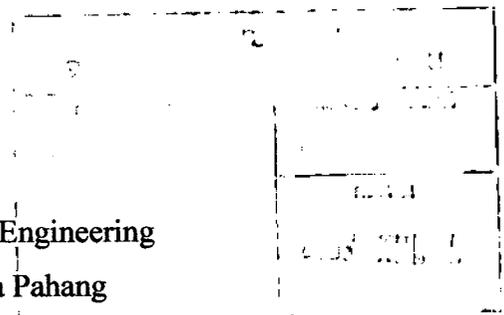


# DEVELOPMENT OF AUTOMATIC GATE OPENER MECHANISM

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## **ABSTRACT**

This project presents mechanisms of automatic gate opener swing operator. The objectives of this project are to design automatic gate opener mechanisms, fabricate and assemble gate opener components. Mild steel and galvanizes iron were used as material in this project. The structural three-dimensional solid modeling of mechanisms automatic gate opener was developed using the solidworks drawing software. The arms that mount to the gate were fabricated using metal inert gas welding. The box for store the motor was fabricated using turret punch machine and bending machine. Result for the first test is the gate not move because the output power that need to push or pull the gate not enough. Result for the second test is the gate can move because the gate is lighter than the first one. The automatic gate opener can be added with remote control system. Therefore, the gate can be opened from more distance.

## ABSTRAK

Projek ini menerangkan mekanisma pembuka pintu pagar automatik yang beroperasi secara ayunan. Objektif projek ini adalah untuk mereka mekanisma pembuka pintu pagar automatik, menghasilkan dan memasang komponen pintu pagar. Keluli lembut dan besi bergalvani telah digunakan sebagai bahan dalam projek ini. Struktur 3 dimensi mekanisma pembuka pintu pagar automatik telah dihasilkan menggunakan perisian lukisan Solidwork. Mekanisma lengan yang dipasang telah dihasilkan menggunakan kimpalan gas. Kotak untuk menyimpan motor telah dihasilkan menggunakan mesin penebuk dan mesin pembengkok. Keputusan untuk ujian pertama adalah pintu pagar tidak dapat bergerak kerana kuasa untuk menolak dan menarik pintu pagar tidak cukup. Keputusan untuk ujian kedua adalah pintu pagar boleh bergerak kerana pintu pagar ini lebih ringan daripada pintu pagar pertama. Pintu pagar automatik boleh ditambah dengan sistem kawalan jauh. Jadi, pintu pagar boleh dibuka daripada jauh.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Project Background**

Now days, we can see that many of people in big city use the automatic gate system at their home. This is happen when they are often to use transport like car to work. To open or close the gate they need to step out side from the car to open it. It just wastes the time. So, they prefer to the automatic gate system because it can save their time and energy. They just need to push the remote control while in the car to open the gate. We rarely to see people outside from the city using the automatic gate system at their home. Probably because the cost to install this system is high.

The function of automatic gate opener is to help user open or close the gate automatically using electrical source without manually pull or push the gate.

There are two types of operator. First, the swing operator. This type usually using at home. Second, the slide operator. This one often to use at industry or large building.

The problem that occurred for using this system are the cost and how to install this part to the gate. The cost will include cost of installment and maintenance. The costs are quite expensive. There will be a problem during how to install this system to the gate.

To solve this problem, on this project, there will be design the simple mechanism operating gate opener. It has two arms that mount each other. First arm is

mounting at the motor and the second arm is at gate. When the motor is on the arm will pull or push the gate to open or close. The motor will be store in the box and will install at the pillar of the gate.

## **1.2 Problem Statement**

In this project, it can be concludes that have two main problems. The first problem is the cost. The costs include the cost of installment and maintenances. The second problem is the how the part will install to the gate.

To solve this problem, this project will have the simple mechanism that can save the cost. The part will install at pillar of the gate.

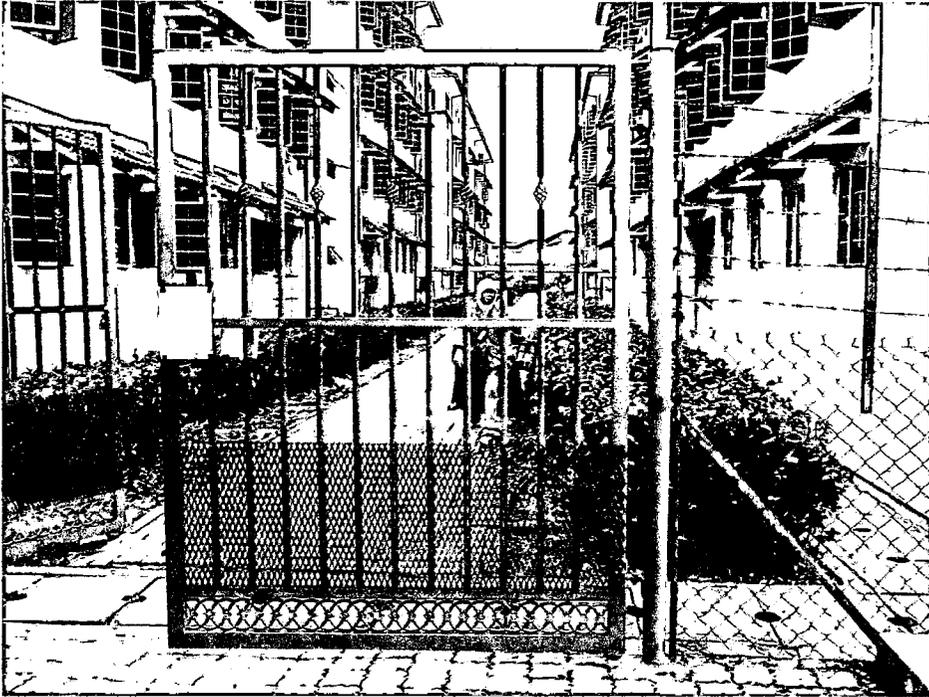
## **1.3 Project Objectives**

This project is base on this two objective:

