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This report is submitted to the Department of Mechanical Engineering in partial fulfilment of the requirements for Diploma in Mechanical Engineering.

MECHANICAL ENGINEERING DEPARTMENT

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DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE : SMS NOTIFIER GAS LEAKAGE DETECTOR

SESSIONS: JUN 2018

1. I am Muhammad Salman bin Ahmadi, a final year student of Politeknik Sultan Salahuddin Abdul Aziz Shah in diploma Mechanical Engineering at Persiaran Usahawan, 40150 Shah Alam, Selangor.

(Can refer as Politeknik Shah Alam)

2. I agree to relinquish the ownership of intellectual property project to 'Politeknik Shah Alam' to meet requirements for the award of the Diploma of Mechanical Engineering.

Created and truth which is recognized by;

……..

MUHAMMAD SALMAN BIN AHMADI

(I/C Number: 000210130285)

Encik Muhammad Faiz Bin Abdullah as the project supervisor at the date: .....

.....

Encik Muhammad Faiz Bin Abdullah

ACKNOWLEDGEMENT

Alhamdulillah, I am most grateful to Allah Almighty for His gifts in blessing, health and kindness that has allowed me to perform and successfully complete this project in time.

Tons of thanks and appreciation to my final year project supervisor, Encik Muhammad Faiz Bin Abdullah for his continuous support, assistance, stimulating ideas and encouragement that helped us to coordinate our project especially in implementing project and writing this report.

Not to forget, a special thanks to my group members, Adib Fadhil Bin Adam and Koh Chia Chuan for giving full commitment and contributing ideas in creating the project. My appreciation to all of you have no boundries.

I also would like to thank the consultant given by my supervisor and panels in our project presentation that had more likely improved our project weaknesses and gave some useful advices and suggestions.

Last but not least, I would like to thank my family members, especially my parents and close friends for moral support and advise. I would like to thank my fellow classmates and friends in which without them, my work would not go as planned. Your support and encouragement are meaningful to me.

ABTRACT

Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and business premises. One of the preventive measures to avoid the danger associated with gas leakage is to install a gas leakage detector at vulnerable locations.

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. Gas Detector where it can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to fix or leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals. Containment into any area where the gas should not be present must be avoided. Because a small leak may gradually build up an explosive concentration of gas, leaks are very dangerous.

Nowadays, existing gas detector is less effective in usage because the user can only detect the gas leakage when they test by using gas detector. It is dangerous since gas leakage must be identified from early of the leak. That is why the Gas Leakage Detector with Notifier System was invented to avoid the fire or explosion occur in the houses or premises. This kind of gas detector will detect the gas continuously as long as there is power supply.

This project used Microcontroller Arduino UNO at the processor where it process the input from the sensor and to GSM module to communicate with the user by sending an alert through SMS. The buzzer will ring until its dangerous concentration of gas is achieved. The benefit of these projects is to prevent the earlier stage of fire because of unattended cooking without a human supervision, could prevent the explosion because of gas leakage.

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INTRODUCTION

1.1 BACKGROUND

LPG is the terminology for Liquefied Petroleum Gas. The gas is made up of hydrocarbon gases comprising of Propane and Butane. LPG is prepared by refining petroleum or "wet" natural gas, and is almost entirely derived from fossil fuel sources, being manufactured during the refining of petroleum (crude oil), or extracted from petroleum or natural gas streams as they emerge from the ground.

As it is a gas, it does not pose ground or water pollution hazards, but it can cause air pollution. As its boiling point is below room temperature, LPG will evaporate quickly at normal temperatures and pressures and is usually supplied in pressurised steel vessels. LPG is also colourless and odourless. However, for safety reasons, an odorant is added to LPG for easy detection of any gas leakage.

LPG is heavier than air, unlike natural gas, and thus will flow along floors and tend to settle in low spots, such as basements. There are two main dangers from this. The first is a possible explosion if the mixture of LPG and air is within the explosive limits and there is an ignition source. The second is suffocation due to LPG displacing air, causing a decrease in oxygen concentration.

Lately, gas leakage problem is highly become current issues that be the main causes of fire burning. This project is produced to detect any leakage of cooking gas and it will alert the user about leakage. User will get the alert in SMS. By using this project it will reduce the accident of fire and explosion. It also helps the early detection of gas before the concentration of gas reaches the dangerous level.

1.2 PROBLEM STATEMENTS

Natural gases such as Liquefied Petroleum Gas (LPG) are widely used in the whole world. LPG is used for cooking in home or hotel. It is also used in certain gas based industry. Although the procedure of installing LPG-based system is very tight, It could not give 100% guaranteed that the LPG-system will not having leakage. Even though human still have certain weakness. Human cannot detect the presence of natural gases as fast as the sensor do. Thus, the use of gas sensing system is hugely needed to give real-time monitoring of the gas system.

In certain cases, gas leakage can cause fire that will destroy human property. The large scale of fire also could contribute to serious injury or death. This is due to the fire station got delay information about the fire occurred.

The current products that are in the market are function as gas detector. It will only detect a gas and trigger an alarm. The main problem is that even the alarm is triggered but if the user is not at home or premise, the user will not get to know the leakage of gas occur.

Therefore, this project shall be able to resolve the problem stated. This is because this project “SMS NOTIFIER GAS LEAKAGE DETECTOR” is able to sense the presence of LPG. Besides that, it give information more efficient as it is also capable to send out an SMS to the owner.

