UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF KITCHEN GAS LEAKAGE DETECTION USING ARDUINO TO PREVENT UNPLANNED TRAGEDY

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Industrial Electronic) With Honours.

by

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ABSTRAK

Projek ini adalah mengenai Pengembangan Pengesanan Kebocoran Gas Dapur Menggunakan Arduino Untuk Mencegah Tragedi Tidak Dirancang. Di rumah di mana gas petroleum cecair (LPG) dirawat dan digunakan, kebocoran gas mengakibatkan masalah yang serius dan perlu dipertimbangkan. Kebocoran gas mengakibatkan pelbagai insiden yang mengakibatkan kerugian kewangan, kecederaan kepada manusia dan kerosakan harta benda. Tujuan projek ini adalah untuk merekabentuk sistem yang mengesan kebocoran gas dan penggera pengguna dengan menunjukkan penggera dan status, serta mematikan injap bekalan gas sebagai langkah keselamatan utama. Shutdown injap solenoid berhenti aliran gas lebih jauh ke dalam periuk untuk mencegah wabak api daripada cuba menyalakan periuk. Tambahan pula, sistem ini datang dengan pencegahan kebakaran dengan menggunakan pemercik sistem sama. Sistem ini adalah pendahuluan, kerana ia tidak menimbulkan gangguan bunyi dengan amaran yang sentiasa dibunyikan, tetapi pembonceng berhenti bersuara apabila kepekatan gas di sekelilingnya jatuh selepas kebocoran dan membuka semula injap solenoid. Sistem ini akan mengurangkan kecederaan dan kerugian akibat kebocoran gas yang disebabkan oleh letupan dan meningkatkan keselamatan manusia.

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ABSTRACT

This project is all about Development of Kitchen Gas Leakage Detection Using Arduino To Prevent Unplanned Tragedy. At homes where liquid petroleum gas (LPG) is treated and used, gas leakages resulting become a serious problem and need to be considered. Gas leakage results in multiple incidents resulting in financial loss, injury to humans and property damage. The purpose of the project is to design a system which detects gas leakage and alarms the user by showing the alarm and status, as well as switching off the gas supply valve as a primary safety measure. The solenoid valve shutdown stops further gas flow to the cooker to prevent fire outbreak from attempting to ignite the cooker. Moreover, this system comes with fire prevention by using system alike sprinkler. The system is an advance, as it does not establish noise disturbance by constantly sounding warning, but the buzzer stops beeping once the gas concentration in the surrounding drops after leakage and reopen the solenoid valve. This work would reduce injuries and losses due to gas leakage caused by explosions and improve the human safety.

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DEDICATION

This dissertation is dedicated to my beloved parents whose unyielding love, support, and encouragement have enriched my soul and inspired me to pursue and complete this project.

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I am making this project not only for marks but to also increase my knowledge as well. Thanks again for those who help me directly or indirectly in completing this project.

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TABLE OF CONTENTS

		PAGE
TABLE OF CONTENTS		**x-xiii**
LIST OF TABLES		**xiv**
LIST OF FIGURES		**xv-xviii**
LIST OF APPENDICES		**xix**
LIST OF SYMBOLS		**xx**
LIST OF ABBREVIATIONS		**xxi-xxii**
CHAPTER 1	**INTRODUCTION**	**1-7**
1.1	Background	1-2
1.2	Problem Statement	3-4
1.3	Objective	4
1.4	Scope	5-6
1.5	Outline of thesis	7
CHAPTER 2	**LITERATURE REVIEW**	**8-36**
2.1	Efficient LPG Leakage Detector and Auto Turn-Off System Using Arduino Microcontroller	8-9
2.2	LPG Gas Leakage Recognition and Aware System	10

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2.3	GSM Based Gas Leakage Detection & Prevention System for Disabled and Handicapped	11-12
2.4	LPG Gas Monitoring & Automatic Cylinder booking with Alert System Using Arduino	13-15
2.5	Improvement on Gas Leakage Detection and Location System Based On Wireless Sensor Network	15-16
2.6	Controlling Gas Leakage Detection	17-18
2.7	Smart Gas Cylinder Using Embedded System	18-19
2.8	Gas Leakage Alerting System Using GSM	20-21
2.9	Design and Development of Kitchen Gas Leakage Detection and Automatic Gas Shut off System	22
2.10	Cylinder LPG Gas Leakage Detection for Home Safety	23-24
2.11	GSM Based Gas Leakage Detection System	24-26
2.12	Embedded system for Hazardous Gas detection and Alerting	26-27
2.13	A Security Alert System Using GSM For Gas Leakage	27-28
2.14	Design and Implementation of an Economic Gas Leakage Detector	29-30
2.15	Comparison table related previous research	31-35
2.16	Summary	36
CHAPTER 3	**METHODOLOGY**	**37-47**
3.1	Block Diagram of Development Of Kitchen Gas Leakage Detection	37
3.2	Flowchart of Development Of Kitchen Gas Leakage Detection	38
3.3	Software Development	39-40
3.3.1	Arduino Integrated Development Environment (IDE)	39

