POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

AUTOMATIC FIRE DIFFUSER

NAMA	NO. PENDAFTARAN
AMIRUL ALLIF BIN ABDUL HALIM	08DMP18F1001
NG CHUNG KIT	08DMP18F1006
SUVANESWARI A/P LOGANATHAN	08DMP18F1015

JABATAN KEJURUTERAAN MEKANIKAL

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Laporan ini dikemukakan kepada Jabatan Kejuruteraan Mekanikal sebagai memenuhi sebahagian syarat penganugerahan Diploma Kejuruteraan Mekanikal

JABATAN KEJURUTERAAN MEKANIKAL

JUN 2020

AKUAN KEASLIAN DAN HAK MILIK

TAJUK : AUTOMATIC FIRE DIFFUSER

SESI : JUNE 2020

1. Kami, **1. AMIRUL ALLIF BIN ABDUL HALIM (08DMP18F1001)**
2. NG CHUNG KIT (08DMP18F1006)
3. SUVANESWARI A/P LOGANATHAN (08DMP18F1015)

Adalah pelajar tahun akhir **Diploma Kejuruteraan Mekanikal (Pembungkusan), Jabatan Kejuruteraan Mekanikal, Politeknik Sultan Salahuddin Abdul Aziz Shah**, yang beralamat di **Persiaran Usahawan, 40150, Shah Alam, Selangor**. (selepas ini dirujuk sebagai 'Politeknik tersebut').

2. Kami mengakui bahawa "Projek tersebut di atas' dan harta intelek yang ada di dalamnya adalah hasil karya/reka cipta asli kami tanpa mengambil atau meniru mana-mana harga intelek daripada pihak-pihak lain.

3. Kami bersetuju melepaskan pemilikan harta intelek 'projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk peanugerahan **Diploma Kejuruteraan Mekanikal** kepada kami.

Diperbuat dan dengan sebenar-benarnya diakui

Oleh yang tersebut;

a) AMIRUL ALLIF BIN ABDUL HALIM	)	…….
(No. Kad Pengenalan: 000331-06-0199)	)	AMIRUL ALLIF BIN ABDUL HALIM
b) NG CHUNG KIT	)	…….
(No. Kad Pengenalan: 000215-13-0495)	)	NG CHUNG KIT
c) SUVANESWARI A/P LOGANATHAN	)	…….
(No. Kad Pengenalan: 000503-01-2258)	)	SUVANESWARI A/P LOGANATHAN

ACKNOWLEDGEMENT

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Further on, I would also like to thank my group members who give cooperation while undergoing this project successfully.

ABSTRACT

Automatic Fire Diffuser is an active fire protection device used to extinguisher fires that occurs in kitchen. An extremely basic fire extinguisher will be leading to anxiety or panic situation during emergencies because, normally the existing fire extinguisher in not designed to function automatically and it has to be handled manually. The main objective of this project is to identify the problems in the existing fire extinguisher system and to investigate how to solve physical fire extinguisher problems such as way of carrying and method of use. This Automatic Fire Diffuser is designed with function in a fire extinguisher which could be powered automatically to put out the fire with the aid of smoke and fire sensor which has been installed in the device. A survey was conducted to gain the reviews about the project and received reviews are positive feedback from respondent. Then, the system to be developed will be tested either for safety procedure and safe to use. Hopefully, it can contribute grateful idea to the society especially in emergency cases.

Keyword: Automatic Fire Diffuser.

ABSTRAK

‘Automatic Fire Diffuser’ adalah alat pelindung api aktif yang digunakan untuk memadamkan kebakaran yang berlaku di dapur. Alat pemadam api yang sangat asas akan menimbulkan kegelisahan atau keadaan panik samasa kecemasan kerana biasanya alat pemadam api yang sedia ada tidak dirancang untuk berfungsi secara automatik dan ia mesti dikendalikan secara manual. Objektif utama project ini adalah untuk mengenalpasti masalah dalam sistem alat pemadam api yang sedia ada dan menyiasat bagaimana menyelesaikan masalah pemadam api fizikal seperti cara membawa dan kaedah penggunaan. ‘Automatic Fire Diffuser’ ini dirancang dengan kombinasi fungsi dalam alat pemadam api yang dapat dihidupkan secara automatik untuk memadamkan api dengan bantuan sensor asap dan api yang telah dipasang di dalam peranti ini. Tinjauan dilakukan untuk mendapatkan ulasan mengenai projek dan ulasan yang diterima adalah maklum balas positif daripada responden. Kemudian, sistem yang akan dibangunkan akan diuji sama ada untuk prosedur keselamatan dan selamat digunakan. Mudah-mudahan, ia dapat menyambungkan idea yang bernas kepada masyarakat terutamanya dalam kes kecemasan.

Kata Kunci: Automatic Fire Diffuser.

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CHAPTER 1

INTRODUCTION

1.1 **RESEARCH BACKGROUND**

The occurrence of fire incidents is not common but when it happens it could cause massive damages such as lost of lives and huge property damage if one failed to control fire in time. Fire incidents can happen anytime and anywhere in an unexpected way. Basically there are certain types of fire incidents which commonly happens and those are kitchen fires,electrical fires,heater fires and smoking-relating fires. Fire incidents are also has been classified by materials involved in the fire.The classifications are:

Class A - fires involving solid materials such as wood, paper or textiles.

Class B - fires involving flammable liquids such as petrol, diesel or oils.

Class C - fires involving gases.

Class D - fires involving metals.

Class E - fires involving live electrical apparatus. (Technically ‘Class E’ doesn’t exists however this is used for convenience here)

Class F - fires involving cooking oils such as in deep-fat fryers.

Compared to the other fire incidents electrical fire incidents are quite dangerous to be handled as it may cause injuries and even death to people without a proper handling.On the other hand,kitchen fires are also quite dangerous. Kitchen fires are the leading cause of home fires and home fire-related injuries. Not only that they can cause thousands of dollars of property damage by setting our house on fire, but there is also the scarier risk of causing burn injuries or even death to our family or neighbors. Kitchen fire safety is a serious issue; home first in

the kitchen more often than any other area in the home.Unattended cooking is a leading cause of fire-related accidents taking place in homes around the world as Unattended cooking equipment causes 47% of the kitchen fires, 20% of the civilian deaths, and 45% of the injuries.Common causes of kitchen fires are high temperatures in the deep fryer,highly flammable vegetable oils,old, more flammable oil, in the deep fryer,fat deposits in the flue and ventilation ducts,misaligned sprinklers due to equipment on wheels being moved around and malfunctioning sprinklers due to the fusible links being clogged by grease.

As this kitchen fires are dangerous and difficult to be handled,there should be a proper device to extinguish kitchen fires and that proper device is the Automatic Fire Diffuser.It is a device which is designed specifically with the purpose to control fire occurrence in kitchen. This Automatic Fire Diffuser is designed with a combination of functions in a fire extinguisher and a diffuser which could be powered automatically to put out the fire with the aid of smoke and fire sensor which has been installed in the device. As this is a device that combined with a function of diffuser this the flow of air from diffuser is in a high speed because the buzzer of this diffuser is narrow and it creates high pressure so this releases ABC dry powder in a high speed. Moreover when there is fire in the kitchen apart from controlling it this is could also send the information to our smart phones immediately.

1.2 PROBLEM STATEMENT

Automatic Fire Diffuser prototypes is very essential because the fire extinguisher used by people today,does not have any changes in the designation which could solve the problems that faced by people in the process of extinguishing the fire. An extremely basic fire extinguisher will be leading to anxiety or panic to people during emergencies because the existing Fire extinguisher is not designed to function automatically and it has to be handled manually.

The existing fire extinguishers are heavy and cannot be lifted by everyone. This is because the fire extinguisher is not a light weight tool even it comes with different size. Sometimes women and kids could not lift the fire extinguisher because of the weight and at the same time during emergency situation that especially involving fire could make people to be extremely panic where they cannot think anything except escaping themself from the situation. To use fire extinguisher there is procedure called PASS which has to be follow by the order from first to the last procedure,during emergencies people could not remember this and eventually they would not be able to use the fire extinguisher and this may cause to spread of fire which results in loss of lives and huge property damage.

1.3 RESEARCH OBJECTIVES

The objectives to this research are:

i. Identify the problems in the existing fire extinguisher.
ii. Auto design to ensure early action is taken to extinguish the fire.
iii. To develop a system that makes it easy for users.

1.4 RESEARCH QUESTIONS

This study will answer the following research questions:

i. Which kind of extinguisher is needed to be use?
ii. How can the automatic fire diffuser can help in reduce the fire from getting worst?
iii. The materials of use is suitable for rescue the fire?

1.5 SCOPE OF RESEARCH

The scopes and limits to this research are:

I. This product can be refilled and used rapidly.
II. This product is light in weight.
III. This product is not a water resistance.
IV. High sensitivity to detect smoke and flame.
V. Could last for a long time with a good care.