1.3 OBJECTIVES

The objectives of this project are:

1. To design a system that can detect the presence of LPG
2. To send SMS alert to the user if gas leakage occurred.

1.4 SCOPE OF PROJECT

The scope of this project is to design a system that can detect the presence of natural gases. It can reduce the fire accident and explosion because of the gas leakage. Beside that it also can detect the early stage of gas leakage. This project will only focus for household. It will detect LPG gas.

In this project it uses a sensor that can detect LPG gas, propane, butane and smoke. This project used Microcontroller Arduino UNO at the processor where it process the input from the sensor and to GSM module to communicate with the user by sending an alert through SMS.

Each thing in a world has a limit same goes to this project. This project limitation includes:

- The sensor – the gas and smoke sensor it will only detect LPG Gas (Buttane/Propane) for gas
- The GSM module – the range it will cover only in Malaysia and the coverage of the Telco. The roaming coverage will not include.
- The GSM module its interface through Short Message System. The module will not able to call the user.

1.5 PROJECT SIGNIFICANT

One of the preventive measures to avoid the danger associated with gas leakage is to install a gas leakage detector at vulnerable locations. Gas leakage problem is highly become current issues that be the main causes of fire burning. This project is produced to detect any leakage of cooking gas and it will alert the user about leakage. User will get the alert in SMS. By using this project it will reduce the accident of fire and explosion. It also helps the early detection of gas before the concentration of gas reaches the dangerous level.

1.6 SUMMARY

Gas Leakage Detector with Notifier System is device that detects the presence of gases in an area, often as part of a safety system. It detects gas leakage continuously. When leakage occur, it will alert the user about leakage in SMS. The buzzer will ring to give alert to the people, who are there in the house or premise.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will provide a review about the previous research and existing project that have been made by using reference sources and guidelines as journals, internet, article writing, blog and scientific studies to get an idea about the project design, conception and any information that related to improve the project. With a differences concept and design, there are other creation and innovation of projects done by the other people. The research that is related to this project also covered in this chapter.

2.2 CONCEPT/THEORY

Gas Leakage Detector with Notifier System is the innovation from existing Gas Detector. This project is mainly for an individual who wants to keep their home safe from the risk of burning. The benefit of this project is to detect any leakage of cooking gas and it will alert the user about leakage. Microcontroller Arduino UNO at the processor where it processes the input from the sensor and to GSM module to communicate with the user by sending an alert through SMS. This kind of gas detector is more efficient as the user will get the information faster and the detection of gas is continuous.

2.3 FIRE STATISTICS IN 2015-2018

CAUSES OF FIRES

	2015	2016	2017 (until June)
Electrical sources	2,453	2,005	877
Cigarette butts	860	753	151
Fire sparks	304	229	87
Firecrackers	52	42	15
Mosquito coils, candles and joss sticks	126	98	46
Stoves	752	528	269
Incendiary fire	4,811	4,710	846
Arson	460	493	119
Chemical reaction	19	10	6
Matches	135	132	35

STATISTICS FROM THE FIRE AND RESCUE DEPARTMENT

	2015	2016	2017 (until June)
Number of deaths due to fire	153	107	73
Number of people injured due to fire	467	477	210
Losses due to fire	RM4.3 billion	RM2.8 billion	RM2 billion
Prevented losses	RM29.4 billion	RM35.8 billion	RM34.2 billion
Number of distress calls	82,600	92,307	40,343

INFOGRAPHIC NST

Figure 2.3.1: Fire Statistics in 2015-2017 by Aliza Shah - September 21, 2017

The statistics below show the fire case that occurs in Malaysia for the years of 2017 article. Stove is the third most causing fire based on the statistic in 2017. Incendiary fire and matches are both contribute a lot causes of fires. Based on the statistics from the Fire and Rescue Department, the number of people injured and died are quiet concern even though decrease throughout the years. Not only hurting or killing people, fire can also burn the properties that cause a huge losses to a family or company. This statistic proves that gas leakage is very dangerous that people can not neglect it for their own safety.

2.4 CHARACTERISTICS OF LIQUIFIED PETROLEUM GAS (LPG)

LPG - Propane Boiling Point

Water boils at 100°C or 212°F, becoming a gas (steam).

In contrast, LPG (propane) boils at -42°C or -44°F, becoming gas vapour.

LPG stays liquid because it is under pressure in a gas cylinder.

As a liquid, it looks a lot like water.

It is colourless and odourless in its natural state.

Composition of LPG

Figure 2.4.1: LPG tanks

LPG – Liquefied Petroleum Gas – describes flammable hydrocarbon gases.

These include propane, butane and mixtures of these gases.

LPG, liquefied through pressurisation, comes from natural gas processing and oil refining.

In different countries, the supply can be propane, butane or propane-butane blends.

In Australia, LPG is just propane.

LPG - Propane Density and Specific Gravity

LPG – propane – gas density is 1.55 times heavier than air at 1.898 kg/m^3 vs 1.225 kg/m^3 for air (both 15°C at sea level).

LPG – propane – liquid density is about half that of water at 495 kg/m^3 (25°C) vs 1,000 kg/m^3 (4°C) for water.

Specific gravity of propane and water is 0.495 (25°C) and 1.000 (4°C), respectively.

LPG Density - Specific Gravity of Liquid LPG - Propane

Figure 2.4.2: 1kg of LPG

Unlike water, 1 kilogram of LPG does NOT equal 1 litre of LPG.

LPG density or specific gravity is about half that of water, at 0.51.

In Australia, where LPG is propane, 1kg of LPG has a volume of 1.96L.