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3.3.2 Eagle 40

3.4 Hardware Development 41-47

3.4.1 Arduino Nano 41

3.4.2 MQ-2 Gas Detection Sensor 42

3.4.3 KY-026 Flame Detector 43

3.4.4 Temperature Sensor (TMP36) 43-44

3.4.5 Solenoid valve 44

3.4.6 Water pump 45

3.4.7 DC Fan 45-46

3.4.8 Buzzer 46-47

3.4.9 16x2 Liquid Crystal Display (LCD) 47

CHAPTER 4 RESULTS AND DISCUSSION 48-62

4.1 Introduction 48

4.2 Schematic Diagram of Development of Kitchen Gas Leakage Detection Using Arduino To Prevent Unplanned Tragedy 48-49

4.3 Testing Phase 50-60

4.3.1 Initial Condition Testing 50-51

4.3.2 Gas, Fire and Temperature Condition Testing 51-52

4.3.3 Fire and Temperature Condition Testing 53-54

4.3.4 Gas and Fire Condition Testing 54-55

4.3.5 Gas and Temperature Condition Testing 55-56

4.3.6 Temperature Condition Testing 57-58

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4.3.7 Gas Condition Testing 58-59

4.3.8 Fire Condition Testing 59-60

4.4 Prototype of project 61

4.5 Summary 62

CHAPTER 5 CONCLUSION 63-64

5.1 Introduction 63

5.2 Project observation 63

5.3 Recommendation 64

REFERENCES 65-66

APPENDIX 67-76

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LIST OF TABLES

TABLE	TITLE	PAGE
Table 1.1	Causes of Gas Accidents from year 2009 - 2018	4
Table 2.1	Results according to test surroundings	30
Table 2.2	Comparison Table 1	31
Table 2.3	Comparison Table 2	32
Table 2.4	Comparison Table 3	33
Table 2.5	Comparison Table 4	34
Table 2.6	Comparison Table 5	35
Table 4.1	Analysis based on test surroundings	62

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LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	Block diagram of Efficient LPG Leakage Detector	9
Figure 2.2	Prototype of Efficient LPG Leakage Detector	9
Figure 2.3	LPG Gas Leakage Recognition and Aware System	10
Figure 2.4	Flow chart of GSM Based Gas Leakage Detection & Prevention System	12
Figure 2.5	Block Diagram of LPG Gas Monitoring & Automatic Cylinder Booking	14
Figure 2.6	SMS sent to the user mobile	14
Figure 2.7	LCD display and status of LPG Gas Monitoring & Automatic Cylinder Booking	15
Figure 2.8	Block diagram for Transmitter Section	16
Figure 2.9	Block diagram for Receiver Section	16
Figure 2.10	Block diagram of Gas Leakage and Control	18
Figure 2.11	Flow chart Of Smart Gas Cylinder Using Embedded System	19
Figure 2.12	Block diagram of Gas Leakage Alerting System	20
Figure 2.13	The flowchart of Gas Leakage Alerting System	21
Figure 2.14	SMS outcome	21
Figure 2.15	Block diagram of Cylinder LPG Gas Leakage Detection for Home Safety	23

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Figure 2.16	Weight of Gas Cylinder Leakage	24
Figure 2.17	The sensitivity characteristics of the MQ-6 gas sensor towards several gases	25
Figure 2.18	Block diagram of GSM Based Gas Leakage Detection System	26
Figure 2.19	Block diagram of Hazardous Gas detection	27
Figure 2.20	Flow chart of Security Alert System Using GSM for Gas Leakage	28
Figure 2.21	Block diagram of Security Alert System Using GSM for Gas Leakage	28
Figure 2.22	Flowchart of Design and Implementation of an Economic Gas Leakage Detector	30
Figure 3.1	Block diagram of Kitchen Gas Leakage Detection	37
Figure 3.2	Flow chart of Kitchen Gas Leakage Detection	38
Figure 3.3	Arduino IDE Software	39
Figure 3.4	Eagle Software	40
Figure 3.5	Pin Configurations of Arduino Nano	41
Figure 3.6	MQ-2 Gas Detection Sensor	42
Figure 3.7	KY-026 Flame Detector	43
Figure 3.8	Temperature Sensor	44
Figure 3.9	Solenoid valve	44
Figure 3.10	Water pump	45
Figure 3.11	DC Fan	46
Figure 3.12	Buzzer	47
Figure 3.13	16x2 LCD Display	47
Figure 4.1	Schematic Diagram of Development of Kitchen Gas	49