1.6 SIGNIFICANCE OF RESEARCH

In our research, the houses and buildings were mostly equipped with manually functioning fire extinguisher, the existing fire extinguishers are heavy and cannot be lifted by everyone because of the weight. Other than that, fire extinguisher is dangerous when the kids are near with it, this is because the dry powder is dangerous.Furthermore, the probability of getting injured is higher during manual handling. Thus, upon completing this study and research, we decided to use arduino, motor and sensor to detect the fire when it occurs, this is more safe and creates more alert compared with the traditional method. Moreover, our product is more creative and the quality is important to improve the product to be excellent and more useful in future.

1.7 DEFINITION OF OPERATIONAL TERMS

Arduino: Arduino is the open source electronic platform based on easy to use hardware and software. It is used to activate a motor, turning on an LED, publishing something online.

Sensor: A device which detect or measure the physical property and records, indicates, or otherwise respond to it.

Wi-Fi: Wi-Fi i the technology that allow a PC, laptop, mobile phone, or tablet device to connect at high speed to the internet without the need for a physical red connection.

Motor: To produce air pressure.

1.8 CHAPTER'S SUMMARY

In this chapter, the studies was explained about its origin of ideas and inspirations. All the objectives were made out of all the problem statements. The objective for this project along with the importance on our product automatic fire diffuser that is more safe and easy to be handle with under high sensitivity. The scope of the project is more focusing on the product working efficiency. In overall, with the help of our product,cost of fire can be reduced and similar level of the safety can be achieve by various means.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, will be shown two types of method of use during fire occurrence. These two types of method have its own advantages and disadvantages. Hence, all the characteristics of those materials will be compared to our own product which has its own specialties and benefits.

i. Fire Extinguisher

The first version of the modern portable fire extinguisher was invented by Captain George William Manby in 1819, consisting of a copper vessel of 3 gallons (13.6 liters) of pearl ash (potassium carbonate) solution under compressed air pressure.The late 19th century saw the invention of the soda-acid extinguish,Foam extinguishers consisted of the main body of the extinguisher filled with foam-producing chemical and a second container filled with another chemical which reacts when it came into contact with the solution in the main cylinder where a cylinder contained 1 or 2 gallons of water that had sodium bicarbonate mixed in it.In the middle of the twentieth century the modern type of extinguisher appeared using different extinguishing agents. Manufacturers of extinguishers generally use some type of pressurised vessel to store and discharge the extinguishing agent. Many fire extinguishers release a fine powder.

Carbon dioxide (CO_2) fire extinguishers are used for Class B and C fires. They emit pressurized CO_2 gas, which smothers the fire by blocking the oxygen that the fire needs. Unlike the dry chemical types, this nonflammable gas quickly evaporates leaving nothing behind. Because the gas is under pressure, pieces of dry ice (solid CO_2) might be emitted. CO_2 is not to be confused with carbon monoxide. Carbon monoxide is a very toxic gas that is generated by burning fuels and can be produced by faulty gas appliances, car exhaust, and fires. CO_2 is a naturally occurring gas and is part of the air we breathe. CO_2 is also found in carbonated beverages. Toxicity from inhaled CO_2 only occurs with very high concentrations. In most situations, there is enough oxygen in the area to prevent toxicity. However, toxicity can occur if a CO_2 extinguisher is used in a small, poorly ventilated area. Inhalation of concentrated CO_2 causes the same symptoms as not having enough oxygen, including difficulty breathing, dizziness, and loss of consciousness. Anyone exposed to concentrated CO_2 should seek fresh air immediately.

ABC Powder Fire Extinguisher are very popular for homes, flats, cars, caravans, HGV's, Boats, Factories and Warehouses. The small 1 and 2 KG extinguisher are ideal for use in Kitchens, Cars and Caravans as they are small and compact. Both of these extinguishers are supplied with a mounting bracket which makes installation and use extremely easy. The larger powder extinguishers 6 or 9 Kg are ideal for larger areas or vehicles such as offices, factories, warehouses or larger trucks.

ii. Fire sprinklers

Fire sprinkler systems have been around for more than two centuries and have seen significant improvements over the years. It's true that early versions weren't very reliable and caused significant water damage. But today, sprinkler systems are credited with reducing deaths and loss of property by more than 65 percent [source: Fleming]. Since each sprinkler head is automatically triggered by fire-specific temperature, just one or two sprinklers can quickly extinguish and/or contain a fire to the room where it started and cause little property damage. And because sprinklers use about six times less water than a fire hose, they're actually less harmful to your property than a visit from the fire department.

Still convinced you know everything you need to know about fire sprinklers? We'll address another common myth and discuss the details of how sprinklers work on the next page.

In this chapter, it will be explained about 3 type of method during the fire is occur and comparison between those method with our product.

2.2 Fire Extinguisher

Prepared By Ng Chung Kit

2.2.1 Introduction

A fire extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situations. With dry chemical extinguishers, nitrogen is typically used; water and foam extinguishers typically use air.Stored pressure fire extinguishers are the most common type.

Since fire extinguishers are our first line of defense in the event of fire:

- Fire extinguishers must be kept clean to be visible.
- Fire extinguishers must be kept easily accessible.
- Correct any deficiencies, such as depleted pressure or blocked nozzles.
- Be sure to conduct regular and thorough inspections of your fire extinguishers.

The following is a brief description of the classifications of the most common types of fires, and the recommended extinguisher to be used on each:

- CLASS "A" FIRES:

Ordinary combustibles such as paper, rags, wood, or cardboard.

Recommended extinguishers: pump type water cans or pressurized extinguishers. Only use hose lines if you have specific training to do so. Multi-purpose dry chemical can also be used.

- CLASS "B" FIRES:

Flammable liquids, oils and greases: Fires that require a smothering effect for extinguishment.

Recommended extinguishers: Carbon Dioxide, Dry Chemical, and Foam.

- CLASS "C" FIRES:

Energized electrical equipment. Fires that require a non- conducting, extinguishing, agent.
Recommended extinguishers: Carbon Dioxide and Dry Chemical. Electrical equipment that is not energized is likely a class A fire.

If you are able to use a fire extinguisher, remember the **PASS** process:

Pull the pin,
Aim at the base of the fire,
Squeeze the handle, and
Sweep back and forth as you.

approach the fire until it is extinguished.

If the fire is outside, approach the fire with the wind at your back. The smoke will blow away from you.

If the fire is inside, approach the fire with the door or exit path at your back. Don’t let the fire get between you and your means of escape.

Fire extinguishers are useful tools, but they are limited by the amount of the extinguishing agent they carry. Be sure that the fire department has been called, before attempting to fight a fire with an extinguisher

Figure 2.2.1 – types of Fire extinguisher

2.2.2 Characteristics of Fire Extinguisher

2.2.2.1 Advantages of Fire Extinguisher

Fire extinguisher is important whether the incident occurs in a restaurant or your own home, keeping fire extinguishers on-site can make all the difference in preventing small fires from turning into a four-alarm blaze. But do you really understand the full impact of this fire protection equipment? Here is the 3 main point benefits of fire extinguisher.

i. Keeping Fires Under Control

In Europe, there are Two European studies conducted in 2002 reviewed over 4,500 fire incidents and found fire extinguishers can be extremely effective in stopping flames before they grow out of control. Both studies found fire extinguishers were able to stop the fire in over 80% of recorded incidents, while also noting many others that are extinguished in this manner are never reported to the fire department in the first place.

ii. Saving Lives

When the effectiveness of fire extinguishers is put in context of overall fire statistics, it becomes clear how much of a difference these tools can make. According to the NFPA, there were 15,700 injuries and 3,280 deaths as a result of property fires in the United States in 2015. These occurred as the result of over 1.3 million reported fires. When a fire extinguisher is able to confine the spread of a fire, it can literally save lives, especially in places with lots of people, like hotels and schools.

iii. Protecting the Environment

Uncontrolled fires can also have a harmful effect on the environment by releasing carbon and other greenhouse gases into the atmosphere. By extinguishing the blaze early on, fire extinguishers help minimize the spread of pollutants while also saving the water firefighters would otherwise use to extinguish the blaze.

By providing an idea and servicing fire extinguishers and other suppression systems, the team at Northland Fire are create an idea and to learn more about their products and services, which can visit online.

Figure 2.2.2 –The use of fire extinguisher

2.2.2.2 Disadvantages of Fire Extinguisher

i. Water

The limitation of water type fire extinguisher is the water is a conductor of electricity and can be highly dangerous if used on Class C fires, for example the fire in the vicinity of live electrical current.

It will cause Class B fires to fare up and spread and if used on Class D fires may cause violent explosions.

ii. Dry powder

Dry powder has no cooling properties and will therefore not prevent re-ignition. For this type of extinguisher it is not as effective as foam on contained flammable liquid fires which have been burning for a long time.

Generally powders are messy and some form sticky deposits on surfaces and must be scraped and washed away after the fire. These deposits can have a detrimental effect on delicate machinery and equipment.

Re-ignition on Class A fires is prevented by using multipurpose (ABC) powders.

iii. Foams

Most foams have to foam a blanket to extinguish the fire, and since it is not possible to cover flowing flammable liquids, foams are not very effective.