Conversely, 1L of LPG (propane) weighs 0.51kg.

1 gallon of liquid propane weighs 4.24 pounds.

The specific gravity (SG) of liquid LPG – Propane – is 0.495 (at 25°C)

Propane is 580.88 kg/m^3 (at boiling point)

The specific gravity (SG) of liquid Butane is 0.601 (at 25°C)

Butane is 601.26 kg/m^3 (at boiling point)

Density of LPG Gas- LPG - Propane is Heavier than Air

The density of gaseous LPG – Propane – is 1.898 kg/m^3 (at 15°C and sea level).

1 ft^3 of propane weighs 0.1162 pounds.

Butane is 2.5436 kg/m^3 (at 15°C and sea level)

In contrast, the density of Air is 1.225 kg/m^3 (at 15°C and sea level).

So, LPG is heavier than air.

Note that LPG gas is also referred to as LPG vapour, which is the more technically correct term.

LPG Melting Point - Freezing Point

Water freezes at 0°C or 32°F, becoming ice.

LPG freezes at a much lower temperature.

LPG (propane) melting point/freezing point is at -188°C or -306.4°F.

LPG - Propane Pressure Varies with Temperature

As mentioned before, LPG is stored in a gas bottle under pressure.

The term “pressure” refers to the average force per unit of area that the gas exerts on the inside walls of the gas bottle.

(LPG Pressure-Temperature Chart shown)

LPG (Propane) Cylinder Pressure Chart			
Temperature		Vapour Pressure	
C	F	kPa	PSIG
54	130	1794	257
43	110	1358	197
38	100	1186	172
32	90	1027	149
27	80	883	128
16	60	637	92
-1	30	356	51
-18	0	152	24
-29	-20	74	11
-43	-45	0	0

Figure 2.4.3: LPG Pressure-Temperature Chart

Pressure measurement is in kilopascals (kPa) or pounds per square inch (psi).

“Bar” is yet another unit of measure for pressure.

1 Bar = 100 kPa, so it is metric based but not an SI unit of measure.

LPG pressure can vary based on temperature, as shown in the chart.

The level of fill in the gas bottle comes into play when the LPG is in use, as it affects the rate of vapourisation.

LPG is a liquefied gas. So, the pressure inside the cylinder will remain the same from full until the vaporistion of the last of the liquid LPG.

Then the pressure will fall, with the use of the last of the LPG vapour.

Odourant Added for Safety

In its natural state, LPG is an odourless gas.

The distinctive smell that people associate with LPG is actually added to it as a safety measure.

Without the addition of an odourant, leaking gas could collect without detection.

Avoid Direct Contact - Cold Burns

Always use caution should to avoid direct exposure, as liquid LPG is cold enough to cause severe cold burns on exposed skin.

Energy Content of LPG - Propane

LPG (propane) contains approximately 25MJ per litre.

This also converts to 6.9kWh.

One gallon of propane contains 91,547 BTU (60°F).

LPG Gaseous Expansion

LPG expands to 270 times the volume when it goes from liquid to gas.

So, 1L of liquid LPG (propane) equals 270L of gaseous LPG.

As there are 1000L in a cubic meter (M^3), 1L of liquid LPG expands to 0.27M^3.

Combustion Formula Equation for LPG - Propane

In the presence of enough oxygen, LPG burns to form water vapour and carbon dioxide, as well as heat.

Formula Equation for Complete Combustion of LPG - Propane:

Propane + Oxygen → Carbon Dioxide + Water + Heat

$C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$ + Heat

Incomplete combustion of LPG (propane) occurs when not enough oxygen is present.

Incomplete combustion results in the production of water, carbon monoxide, and carbon dioxide:

Formula Equation for Incomplete Combustion of LPG - Propane:

Propane + Oxygen → Carbon Dioxide + Carbon Monoxide + Water + Heat

$2\ C_3H_8 + 9\ O_2 \rightarrow 4\ CO_2 + 2\ CO + 8\ H_2O$ + heat

LPG - Propane Flame Temperature

Figure 2.4.4: Complete combustion of LPG

An LPG (propane) flame burns at 1980°C. When it is burning properly, the flame is blue. A yellow or red flame is usually indicative of incomplete combustion.

Limits of Flammability

The lower and upper limits of flammability are the percentages of LPG that must be present in an LPG/air mixture.

This means that between 2.15% and 9.6% of the total LPG/air mixture must be LPG in order for it to be combustible.

LPG Flash Point Temperature

The flash point of LPG (propane) is -104°C or -156°F.

This is the minimum temperature at which propane will burn on its own after ignition.

Below this temperature, it will stop burning on its own.

However, if a source of continuous ignition is present, it will burn below -104°C.

Autoignition Temperature - Propane & Butane

Autoignition temperature is the lowest temperature at which it will spontaneously ignite in air.

This is without an external source of ignition, like a spark or flame.

The autoignition temperature decreases as the pressure or oxygen concentration increases.

The autoignition temperature of LPG – Propane – is 470 °C or 878°F.

The autoignition temperature of Butane is 405°C or 761°F.

Dissipation

LPG gas is heavier than air and will sink to and collect at the lowest point.

If vented to the outside air, LPG will dissipate with the slightest movement of air.

With LPG vented into a sealed structure, with no air movement, the LPG gas will collect on the floor. It will rise toward the ceiling, as more LPG enters into the structure.

Molecular Weight for LPG – Propane – Butane – Isobutane

The molecular weight for LPG – Propane – is 44.097 kg/kmole.