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Figure 4.2	Initial condition of system	51
Figure 4.3	Start up LCD display	51
Figure 4.4	LCD display after 3 seconds	51
Figure 4.5	Coding of Gas, Fire and Temperature Condition	52
Figure 4.6	Gas, Fire and Temperature Condition Testing	52
Figure 4.7	LCD display “GAS FIRE TEMP”	52
Figure 4.8	Coding of Fire and Temperature Condition	53
Figure 4.9	Fire and Temperature Condition Testing	53
Figure 4.10	LCD display “FIRE TEMP”	54
Figure 4.11	Coding of Gas and Fire Condition	54
Figure 4.12	Gas and Fire Condition Testing	55
Figure 4.13	LCD display “GAS FIRE”	55
Figure 4.14	Coding of Gas and Temperature Condition	56
Figure 4.15	Gas and Temperature Testing	56
Figure 4.16	LCD display “GAS TEMP”	56
Figure 4.17	Coding of Temperature Condition	57
Figure 4.18	Temperature Testing	57
Figure 4.19	LCD display “ TEMP”	58
Figure 4.20	Coding of Gas Condition	58
Figure 4.21	Gas Testing	59
Figure 4.22	LCD display “GAS”	59
Figure 4.23	Coding of Fire Condition	60

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Figure 4.24 Fire Testing 60

Figure 4.25 LCD display “ FIRE” 60

Figure 4.26 System after operate 61

Figure 4.27 System before operate 61

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LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1	Gantt Chart 1 of PSM 1	67
Appendix 2	Gantt Chart 2 of PSM 2	68
Appendix 3	Arduino Coding for Development of Kitchen Gas Leakage Detection Using Arduino To Prevent Unplanned Tragedy	69-74
Appendix 4	Annual Report on Liquefied Petroleum Gas (LPG) Related Accidents by The High-Pressure Gas Safety Institute of Japan (KHK)	75
Appendix 5	New Straits Times News Report	76

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LIST OF SYMBOLS

V	-	Voltage

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LIST OF ABBREVIATIONS

LPG	Liquid Petroleum Gas
LED	Light Emitting Diode
GSM	Global System for Mobile communications
ARM	Advanced RISC Machine
LCD	Liquid Crystal Display
SMS	Short message service
PIC	Peripheral Interface Controller
IDE	Integrated Development Environment
IC	Integrated Circuit
ppm	Parts Per Million
WSN	Wireless Sensor Network
AVR	Alf Vegard's RISC
CNG	Compressed Natural Gas
UK	United Kingdom
HEX	Hexadecimal source file
USB	Universal Serial Bus
PCB	Printed Circuit Board
DC	Direct Current
MCU	Microcontroller unit
ASCII	American Standard Code Integration Interchange
ADC	Analog Digital Converter

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PIC Peripheral Interface Controller

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CHAPTER 1

INTRODUCTION

1.1 Background

In the 21st century home provides safety and convenience for many people. A smart home comes with many functions, features and system. In every house the need of gas is much considered. For instance, like Liquid Petroleum Gas (LPG), butane and some other. LPG gas leak accidents have occurred due to human error or in other word man-made factors. Gas leakage is very harmful for the safety of human life. The appliance of gas leakage detection system is a best effective solution to avoid leakage of gas. Gas leakage endangers people's life.

There have many cases regarding gas accident in the world due to gas leakage. As reported by statistics of Institute of Japan in appendix 4 from the year of 1972 to 1989 the number of gas accidents increase dramatically and it's decrease from the year of 1990 to 2001. From 2002 to 2012 the number of accidents starts to increase and decrease slightly in the year 2013 to 2016. Meanwhile, in the year 2017 onwards it's started to increase again and it's needs to be considered. In addition to lives, the number of properties damaged because of gas leakage are enormous. Apart from the detection, the controlling of gas leakage plays an important role. Mostly LPG used in houses or manufacturing. In household appliances LPG mainly used for purpose of cooking.

This project is designed to detect LPG and it will aware the user regarding gas leakage. The buzzer will beep loudly to alert the user and shut off the supply from the cylinder. The exhaust fan run after the gas supply has shut off. Meanwhile, the flame

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detector will be active always to avoid the fire burn from happen. At the same time, this will help to reduce the explosion accident. This system also helps to detect early of fire before the fires getting spread over every place.

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