Foam is water based and therefore a conductor of electricity. It is dangerous to use it on live electrical equipment. Some foams tend to break down when in contact with liquid such as alcohols, and this can prevent the production of an effective blanket.

iv. Carbon dioxide

The cooling properties of CO2 gas are limited and therefore it provides very little protection against re-ignition. Since CO2 is a gas, drafty or windy conditions will affect its performance. The effective range of a CO2 extinguisher is also limited. Direct impingement of CO2 onto delicate electrical or electronic equipment could cause additional damage through cold shock. Under dry condition, the discharge of CO2 extinguishers generates static electricity which can be uncomfortable to the user.

2.3 METHODS OF MAKING FIRE EXTINGUISHER

2.3.1 Introduction

What are fire extinguishers made of?

Fire extinguishers are made of different parts.

i. Pressurised cylinder - this cylindrical tank is flat on the top and bottom, and curved on the edges. It is made out of metal and contains the extinguishing agent and the propellant. Most extinguisher tanks are made out of steel. This strong material can withstand high pressure and extreme temperatures.

ii. Valve - The valve assembly is attached to the release lever and the squeeze handle. The handles are made out of metal and can be operated after removing the metal locking pin. Some extinguishers also have a pressure gauge attached to the valve. The valve is usually made out of aluminium or brass. For more information about fire extinguisher use, check out our blog about how to use a fire extinguisher.

iii. Hose - The hose is made out of flexible pipe and is attached to the nozzle. The hose is usually made out of rubber. The flexibility and strength of the hose provides a channel for the pressurised contents and helps you direct the extinguishing agent onto the flame.

iv. Extinguishing agent - The contents of your extinguisher are pressurised during the manufacturing process. Each extinguisher contains a different agent designed to smother different classes of fire.

v. Propellant - The propellant is a type of gas that is combined with the extinguishing agent during the pressurising process. This gas is what helps to propel the contents from the extinguisher when the valve is released.

2.3.2 The step of making Fire Extinguisher

STEP 1: FROM STEEL ROLL TO PLATE

It all starts with steel, which arrives in the factory in large rolls. Each roll is stretched on a drawing and cutting machine, and advanced electronics are used to ensure that it is cut into sheets of exactly equal size with precision and force.

STEP 2: FROM PLATE TO TUBE

Once the roll is completely cut up, a roller turns each sheet into a round tube. Again, computers guarantee the required accuracy: each sheet is rolled into shape with exactly the right pressure.

STEP 3: WELDING

The automatic welding machine fixes the cylindrical tube with a longitudinal seam. Special software lets us control the quality of the welding. Depending on the type of extinguisher, we may also weld mounting brackets onto it. This allows the extinguisher to be attached to a wall, for instance. Each tube is then given a lid and a bottom, including a threaded ring. This process is also fully automated.

STEP 4: TESTING THE CYLINDER

The product now has the familiar shape of a fire extinguisher. To test its resistance to pressure, we pick a number of cylinders from each batch and check to see how many bars are required to cause them to burst. This is done with water: the cylinder is first pushed flat and then inflated with water pressure. If all is well, the longitudinal seam holds and the cylinder instead cracks right next to it. This means that the material is too weak, but the longitudinal seam is of good quality. At any rate, the extinguisher does not pass the test.

STEP 5: AIR PRESSURE TEST

During the air pressure test, all fire extinguishers are exposed to one and a half times normal operating pressure. Our machines measure whether the pressure remains constant for a given period. Once it passes this test, an extinguisher is given a batch number and production date, and the Rijkstypekeur national certification. This allows the origin of the product to be traced throughout the chain. The Rijkstypekeur indicates that the product is suitable as a fire extinguisher in the indicated class (A, B, C, D, or F), which refers to the type of fire, e.g. liquid or gas.

STEP 6: INTERNAL AND EXTERNAL COATING APPLICATION

During this step, the fire extinguishers are given a coating. Foam and water extinguishers receive a coating on the inside, while the dry extinguishers do not. The inner coating prevents corrosion of the casing and is applied directly inside, with a robot linking the various process steps to each other. The latter picks up the extinguishers, shakes them firmly to ensure an equal distribution of the coating, and puts them down again.

STEP 7: SPRAY PAINTING

Extinguishers get their distinctive red coating in the powder spray paint booth. This colour is required by law. Fire hose reels may have other colors. Hose reel cabinets can also be spray painted on request in any colour the customer desires. A distinctive characteristic of this system is that 90% of the powder used is automatically recycled.

STEP 8: FILLING

Once the fire extinguisher has received a coating, it is ready to be filled with powder foam, water or carbon dioxide.

STEP 9: ASSEMBLY

This is where all the parts, from spray gun to pressure gauge, are fitted. The work is partly done by hand. The closing cap is tightened mechanically, ensuring that it is closed with just the right amount of power.

STEP 10: HELIUM TEST

To determine whether a fire extinguisher is sealed properly, helium test is carried out.Each fire extinguisher is filled with nitrogen, supplemented with 3% of helium. Escaping nitrogen consists of particles too small to be detected, but the same does not apply to helium. If the test indicates that helium is escaping, the extinguisher is discarded. This is extremely rare.

2.4 TYPE OF EXTINGUISHERS

Fire extinguishers come with a variety of different extinguishing agents inside of them. Each different formula is designed to deal with a different class of fire.

- Dry Powder

Fire extinguisher powder comes in a variety of solutions. ABC powder is generally made out of a mix of monoamonium phosphate and ammonium sulfate.

- Wet Chemical

Wet chemical extinguishers generally contain potassium acetate with potassium citrate or potassium bicarbonate.

- Foam

Foam extinguishers are made up of foam, water, and air. The foam generally contains organic solvents, foam stabilisers, and corrosion inhibitors.

- Water

This one is pretty self-explanatory! This cylinder will have water inside, mixed with the gas propellant.

- C02

These tanks contain carbon dioxide in a liquid form. When this liquid is released into the air, it interacts with the oxygen molecules that are feeding the flame and neutralizes them, cutting off the supply.

2.5 RAW MATERIAL SELECTION OF FIRE EXTINGUISHER

Fire extinguishers can be divided into four classifications: Class A, Class B, Class C, and Class D. Each class corresponds to the type of fire extinguisher is designed for, and, thus, the type of extinguishing agents used. Class A extinguishers are designed to fight wood and paper fires; Class B units fight contained flammable liquid fires; Class C extinguishers are designed to fight live electrical fires; and Class D units fight burning metal fires.

Water has proven effective in extinguishers used against wood or paper fires (Class A). Water, however, is an electrical conductor. Naturally, for this reason, it is not safe as an agent to fight electrical fires where live circuits are present (Class C). In addition, Class A extinguishers should not to be used in the event of flammable liquid fires (Class B), especially in tanks or vessels. Water can cause an explosion due to flammable liquids floating on the water and continuing to burn. Also, the forceful water stream can further splatter the burning liquid to other combustibles. One disadvantage of water extinguishers is that the water often freezes inside the extinguisher at lower temperatures. For these reasons, foam, dry chemical, CO 2 , and halon types were developed.

Foam, although water based, is effective against fires involving contained flammable liquids (Class B). A two-gallon (7.5 liters) extinguisher will produce about 16 gallons (60 liters) of thick, clinging foam that cools and smothers the fire. The agent itself is a proprietary compound developed by the various manufacturers and contains a small amount of propylene glycol to prevent freezing. It is contained as a mixture in a pressurized cylinder similar to the water type. Most aircraft carry this type of extinguisher. Foam can also be used on Class A fires.

The dry powder agent was developed to reduce the electrical hazard of water, and thus is effective against Class C fires. (It can also be used against Class B fires.) The powder is finely divided sodium bicarbonate that is extremely free-flowing. This extinguisher, also equipped with a dip-tube and containing a pressurizing gas, can be either cartridge-operated or of the stored pressure type as discussed above. Many specialized dry chemical extinguishers are also suitable for burning metal fires, or Class D.

Carbon dioxide (CO 2) extinguishers, effective against many flammable liquid and electrical fires (Class B and C), use CO 2 as both the agent and the pressurizing gas. The liquified carbon dioxide, at a pressure that may exceed 800 psi depending on size and use, is expelled through a flared horn. Activating the squeeze-grip handle releases the CO 2 into the air, where it immediately forms a white, fluffy "snow." The snow, along with the gas, substantially reduces the amount of oxygen in a small area around the fire. This suffocates the fire, while the snow clings to the fuel, cooling it below the combustion point. The greatest advantage to the CO 2 extinguisher is the lack of permanent residue. The electrical apparatus that was on fire is then more likely to be able to be repaired. Unlike CO 2 "snow," water, foam, and dry chemicals can ruin otherwise undamaged components.

As extinguishing agents, halons are up to ten times more effective in putting out fires than other chemicals. Most halons are non-toxic and extremely fast and effective. Chemically inert, they are harmless to delicate equipment, including computer circuits, and leave no residue. The advantage of the halon over the CO 2 extinguisher is that it is generally smaller and lighter. Halon is a liquid when under pressure, so it uses a dip-tube along with nitrogen as the pressurizing gas.