The molecular weight for Butane (n-butane) is 58.12 kg/kmole.

For Isobutane (i-butane), the molecular weight is the same as for n-butane at 58.12 kg/kmole.

LPG Vapour (Gas) Use vs. Liquid Use

LPG (propane) supply is either liquid or vapour.

The difference is in the extraction from supply cylinder or vessel.

Most LPG applications use vapour.

Appliances such as water heaters, room heaters and cookers all use vapour.

If these appliances were to have liquid LPG flow to their burners, the result could be a fire or similar safety hazard.

This is why LPG cylinders should always be upright, so that any gas released is in vapour form only.

2.5 POTENTIAL HEALTH EFFECTS

Methane is not a toxic gas below the below explosive limit of 5% (50000 ppm). However, when methane gases are available at high concentrations, it acts as an asphyxiant. Asphyxiants will replace oxygen in the air and can cause symptoms of oxygen deprivation (asphyxiation) or suffocation. Oxygen is found should be to be at least 18% or harmful effects will occur. Methane will convert to 18% oxygen in the air when present at 14% (140,000 ppm).

The effect of oxygen deficiency in 12-16% to humans is breathing and the pulse rate is increased, with slightly muscular coordinates at 10-14% emotional disturbance, abnormal fatigue from exertion, breathing is interrupted by 6-10%, nausea and vomiting, inability to move freely, collapse, possible lack of awareness and under 6% of seizures movements, gasping, possible respiratory collapse and death.

Methane gas is not irritating to the skin. Contact with the refrigerated liquefied gas compressed gas escaping from a cylinder that can cause cold burns or frostbite. Symptoms such as mild frostbite include numbness, prickling and itching in the affected area. Symptoms of more severe frostbite include a burning sensation and stiffness of the the affected area. The skin may become waxy white or yellow. Blisters and tissue death, gangrene may also develop in severe cases. Methane gas is not irritating to the eyes. Contact with liquid or cold gas compressed gas escaping from a cylinder that can cause freezing burns or eye. Permanent eye damage or blindness can occur.

2.6 PREVIOUS JOURNAL

Gas detectors measure and indicate the concentration of certain gases in an air via different technologies. Typically employed to prevent toxic exposure and fire, gas detectors are often battery operated devices used for safety purposes. They are manufactured as portable or stationary (fixed) units and work by signifying high levels of gases through a series of audible or visible indicators, such as alarms, lights or a combination of signals.

While many of the older, standard gas detector units were originally fabricated to detect one gas, modern multifunctional or multi-gas devices are capable of detecting several gases at once. Some detectors may be utilized as individual units to monitor small workspace areas, or units can be combined or linked together to create a protection system.

As detectors measure a specified gas concentration, the sensor response serves as the reference point or scale. When the sensors response surpasses a certain pre-set level, an alarm will activate to warn the user. There are various types of detectors available and the majority serves the same function to monitor and warn of a dangerous gas level.

2.6.1 Existing Gas Detector

Portable Multi Gas Detector (XA-4400II)

It is a multi-gas detector which can monitor combustible or flammable gases including LPG and methane, hydrogen sulphide/sulfide, carbon monoxide, and oxygen. This comes with an attachable pump.

Super Sensitive Portable Gas Leak Detector (XP-702III Series)

These portable gas detectors are highly sensitive, making them an effective tool when it comes to locating trace gas leaks in a rather shorter time and offer a remarkably more sensitive solution to any leak detection liquid. This is equipped with a built in gas sampling pump, and depending on the specific model you choose, these detectors are available in both dual and single gas applications. The types of gas these can monitor include combustible or flammable gases and refrigerant gases or CFC.

XP-3000 Series Portable Gas Detector

The compact and light weight XP-3000 Series detectors are designed to quickly and accurately display gas concentrations of up to 5 flammable gases. The LCD display, which comes with a backlight feature, displays both a digital as well as an analogue reading for easy and fast reading. The ppm range detectors also poses super-sensitive detection capability to detect the slightest trace of gas leaks.

All XP-3000 Series comes with a powerful built-in sampling pump, capable of drawing air samples from up to 30m. Extended battery life also allows usage of up to 30 hours.

The primary features of the XP-3000 Series Detectors are:

- Comes with robust, quick-connect sampling hose, probe and dust/moisture trap
- Audible and visual alarms
- Dual Range readings (High and Low) with auto-switching feature

2.6.2 EXISTING GAS DETECTOR ISSUES

Faulty gas detection instruments can be fatal. There are many factors in the workplace that can cause a gas detector to fail. Here are the issues:

1. Environmental

Dirt, dust and water impact. These physical affects can block gases and vapours from entering the sensor chamber preventing detection of the gases. This can be either within the sensor area, sampling pump or sample lines.

2. Physical Affects

Dropping and other abuse can damage the instrument from working properly or at the least change the ability of the detector from measuring accurately.

3. Gas Exposure

High gas exposure will change the calibration curve of the sensors causing false or inaccurate readings. Extremely high concentrations can kill the sensor's ability to measure gas. Further, many sensors can fail but not provide a warning that they have failed. In fact, many provide a zero (0) indication on the meter reading which suggests they are working correctly when they are not.

4. Temperature Affect

Storing instruments in environment which is either too cold or too hot can affect the ability of the sensors to measure accurately.

5. Moisture

Moisture condensing on or in sensor: this can happen to oxygen sensors when moisture condenses in the capillary tube in the sensor. It will cause the sensor to fail.

6. Calibration Drift

All sensors from all manufacturers drift over time. Calibration brings the sensor back into equilibrium and provides accurate readings.

