vehicle was completely burned. This case proves that in this situation, no early action can be taken to extinguish fires even if the vehicle is still on fire. Possibility the police came to help and the people who are near the area does not have a fire extinguisher as recommended by the Malaysian Fire and Rescue Department. The automatic car fire extinguisher system is expected to positively impact the vehicle fire statistics in Malaysia.

Wanita cemas kereta terbakar



REAKSI Umi selepas melihat kenderaannya terbakar ketika melalui jambat Jalan Tun Razak dekat bulatan Loke Yew semalam

KUALA LUMPUR - Seorang wanita nyaris maut apabila kenderaan jenis Mitsubishi Storm yang dipandunya terbakar di atas jambat Jalan Tun Razak berhampiran bulatan Loke Yew di sini semalam.

Kejadian mencemaskan pukul 11 pagi itu berlaku ketika wanita berusia 26 tahun yang dikenali sebagai Umi memberhentikan kenderaan berkenaan selepas enjinnya terhenti secara tiba-tiba.

Pekerja di sebuah syarikat swasta itu kemudian cuba menghidupkan kenderaannya tetapi gagal sebelum anggota polis yang tiba selepas menerima aduan kesesakan jalan membantunya untuk menolak kenderaan itu ke tepi.

Tanpa disangka, kenderaan itu terus disambar api di bahagian enjin sebelum wanita itu bergegas keluar sebaik melihat api tersebut.

Sepasukan bomba dari Balai Bomba dan Penyelamat Cheras yang menerima maklumat pada pukul 11.08 pagi bergegas ke tempat kejadian untuk memadam kebakaran tersebut.

Jurucakap bomba memberitahu, pihaknya mengambil masa sekurang-kurangnya 10 minit untuk mengawal kebakaran itu namun kenderaan itu telah terbakar sepenuhnya ketika mereka tiba.

Figure 1.3.2 Kosmo 23 September 2012

1.4 Scope Of Project

To achieve the project objectives, there are three work scope that must be are concern:

1.4.1 Circuit Design and development.

Automatic Car Fire Extinguisher system is an electronic device that must detect and extinguish fires when it occurs. An Arduino Uno circuit is developed which will compare the voltage input from a heat temperature sensor, flame sensor which will trigger the fire extinguisher dry powder element. The heat temperature sensor detects a high temperature while the light sensor detect light from fire.

1.4.2 Implementation in a car engine model.

The sensors and the fire extinguisher nozzle will be attached close to the engine. The nozzle fire extinguisher is connected solenoid valve which is mounted on the cylinder powder tank. The tank will be placed in interior of the vehicle. Testing the fire extinguisher system after installing at the engine and doing an analysis for this project.