Halon, at least in fire extinguishers, may soon become a footnote to history. In 1992, 87 nations around the world agreed to halt the manufacture of halon fire extinguishers by January 1, 1994. This will eliminate a potential threat to the earth's protective ozone layer, which halon molecules—highly resistant to decomposition—interact with and destroy.

Most of the other elements of a fire extinguisher are made of metal. The pressure vessel is generally made of an aluminum alloy, while the valve can either be steel or plastic. Other components, such as the actuating handle, safety pins, and mounting bracket, are typically made of steel.

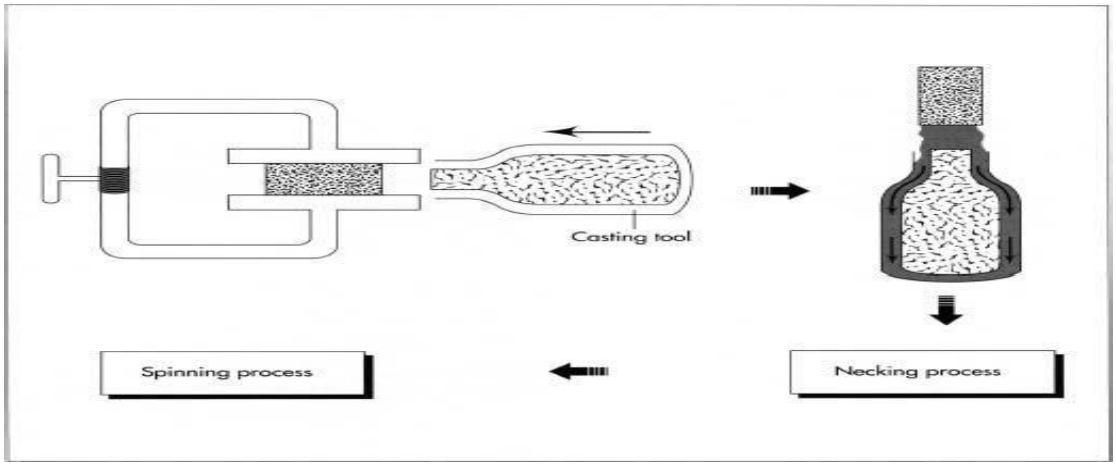


Figure 2.5.1–The use of fire extinguisher

The figure 2.4.1 show the aluminum pressure vessel is made by impact extrusion. In this process, the aluminum block is put into a die and rammed at high velocity with a metal casting tool. The force liquifies the aluminum and causes it to flow into the cavity around the tool, thus forming the open-ended cylinder.

This cylinder is then finished in necking and spinning processes, which form the open end of the cylinder.

2.6 Fire sprinklers system

2.6.1 Introduction

A fire sprinkler system is an active fire protection method, consisting of a water supply system, providing adequate pressure and flow rate to a water distribution piping system, onto which fire sprinklers are connected. Although historically only used in factories and large commercial buildings, systems for homes and small buildings are now available at a cost-effective price. Fire sprinkler systems are extensively used worldwide, with over 40 million sprinkler heads fitted each year. In buildings completely protected by fire sprinkler systems, over 96% of fires were controlled by fire sprinklers alone.

2.6.2 Characteristic of fire sprinklers system

2.6.2.1 Advantages of fire sprinklers system

Fire sprinkler systems are designed to react promptly and automatically in the event of a fire, much faster than any human, irrespective of time of day or safety concerns. Here are more benefits of a fire sprinkler system:

i. Sprinkler systems are automatic and respond at all times. Fire control is therefore rapid and no human intervention is needed.
ii. Sprinkler systems are fitted with water flow ‘gong’ alarms and will alert occupants /guards of a developing fire.
iii. Significantly less heat and smoke is generated if the fire is extinguished at inception – this is what sprinklers are designed to do.
iv. Property damage is reduced. A well-designed system will control a fire and fire/water damage will generally be localised.

v. Occupants and fire fighters are exposed to much less danger if the fire is kept in check by a sprinkler system.
vi. Savings on insurance premiums because sprinkler controlled fires are in the overall majority of instances less damaging than fires that are not kept in check by sprinklers.
vii. Sprinkler controlled fires reduces the demand for security as it minimises intrusion opportunities.

Sprinkler systems use significantly less fire water than hydrants, hydraulic hose reels or the fire brigade.

2.6.2.2 Disadvantages of fire sprinklers system

With all the myths and misconceptions out of the way, all that's left are the actual fire sprinkler system disadvantages, as promised.

i. Automated Fire Sprinkler Cost.

The cost of fire sprinklers is tough to address because the costs can vary so greatly depending on the a multitude of factors like structure type, size, risk profile, and even aesthetics. The difference in cost to implement fire sprinklers in an existing structure versus an under-construction or planned structure is also quite different. With an existing structure, you need a certified fire safety design specialist to determine what existing framework can be used for fire sprinklers, as well as what needs to be added. Additions can be extensive, or they can be as minor as making some adjustments to your building's plumbing. Making the decision to put fire sprinklers into a building before construction begins, or in the beginning phases of construction, is the best method. This ensures that the fire sprinkler system design can be optimized for cost as well as for integration with other life safety systems.

In summary, yes, of course putting automated fire sprinklers into a building will have a cost associated with it; it involves additional plumbing plus the cost of equipment and installation, and may even require water storage tanks and/or backflow preventions, all depending on your building, its needs, and its complexities. However, the cost is easily outweighed by the peace of mind it provides, and if your facility has even a single fire, the system will likely pay for itself by extinguishing it or preventing it from spreading.

ii. Fire Sprinklers Require Maintenance

There are many residential fire sprinkler systems currently being sold that claim to be "maintenance-free", and as much as that claim would support our efforts to increase the number of buildings with fire sprinkler systems, the truth is that a maintenance-free fire sprinkler system is either a pipe dream (no pun intended), or an accident waiting to happen. Just like every other system within your building, some maintenance will absolutely be required. Fire sprinkler heads need to be cleaned periodically to keep them free from debris buildup, and sometimes fire sprinkler heads get damaged or become clogged or rusty and need to be replaced.

However, perhaps the most important part of fire sprinkler system maintenance is regular inspection and testing. All life safety systems should have regular periodic inspections and testing performed, particularly in a commercial setting. Like any system that is in regular contact with water, corrosion such as rust or oxidation is always a possibility to be watchful.

The point is that without proper and regular maintenance, inspection, and testing of fire sprinkler systems, they could become corroded, rendering them completely ineffective and costing a lot to repair. But with proper maintenance, testing, and regular inspections for corrosion and internal obstructions, you'll know about issues and problems in more than enough time to have them effectively resolved by a professional without a huge bill, without the risk of a leaky pipe, and without the risk of ineffective fire sprinklers.

2.7 TYPE OF FIRE SPRINKLERS SYSTEM

Should you decide to invest in a fire protection system, fire sprinklers are certainly a great choice for most buildings. With a sprinkler system, you can be guaranteed total protection against fire emergencies since they are known to significantly minimize damage and prevent loss of life. Sprinklers have come a long way today and there are many types you can consider depending on your building's unique fire protection requirements. We'll cover the 5 common types of sprinklers available in the market today

.

i. Wet Pipe Fire Sprinkler Systems

This type of sprinkler contains pipes that are filled with water and sprinkler heads. During a fire, the heat causes the core of the sprinkler head to burst discharging water. The sprinkler heads are not all activated at once since each one of them is independent. It will depend on whether they are exposed to heat. The main advantage of this system is that it can help to significantly reduce damage in the event of a false alarm since only one sprinkler head will be activated. It's no wonder this is the most commonly used sprinkler system in the market today.

ii. Dry Pipe Fire Sprinkler Systems

In locations that experience cold climates, the wet pipe sprinklers may be at risk of freezing and becoming inefficient. In this case, the dry pipe system, which is filled with air as opposed to water in the pipe system, is recommended. This dry pipe sprinklers are designed to only discharge water to the pipes when the sprinkler heads are activated. They are usually more complex than the wet pipe sprinklers and therefore cost more to install. Because the water is not supplied to the pipe, this kind of system has an increased fire response time. It is often recommended in cold climates where the risk of freezing is so high that it could undermine other fire protection systems.

iii. Foam Fire Sprinkler Systems

There are other fire protection systems that are designed to discharge water and foam to put off a fire. The foam fire sprinkler system works this way. It is mainly recommended in buildings that handle highly hazardous components and flammable liquids like workplaces, industries and aircraft hangers.

iv. Pre-action Fire Sprinkler Systems

These are hybrid fire protection systems that are designed to take advantage of the flexibility of wet pipe systems as well as the complexity of dry pipe sprinklers. The major drawback is that they can be very costly to install and have high maintenance demands. This type of system is often installed in commercial properties such as libraries, museums and data centres where if there is an accidental discharge it can lead to significant losses.

v. Deluge Fire Sprinkler Systems

This sprinkler system is designed without the heat sensing elements that are contained in both wet and dry pipe systems. They have a common trigger that causes the valves to open. Once the valve opens, the water is discharged to the piping system and sprays on all the heads at once covering the whole area. This type of system is not commonly used at homes but is mainly found in industries with flammable liquids

2.8 CHAPTER'S SUMMARY

As to conclude this chapter, literature review is important to showcase all the studies of materials and methods to enhance the knowledge on this project. Every research that we make is really helpful to giving us an idea and also it can help us to understand more about the product usage and functionality.