2.7 SUMMARY

In this chapter, it is an explanation on how literature reviews were done and the reasons why this project has been selected. There are many of case study stated and related to our project regarding to improve gas detector. Since existing gas detectors are expose to contaminants such as dirt and dust, the gas sensor will work less efficient. The existing gas detectors are not protected compare to our project. The risk of broken down possibly occur if the gas detector expose to high temperature or humid air for too long. These factors will cause the sensor fails to operate well. Therefore, in chapter 3 there will be explanations of the methodology of project on how the project are made and assembles.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodology is the rules or procedures used to implement the project in detail. This step is very important step in the implementation of this project to ensure the project is successfully completed at set times. Furthermore, in this chapter, there are many methods used in order to finish the project. In producing a project, this step that must be taken before the project is completed. These steps should be done with the utmost precision in order to produce a quality project. The result of this project, there are some steps have been made. The next topic is topics selection.

Selection of topics is very first step before starting work encountered work related to the project. The project title should be appropriate to the level sought diploma as a final project for the course Diploma in Mechanical Engineering.

In addition, the selection of appropriate projects to help power the creative and innovative thinking as well as it symbolizes the level of consciousness of a person.

After the project is selected, the title of the project should be selected based on its ability to attract others to know more about the project closely. Tittle that attracts the attention of others symbolizes the initial status of the project.

After an appropriate tittle is chosen, the step that must be taken is to choose components to the project to be made. This is because the materials are difficult to be found will have an impact on the projects to be made because it will probably take a long time to get it.