After a lot of materials and methods were discussed and researches were done, the materials that are the most compatible for our project is thermoset. Due to its characters and advantages, meanwhile the methods that we decided to carry on is hands layup method. This is because of its low cost benefits and great for beginner's process.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodology is a ‘contextual framework' for research, a coherent and logical scheme based on views, beliefs, and values, that guides the choices researchers [or other users] make"The methodology refers to a discussion of the underlying reasoning why particular methods were used. This discussion includes describing the theoretical concepts that inform the choice of methods to be applied, placing the choice of methods within the more general nature of academic work, and reviewing its relevance to examining the research problem. The methodology section also includes a thorough review of the methods other scholars have used to study the topic.

Methodology is closely related to the method as well as the use of flow charts to show the course of a project being carried out.The flow chart is very important to illustrate the sequence of operations to finish the work. The flowchart is generally drawn in the early stages. It will guide to finish the works. Meanwhile, the Gantt chart shows how the project is planned and seen instantly whether the project is behind or ahead of the schedule. The function of the Gantt chart is to guide towards the direction of the project plan. So, these two charts are very important to guide us to finish up the projects..Gantt chart also can used to indicate the activities performed during the project implemented period.Thus,in this chapter all the implementation steps used, chart flow and gantt charts as well as descriptions of the components will be described in more detail.

3.2 FLOW CHART

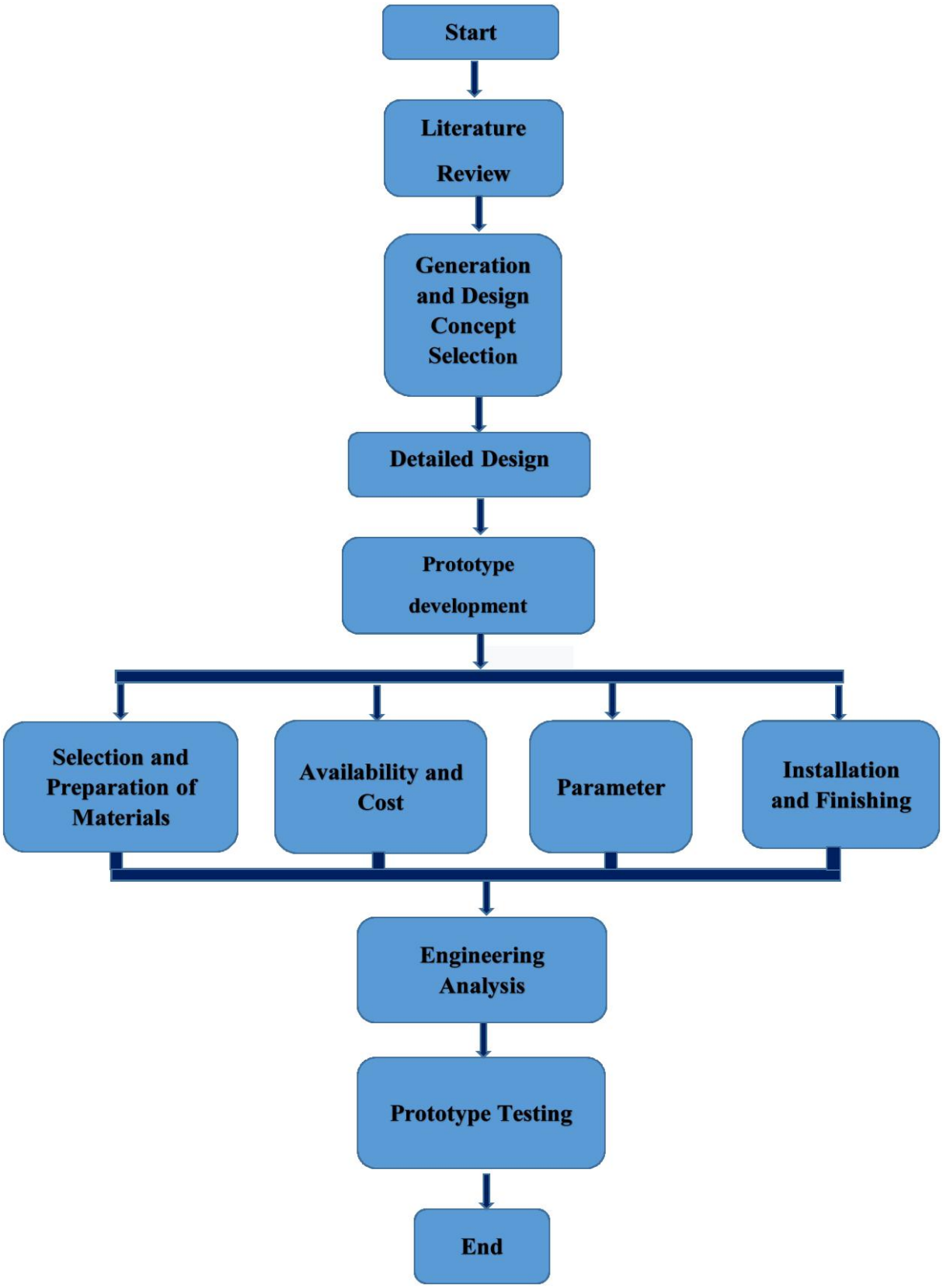


Figure 3.2.1 – Flow Chart

3.3 FLOW CHART EXPLANATION

Prepared by Suvaneswari A/P Loganathan

Literature review

From the research through the online survey and a Google website, we can gain a lot of idea for our project. We create a Google Form for the survey asking a question to the audience for our project idea. Other than that, we also met a fire fighter at the fire station for the details about the common situation that always happened that they faced before, and the way that they solve the problem for every emergency cases.Through the situation given, We make a lots of reference from the Google website to figure out some ideas and solutions to reduce the situation getting worst.

Generation and concept selection

The generation and concept design is done after the literature review.We clarify the problem of the existing product. From the survey and advise about the fire diffuser, we got the customer needs analysis.We used the information that we gain from the survey to upgrade as we get to know what is the need and expectation of the users for the generation and concept selection.

Detailed design

Detailed design is done after we discussed with the group members. Give a specific size (measurement) that fully fit the fire diffuser inside the box. Beside that we also designed it in suitable shape and size to make the fire diffuser easy to install in every kind of space and place, it also strong enough to stand all the out force pressure and in critical situation. That detailed design is designed in Auto Cad design and inventor design, at here now we have a perfect illusion to imagine the project (product) look like. With the design it can help us to solve the problem and fix it during making a prototype.

Prototype development

In the process of prototype development, we give a specific space to make sure the fire diffuser can function well in a long period without interruption. The prototype are build up with the selection and preparation materials, to make sure the box and the fire diffuser inside are safely place without any damage. The prototype are also build into high accurate position for the fire diffuser. Other than that, the aspect that we list down are need to apply in it so that they are fully function and show out the characteristic and functionality every part that has been selected. Double check the fire diffuser are working well and make sure all the things can be work smoothly.

Selection and preparation of materials

The right choice of materials is very important to produce a prototype of a automatic fire diffuser. With the good selection and preparation, we can conduct out a good result/product for the consumer and audiences. The selection must come out with the important point that can be strongly support the project use and functionality. We found out a lot of materials but the only suitable materials will going to use that can be fulfill the needs and show all the characteristics of the product. Try and repeat choosing is the best way to come out the final selection and preparation of materials. This can reduce our time and money on the unnecessary materials.

Figure 3.3.1-Arduino

Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.We can tell the board what to do by sending a set of instructions to the micro-controller on the board. To do so we use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Figure 3.3.2 – Electric motor

Electric motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates with a reversed flow of power, converting mechanical energy into electrical energy.

Figure 3.3.3 –Flame detector

Flame detector

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line (such as a propane or a natural gas line), and activating a fire suppression system. When used in applications such as industrial furnaces, their role is to provide confirmation that the furnace is working properly; it can be used to turn off the ignition system though in many cases they take no direct action beyond notifying the operator or control system. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame.

Figure 3.3.4 -Smoke detector

Smoke detector

A smoke detector is a device that senses smoke, typically as an indicator of fire. Commercial security devices issue a signal to a fire alarm control panel as part of a fire alarm system, while household smoke detectors, also known as smoke alarms, generally issue a local audible or visual alarm from the detector itself or several detectors if there are multiple smoke detectors interlinked.Smoke detectors are housed in plastic enclosures, typically shaped like a disk about 150 millimetres (6 in) in diameter and 25 millimetres (1 in) thick, but shape and size vary. Smoke can be detected either optically (photoelectric) or by physical process (ionization); detectors may use either, or both, methods. Sensitive alarms can be used to detect, and thus deter, smoking in areas where it is banned. Smoke detectors in large commercial, industrial, and residential buildings are usually powered by a central fire alarm system, which is powered by the building power with a battery backup. Domestic smoke detectors range from individual battery-powered units, to several interlinked mains-powered units with battery backup; with these interlinked units, if any unit detects smoke, all trigger even if household power has gone out.

Availability and cost

In the manufacturing process, the cost used is below than RM600.00. We spend a lot of money on Arduino and Motor. Motor that can produce air pressure through out the buzzer. Arduino will activating a motor when the smoke and fire is sensed by the sensor. It can spray continuously around until the fire fully stop. Notification will be send to our smart phone through an application.

Installation and Finishing

The prototype installation will be done after the materials and equipment are gathered and also after deciding the design of the suitable box.The installation is done by referring the design of the box.

Ergonomic analysis

Ergonomic analysis is done with dropping, carrying, holding, high and low surrounding temperature. The analysis shown that the way to improve our work efficiency to make it less time to complete a task/job. Thorough the analysis we can know that the limitation of the fire diffuser ,from the limitation, we take an action to get improve and fix in so that it can be used for a long period. In the same time, it can be improve the product's quality and work quality. Other then that, improve safety is the most important, our product named "Automatic Fire Diffuser". This because we need to reduce the mistake that bringing harm/injured when using.

Prototype Testing

The model that is ready to be developed will be tested either it is can be use in the future or not. Prototype also used to show the toughness, characteristics, functionality, suit ablation and stabilization. The audience's suggestion also can be used to make improvement on our prototype to be better. We also repeat and re-do to get improve every part that not satisfied and function well. With prototype, we can create a perfect product that we can be publish and promote in the market air.

3.4 PRODUCT DESIGN

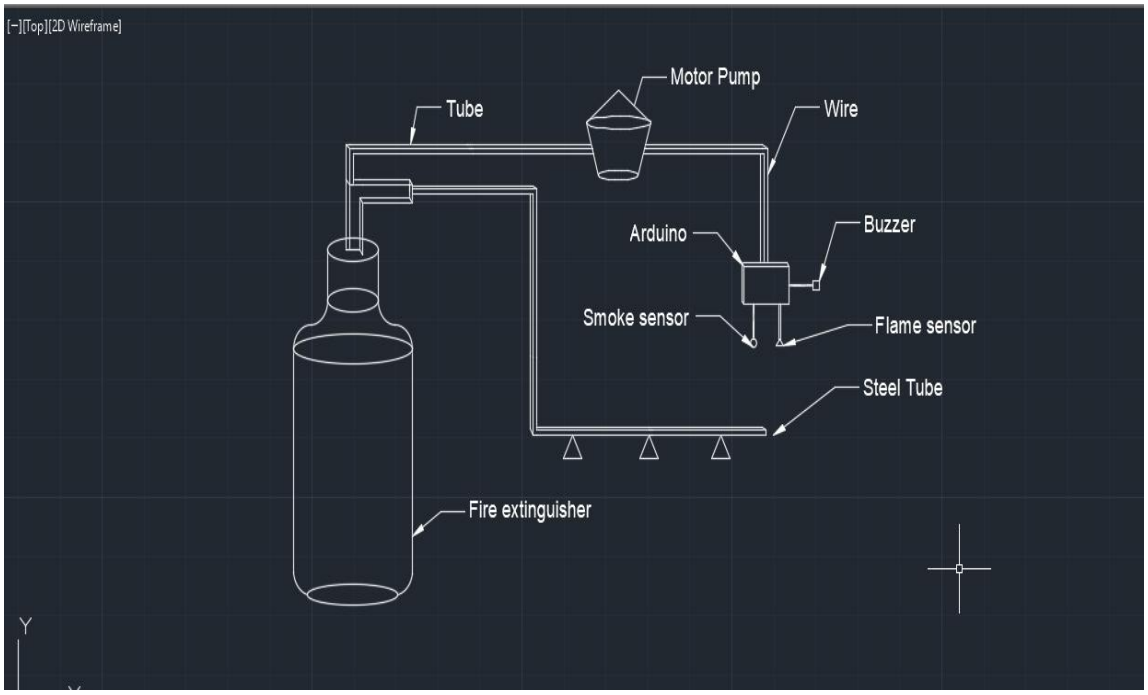


Figure 3.4.1 - Design

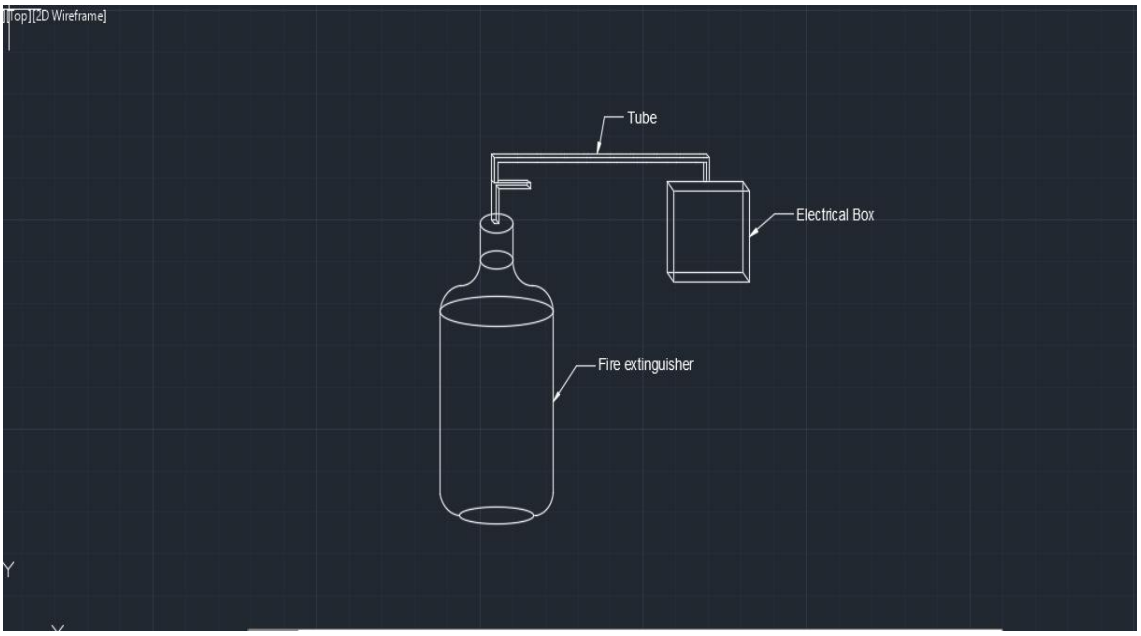
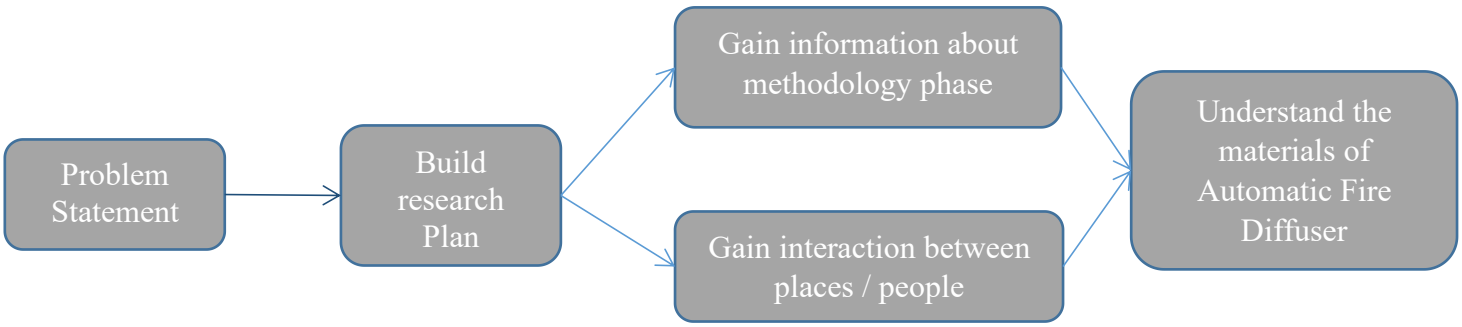


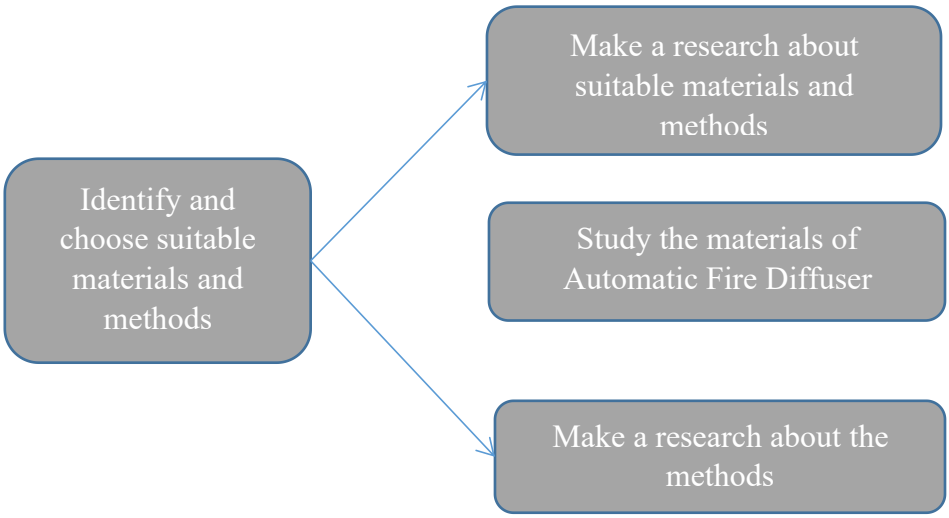
Figure 3.4.2 -Design

3.5 METHODOLOGY PHASE

Phase 1 : Data Analysis



Phase 2 : Method and Material



Phase 3 : Preliminary Study

3.6 BUDGET CALCULATION

Prepared By Amirul Allif Bin Abdul Halim

MECHANICAL PARTS COST :