3.2 PROJECT DESIGN

Figure 3.2.1: Assembly of project

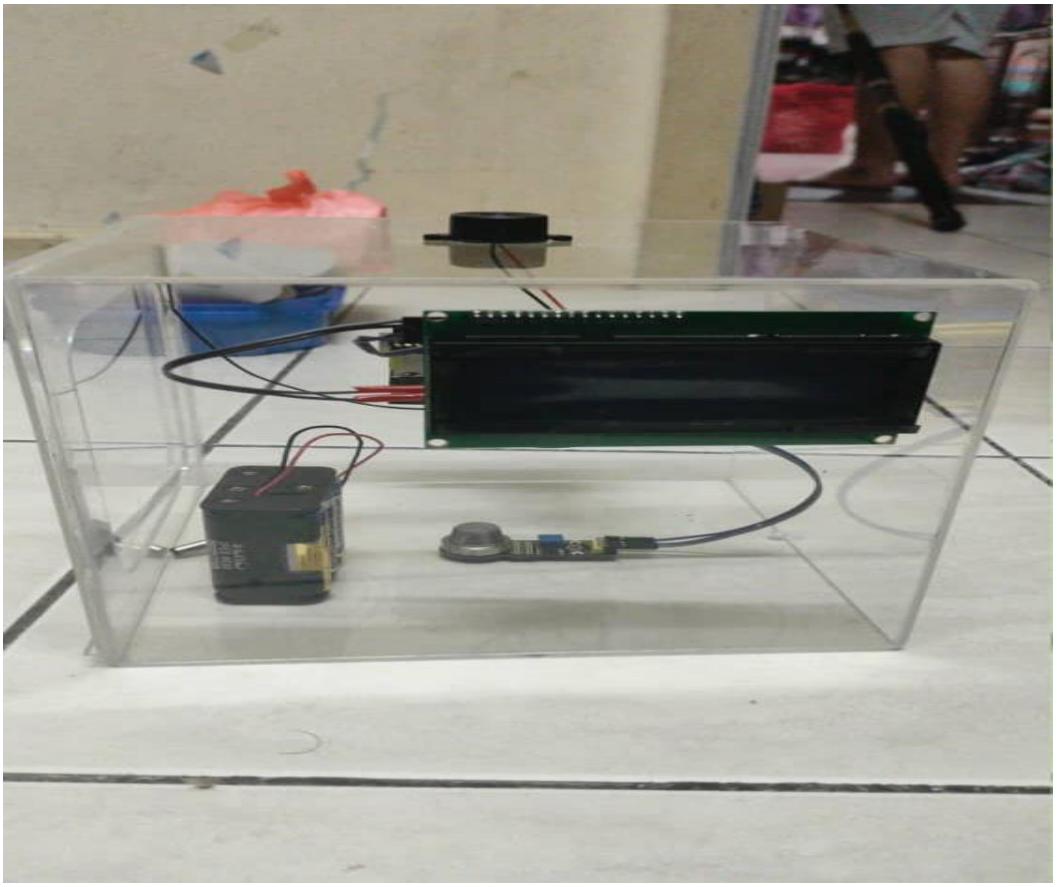


Figure 3.2.2: Project design

3.3 SPECIFIC DESIGN OF PROJECT

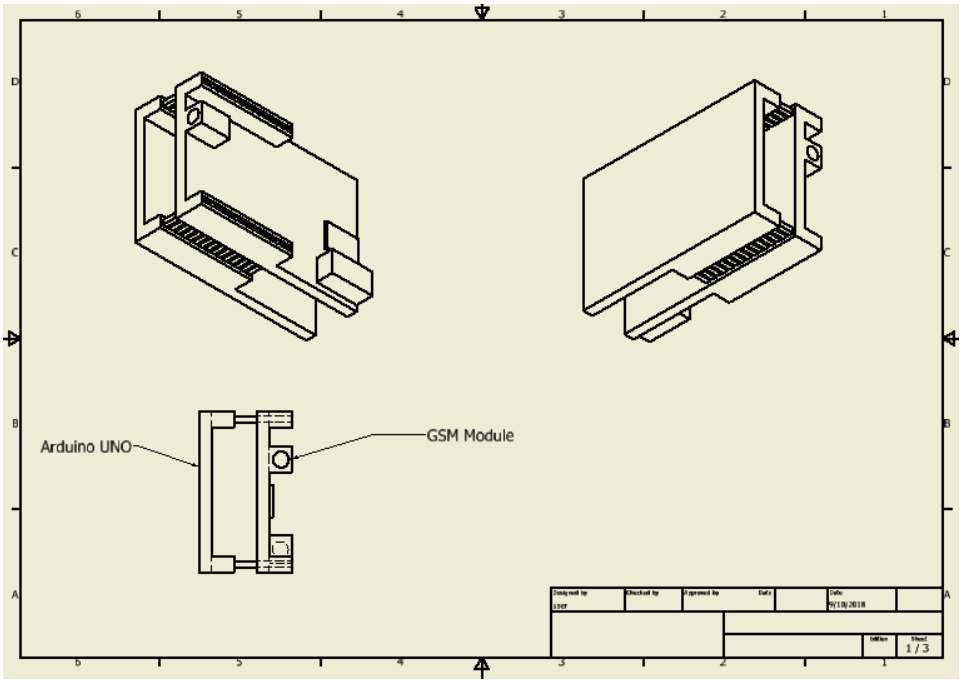


Figure 3.3.1: Arduino Uno and GSM Module

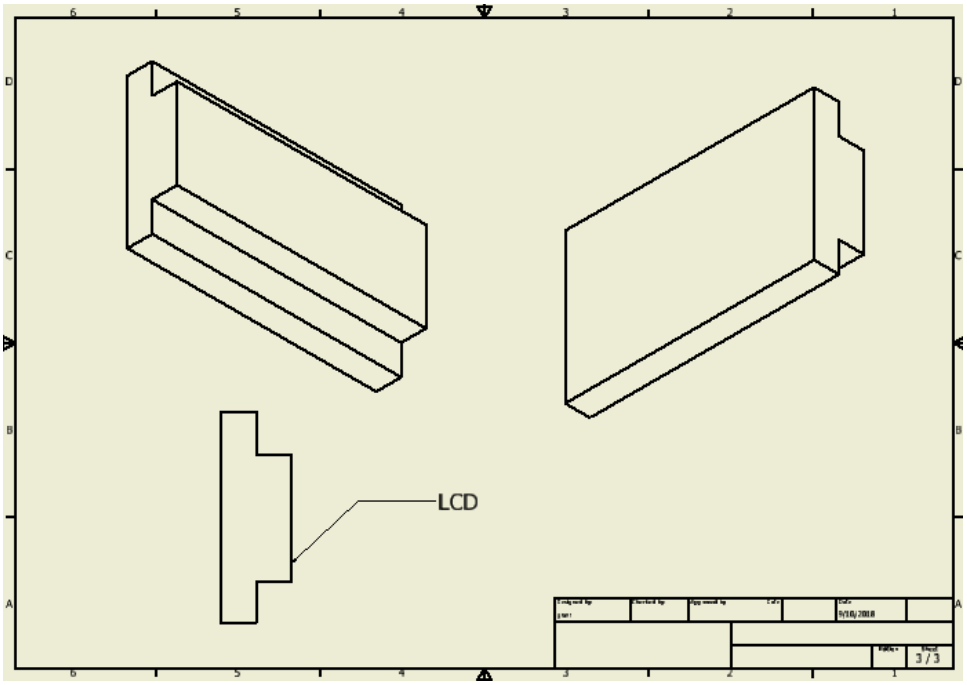


Figure 3.3.2: LCD Display

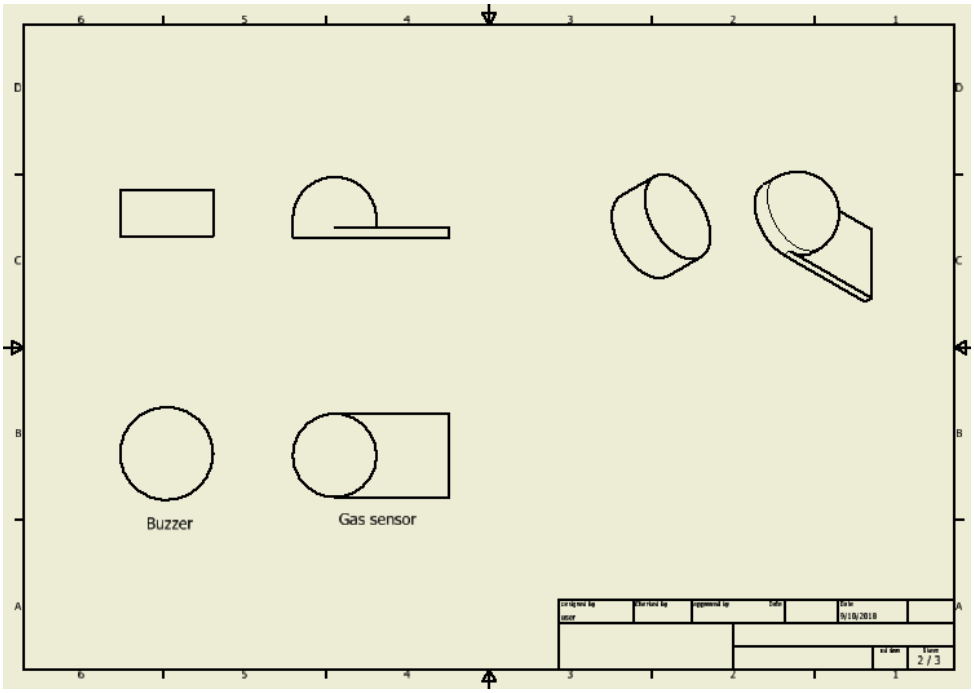


Figure 3.3.3: MQ2 Sensor

3.4 METHODS OF DATA COLLECTION

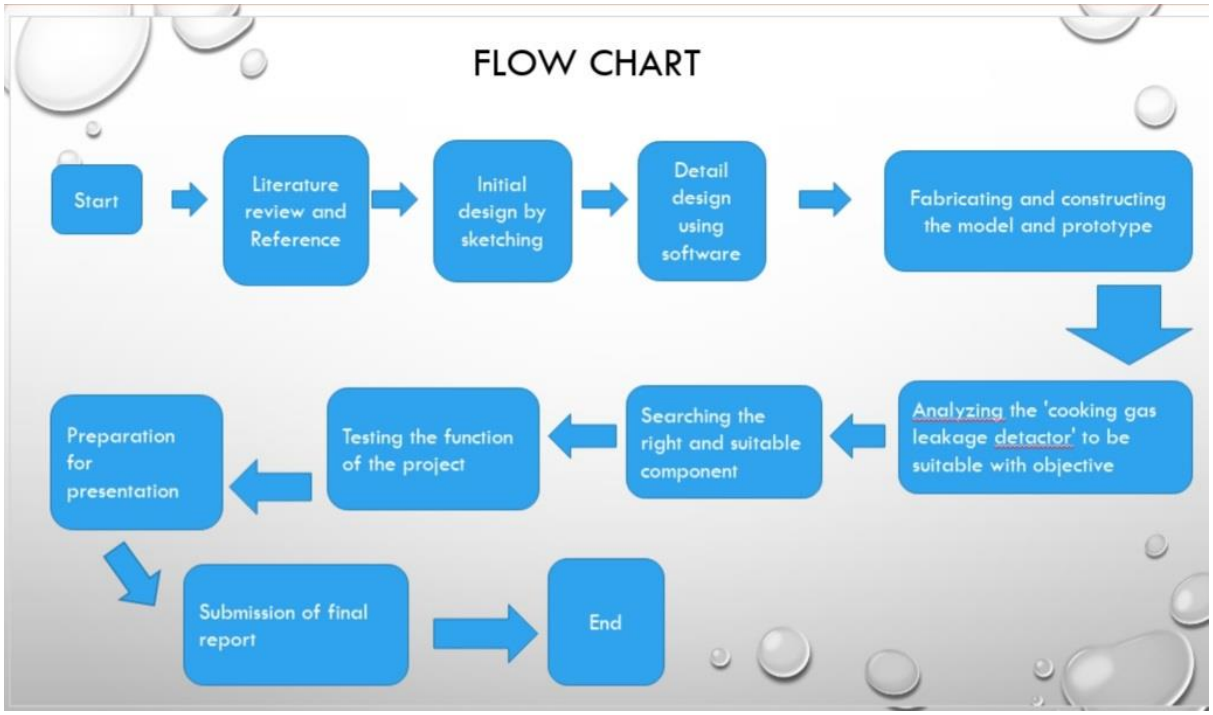


Figure 3.4: Flow chart of the methodology

i. Find ideas to create the project

Idea 1: Rain water filter
Idea 2: Corn cutter machine
Idea 3: Rod dispenser
Idea 4: Sand filter

ii. Discussion of ideas and problem statement

Idea 1: Not commercial to do this project
Idea 2: Many people have done this project
Idea 3: More process and complicated to do this project
Idea 4: Have no idea to innovate this project

iii. Literature review

The literature review is aimed to obtain information and data from previous researches to know the background and the problems of this project. With an earlier stage or studies, every problem can be identified and addressed. Therefore, an SMS NOTIFIER GAS LEAKAGE DETECTOR was established. It will assist one's property or thing from occurring fire to destruction. This project is more focused to a place like canteen, restaurant and household that are suspected to using LPG (liquefied Petroleum Gas).

YES

iv. Generation and selection of concept

In a process of designing, generating and selecting design concepts need to be done in detail so that the project produced effective and a good impact on consumers. This is because effective project can be used in a long time and more durable.