Bil	Material	Quantity	Price/Unit (RM)	Total (RM)
1.	Pallet Board	5	RM10	RM50.00
2.	Fire Extinguisher	1	RM120	RM120
3.	Tube	5meter	RM1.00	RM5.00
4.	Battery Charger	1	RM30	RM30.00
5.	12V Battery	1	RM30.00	RM30.00
OVERALL TOTAL				**RM235.00**

Table 3.6.1

SYSTEM COST :

Bil	Material	Quantity	Price/Unit (RM)	Total (RM)
1.	Arduino (CAD)	1	RM150	RM150.00
2.	Flame Sensor	1	RM20	RM20.00
3.	Smoke Sensor	1	RM20	RM20.00
4.	Buzzer	1	RM15	RM15.00
5.	Cable	5	RM3.00	RM15.00
6.	Junction Box	1	Rm5.00	Rm5.00
OVERALL TOTAL				**RM225.00**

Table 3.6.2

OVERALL TOTAL COST : RM460

3.7 PROJECT ACTIVITY

project Activity	weeks													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Briefing and Project Plannig														
Project Design														
Material Selection														
Materials Purchase														
Method Selection														
Fabrication														
Test Run														
Analysis Data														
Report Writing														
Video and Slide making														
PITEX preparations														
PITEX presentation														

Table 3.7.1

PLANING

ACTUAL

3.8 SUMMARY

As a conclusion, the methods implemented in this project are very crucial and important to complete the project.In the initial stage, the literature review,generation and concept selection,detailed design are made systematically in the methodological study to know the facts and information to support the research instrument and describe more clearly in this study.

CHAPTER 4

FINDINGS AND ANALYSIS

4.1 INTRODUCTION

This chapter is about findings and analysis of our project.Once all the data and information are obtained, analysis is done to see the effectiveness of the installation of Automatic Fire Diffuser.The results obtained in this chapter are the results obtained from the questionnaires and experiments that have been conducted in the study area.Data resulting from experiments in the study area are analyzed in more detail to draw conclusions based on the objectives of the study that have been stated.

This data and analysis are crucial for this project to achieve the objectives and scope of the project.This data indicates the successful results of the materials testing. After getting all of this data, we analyze every single possible to make it be perfect.

4.2 GENERAL VIEW OF THE STUDY

Is a Home Fire Extinguisher important to you?

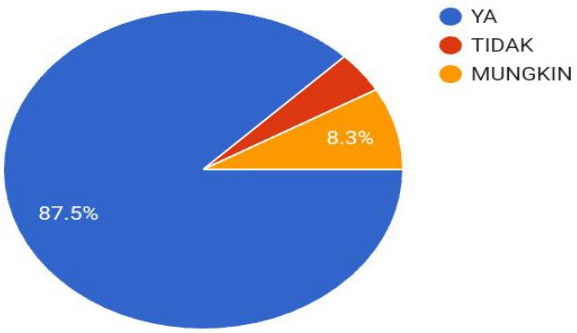


Diagram- 4.2.1

Diagram 4.2.1 shows the analysis obtained based on the question stated above.From the analysis,about 87.5% of the respondent agreed that its important to have home fire extinguisher.Meanwhile about 8.3% of the respondent thinks that it can be important.About 4.2% of the respondent disagree with the question.

Do you feel safe if your home does not have a fire extinguisher?

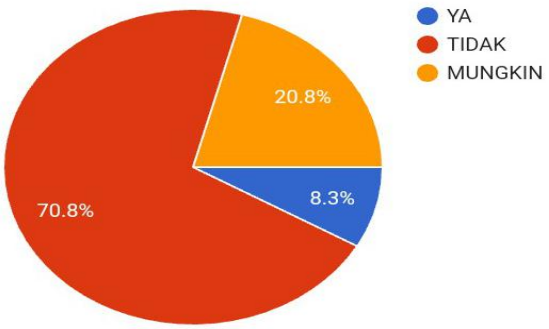


Diagram- 4.2.2

For the analysis of the safety regarding the existence of fire extinguisher at home Diagram - 4.2.2 shows the results of the questionnaire.A total 70.8% of the respondent disagree.However,20.8% of the respondent feels maybe it is not safe.Other than that 8.3% agree that it is safe even if no fire extinguisher is equipped in their homes.

Whether the fire extinguisher is an early fire prevention device from the fire continues to spread?

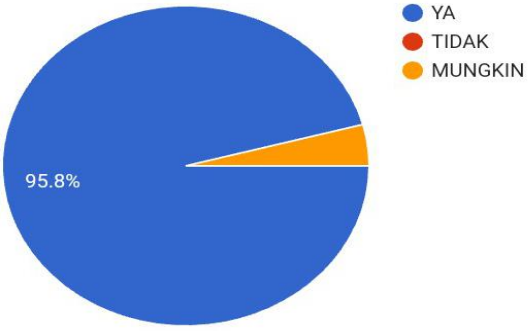


Diagram- 4.2.3

The results of the above analysis, shows that 95.8% of the respondent agrees that fire extinguisher is an early fire prevention device.Meanwhile, the remaining 4.2% of the respondent feels it might be an early prevention.No negative respond is obtained.

Does your home / office have a fire extinguisher (especially in the kitchen)?

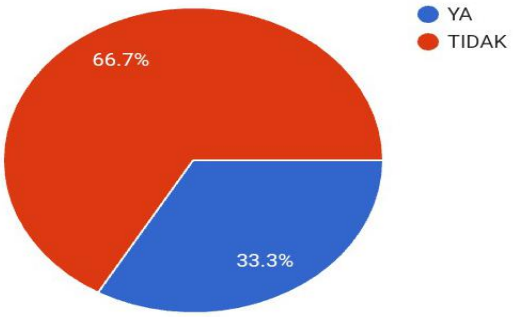


Diagram- 4.2.4

For the analysis obtained in the diagram above,the results shows that 66.7% of the respondent have a fire extinguisher in their home/office.A 33.3% of the respondent does not have a fire extinguisher at their home or office.

Does a manually controlled fire extinguisher make it easy for you?

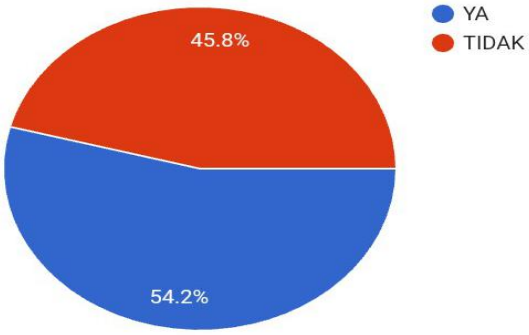


Diagram- 4.2.5

The result of the analysis from the Diagram- 4.2.5 shows that a 54.2 % of the respondent agreed that a manually controlled fire extinguisher is easy for them to use.While the remaining respondent containing 45.8% respondent disagree.

Do you think the size of the existing fire extinguisher is right for you?

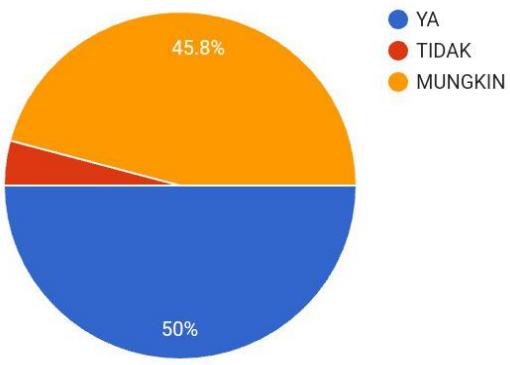


Diagram- 4.2.6

Diagram- 4.2.6 shows the result of the analysis regarding the size of the extinguisher,whereby, 50% of the respondent agree that the size of the existing fire extinguisher is right for them,45.8% of respondent feels maybe the size is right for them and 4.2% respondent disagree.

Will you buy a fire extinguisher that will work automatically?

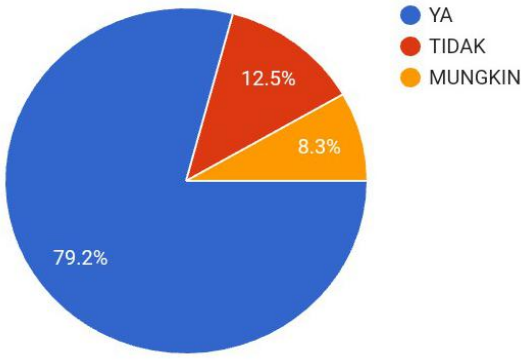


Diagram- 4.2.7

The following analysis is about the acceptance of respondent about the fire extinguisher.The results in the diagram shows that 79.2% of the respondent accepts the fire extinguisher that work automatically.Besides that,8.3% respondent maybe accepts and 12.5 does not accepts the automatically working fire extinguisher.

Do you think it is worth it to buy this automatic fire extinguisher?

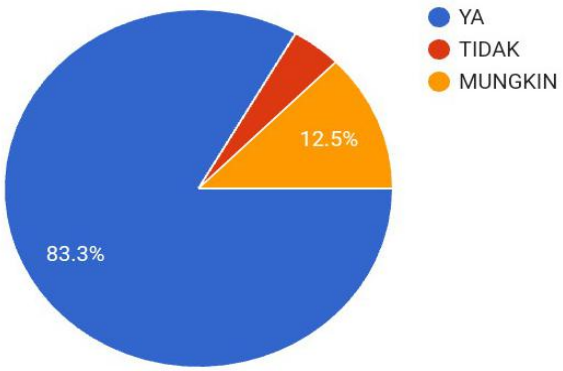


Diagram- 4.2.8

Diagram- 4.2.8 shows the analysis that does the respondent feels it is worth to buy automatic fire extinguisher.About 83.3% respondent feels it is worth,12.5% fells it might be worth and remaining 4.2% respondent disagree which means they does not feel it is worth to be bought.

Would you feel more secure if your home / office had an auto-fire extinguisher?

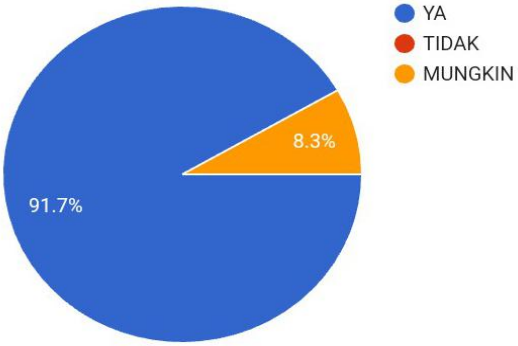


Diagram- 4.2.9

The next result is about the safety of home/office with the automatic fire extinguisher.91.7% of the respondent agrees that they feel it is safe to have automatic fire diffuser at home/office and 8.3% respondent feels it might be safe ,and there is no negative respond for this analysis.

Would you recommend to your friend to provide a fire extinguisher at home / office?

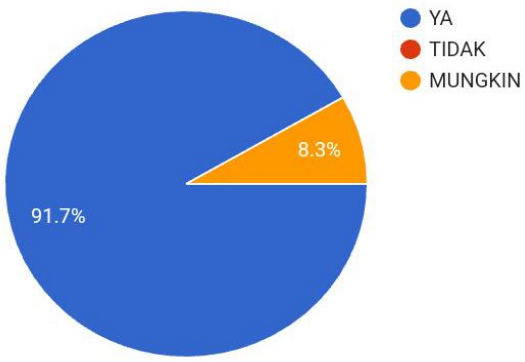


Diagram- 4.2.10

The final analysis of the project is regarding the recommendation of the extinguisher.91.7% of respondent agrees that they would recommend this fire extinguisher while remaining 8.3% of the respondent might recommend and no negative respond for this analysis.

4.3 ADVANTAGE AND DISADVANTAGE

Prepared By Suvaneswari A/P Loganathan

Every project has its own advantages and disadvantages.However, the the disadvantages must be improvised or changes needed to be applied so that we could enhance the good and very efficient product that hardly to find disadvantage of the project.Automatic Fire Diffuser has a lot of advantages to help people to put out fire in time and prevent huge damages from happening.

4.4 CHAPTER'S SUMMARY

As a conclusion for this chapter , the analysis and findings have been made. This Automatic fire diffuser has a lot of advantages however there are every cons to pros. Hence, the challenges are taken as a room for improvements and more developments for future generation and well as to enhance their knowledge on the project we carried out

CHAPTER 5

DISCUSSION , CONCLUSION AND UPGRADE PLAN

5.1 INTRODUCTION

For this chapter, the decision made is based on all the results obtained from the experiments conducted and the discussion in the previous chapters. In this chapter as well, the relevant matters are regarding the objectives of the study and also the recommendations on the study conducted. In addition, the conclusion will be made based on the discussion and upgrade plan that have been made.

5.2 DISCUSSION

Based on the data we collected , we all agree that we need to change the material of flexible rubber pipe to metal pipe. This is because the flexible pipe cannot withstand under high temperature around 50 degree Celcius. With this problem, it will make the flexible rubber pipe melt and cannot be transfer ABC dry powder anymore through out the nozzles. To fix this problem, we change it to metal pipe, metal pipe is more suitable and can withstand high temperature around 100 - 200 degree Celcius. It still can allowed the dry powder to flow through out the nozzles. Other than that, the metal pipe is not easy to break and rush, but in long period, the metal pipe will become rush and blocked.in this situation, we need to have a maintenance.

Next is the motor, the power of the motor that we use is 50 bar, the pressure produce is not enough to push the dry powder to spraying out from the nozzles. Once change it to 100 bar, under the high pressure, the dry powder is spraying out more rapid and balance. This can help in to fastest of spraying during fire is occur. The motor can be use in long period without any maintenance need to be do for 3-4 years. Moreover, the good quality of motor pressure can produce the air pressure in a long period.

Furthermore, we need to increase the size of the fire extinguisher, the smallest size of fire extinguisher cannot stand for too long to slow down the fire. In this case, increase the size of the fire extinguisher is the best way to help the fire slow down the fire getting worst. The material fir fire extinguisher also should can be withstand under high temperature so that the dry powder can be continue to use without any blockage and leaking happen.

CONCLUSION

Based on our project, the design and implementation of the automatic fire diffuser is customizable and flexible. This wireless detection mechanism lower in cost-effective than the available fire detection systems in the traditional market. This automatic fire diffuser recognition framework a has high precision rate, and rushes to distinguish changes in temperature and stickiness degrees which empower consistent incorporation with the a clients and gives more a tightly security. All the upgrades and improvements will be made so that this project could give more benefits and advantages . last but not least, hope that this project could expand even more through out all the upcoming generations.

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APPENDIX A

	ITEM	FUNCTION	MATERIALS	DESCRIPTION(cm)	
				length	Width
1	Wood box	Use to installed all the components such as arduino, motor and fire extinguisher.	Pallet wood	90	70
2	PU fitting	Used to connect 2 flexible hoses tubing for carrying fluid and gas.	polyurethane	-	-
3	Flexible pipe	To allowed the flow of gas and ABC dry powder.	Plastic	-	-
4	Junction box	To install the smoke and flame sensor	Plastic	16	13

Table 1 : *Description of raw materials*

AUTOMATIC FIRE DIFFUSER COMPONENTS		
NO.	COMPONENTS	FUNCTION
1	Arduino	Use to activating a motor, turning on an LED, publishing something online.
2	Motor	To produce a high air pressure.
3	Wi-Fi	Use to send the notification and data to the application called ''blynk''.
4	Sensor	Use to detect smoke and flame when it occur.
5	Battery	Connects the arduino to power source, to enable the flows of electrical energy into the motor components and sensor.
6	Fire extinguisher	To install the ABC dry powder

Table 2 : *Description of Components and function*

APPENDIX B

	• All components are connected and Iis ready to be installed inside the Mahogany wood box.
	• The components is installed and set up in a suitable position.

	• The arduino, motor and sensor is attached on wood box that can be conducted effectively.

INSTALLATION WORK

APPENDIX C

RESULTS

1. Running Test 1

We had conducted of rescue fire by cut off the gas sources in Figure 1. Figure 2 is mostly use by spraying the fire using fire extinguisher. So, it take a long period to stop the fire keep burning.

Figure 1 : *Cut off gas sources*

Figure 2 *: Spray by using fire extinguisher*

NO	TYPE OF MODEL	ACTION	TOOLS	VOLTAGE	TIME TAKEN	EFFECT OF ACTION
1	T1	Cut off the gas source	Spanner or cutter	-	30 minutes	Get injured
2	T2	Spray the fire by using fire extinguisher	fire extinguisher	-	15 minutes	Took a long period to stop the fire

Table 1 : *Test result*

REMARKS :

The fire become more raging because it take a long period to stop the fire.

2. Running Test 2

Finally, condition of using automatic fire diffuser are shown in Table 3.

NO	TYPE OF MODEL	ACTION	TOOLS	VOLTAGE	TIME TAKEN	EFFECT OF ACTION
1	T1	By using automatic fire diffuser	Arduino and sensor	12 V	Less than 10 minutes	The fire completely stop and no one get injured.
2	T2	By using automatic fire diffuser	Arduino and sensor	12 V	Less than 10 minutes	The fire completely stop in a shortest period.

Table 2 : *Test result 2*

REMARKS :

The fire is fully stop in a short period and no one was injured during rescue the fire

Table 3 : *Condition after use of automatic fire diffuser Running on Test 2.*