v. Detailed design

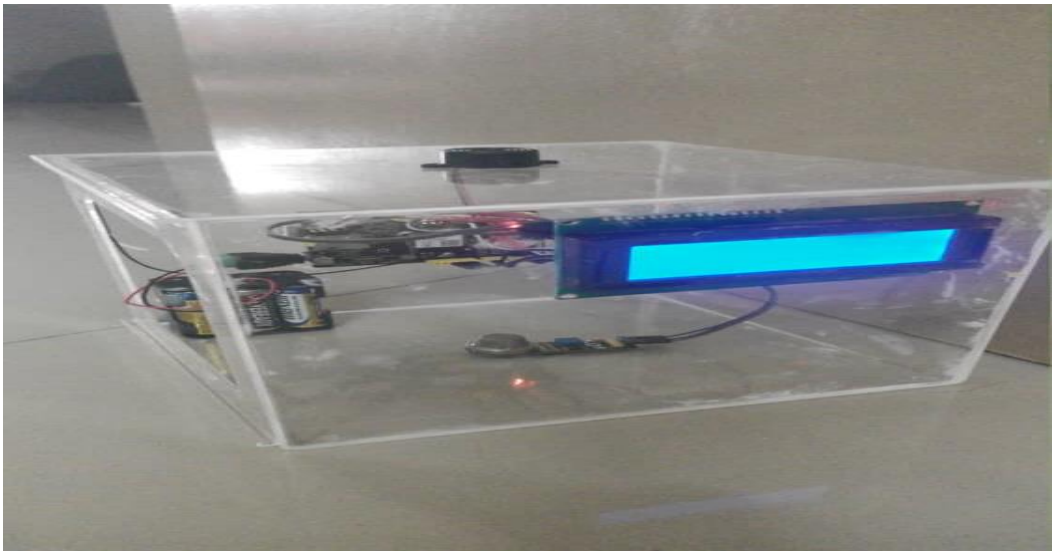
Detailed design is done in order to ensure the project meets the requirements of users. In addition, it can follow all the aspects which have been set as not to drop out from the project scope. By doing this income, detailed design projects are more effectively.

vi. Availability and cost

In manufacturing process, the cost has to be emphasized that the expenditure does not exceed out from the expenses scope. Therefore, the importance of survey need to be done before selection of materials is made.

3.5 TESTING METHODS

This Project is tested onto closed and open spaces to test the concentration of gas. By using lighter gas at the sensor to detect the presence of gas.



3.6 ESTIMATE COST

Quantity	Materials	Price
1	Arduino Uno	RM 95.00
1	GSM/GPRS SIM800C	RM 120.00
1	Jumper Wire	RM 4.80
1	Piezo buzzer	RM 3.50
1	Gas senor (MQ2)	RM 26.50
1	Perspex Box	RM 56.40
1	LCD Display	RM 55.00

Table 3.6: Estimate cost of project

3.8 SUMMARY

In conclusion, this study requires the use of components that are appropriate to the subject that have to review. The uses of appropriate research methods are very important in order for the results of studies in accordance with the objectives and research questions. It is also important that the validity of the study was not disputed by the other parties. In chapter 4, all data that have been obtained using this methodology will be analysing carefully.

CHAPTER 4

DATA ANALYSIS AND RESEARCH FINDINGS

4.1 INTRODUCTION

This chapter describes the analysis of data followed by a discussion of research findings. The findings relate to the research questions that guided the study. Data were analysed to identify. Describe and explore the relationship between Gas Detector with Notifier System and existing gas detector in the market. Data were obtained from self-administered questionnaires, completed by 30 respondents; 8 males and 22 females.

A total of 30 questionnaires were received, all of the questionnaires were usable for this study and met the required inclusion criteria as discussed in the previous chapter. Throughout the questionnaires, we need to know whether the respondent ever experience the gas leakage at home. From the data we will get to know the frequency of the gas leakage occur among 30 respondents. The purpose of analysis is to seek public opinion on our product and improve our marketing.

For questionnaires, there are part A and part B. Part A is demography where we need to know the details about respondents. We will get to know about respondents' gender, age, occupations and their experience experiencing the gas leakage. For part B, the questions will be asking about our product whether it is useful, effective and good to be marketed.

CHAPTER 5

SUGGESTION AND CONCLUSION

5.1 INTRODUCTION

This chapter presents the summary of the findings, conclusion and recommendations based on the data analysed in the previous chapter. There is a discussion on the suggestion for the project to be improved. Some limitations have been identified.

5.2 SUGGESTION

This project has been improved from the existing gas detector. However, there are some improvements can be made to achieve a better result. Thus, it will make the project even better than the previous gas detector and more efficient. Gas Leakage Detector with Notifier System is the innovation from existing Gas Detector. This project is mainly for an individual who wants to keep their home safe from the risk of burning. The benefit of this project is to detect any leakage of cooking gas and it will alert the user about leakage.

As discussed in previous research work, it is clear that the result is not satisfactory and further research must be done. This project can be improved in future. This is because SMS NOTIFER GAS LEAKAGE DETECTOR only can detect the gas and notify it to the user about the leakage but has not safety to extinguish the fire if the fire occur. It also can not reduce the concentration of LPG. When the issues are obvious, so improvement must be made by suggesting to install sprinkle. Sprinkle is for in the case fire occur.

Other than that, there is an issue where gas detector is an electrical device that is dangerous when it is installed near to the LPG barrel. If electric shock occur it will cause electric spark that can cause fire. The wires are messy and too long to connect to other components such as Arduino UNO, gas sensor, buzzer and GSM Module. So, for the betterment of the project, it is encouraged to use Bluetooth. The sensor will stick to the LPG barrel by using magnet.

5.3 CONCLUSION

In conclusion, although there are many gas detectors that are better than our project in term of technology but they are frequently used in factory or oil and gas site. Compared to our project, it is specific to use at home. From previous research, there is no safety system that is install at home. Since there are a lot of cases regarding hundreds of houses caught on fire throughout the years, so the early stage before the fire occur must be avoided.

This project is produced to detect any leakage of cooking gas and it will alert the user about leakage. User will get the alert in SMS. By using this project it will reduce the accident of fire and explosion. It also helps the early detection of gas before the concentration of gas reaches the dangerous level.

From the survey, the answers given by respondents create an improvements to our products. The results have shown the percentage of respondents choosing the answer for each question is objectively related to the product. Throughout the questionnaires, it is useful for us to make analysis. As we get the data we know what customers want and which aspect we have to make an improvement.