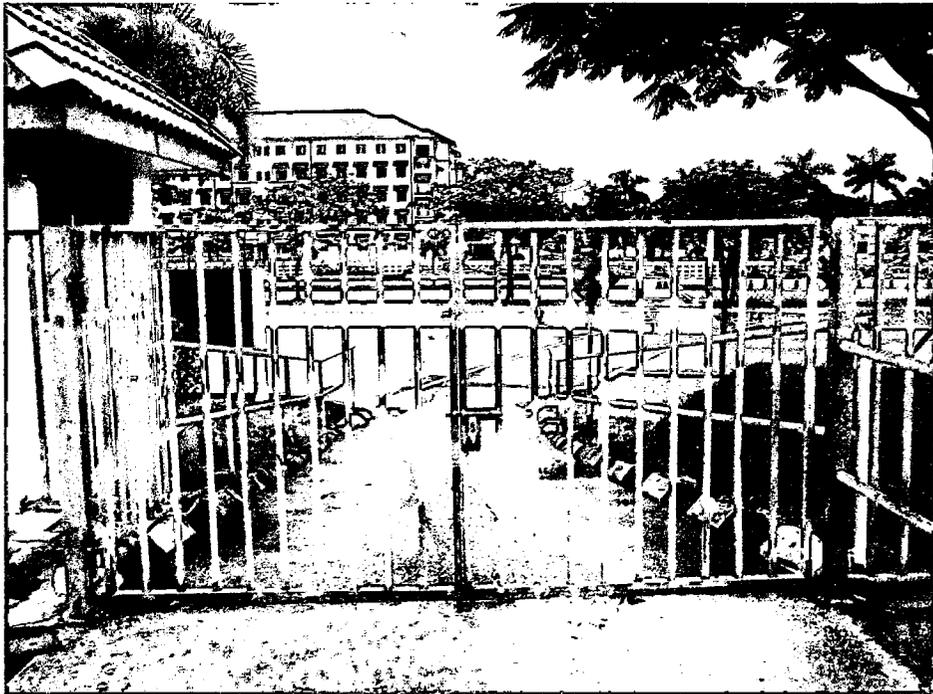
1. To design gate opener mechanism.
2. To fabricate and assemble gate opener component

## **1.4 Project Scopes**

On this project, it will focus on mechanisms parts of automatic gate opener. It includes the movement and component part of automatic gate opener. It does not include the electronics part of this system. The project is especially for the swing type gate. It also limited for motorizes use only. For this project, there will be two different gate will be tested. The first one located at café Kolej Kediaman 1 and the second one located at entrance of Taman Teknologi dan Inovasi in Universiti Malaysia Pahang.



**Figure 1.1:** Gate at café Kolej Kediaman 1



**Figure 1.2:** Gate at entrance of Taman Teknologi dan Inovasi UMP

## **1.5 Thesis Organization**

For chapter 2, it will discuss about the literature review. This chapter will discuss about the reviewing study about the automatic gate opener mechanism.

For chapter 3, it will discuss about the methodology of the project. This chapter will discuss more about the fabrication process of the project. It includes the analysis design, material, and method for fabrication.

For chapter 4, it will discuss about the result and discussion. For this chapter, it will show the details of the result from testing the mechanism of automatic gate opener.

For chapter 5, it will conclude the project, about the conclusion from the project. It also includes the summary from the project and recommendation for future project.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

The automatic gate opener mechanism is the system that combined mechanical system and electrical system. The function of mechanical part is to move the gate according the directions that have been set. While, electrical system is to give source energy to move the mechanical part.

The function of automatic gate opener mechanism is to help user open or close the gate without using human energy to pull or push the gate. It functionally automatic to move the gate by switch on the switch.

There are various kind types of automatic gate opener. For example, the swing operator and slide operator. Many of users at home usually use the swing type operation. While, at big industry they using the slide type operation.

#### **2.2 Types of drive system operator**

There are two different type of drive system operator for automatic gate opener. First, is using the torque motor. This type is commonly used in market. There can be operated by using electrical source and battery supply 12 V.

Second, is using the belt system. This is the latest technology for safest and more efficient operator. There can be operated by using electrical supply.

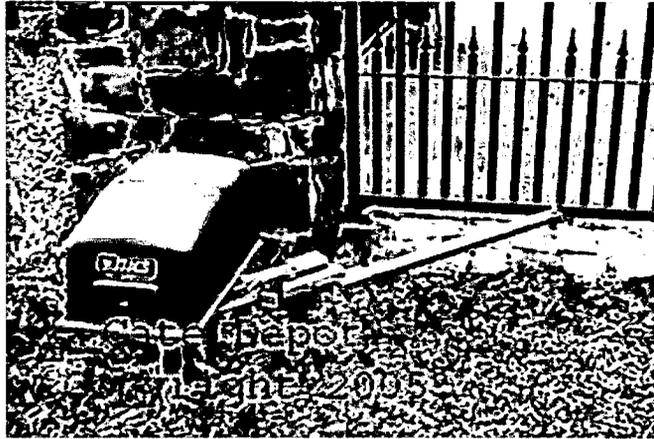
### **2.3 Design of Swing Type Operator**

The swing type operator is suitable use at home. It is because it easy to install and time to open or close the gate is faster than slide operator. The cost to install and maintenance are low than slide type operator.

#### **2.3.1 Bottom Mounted Swing Arm**

These units have the arm mounted on the bottom. The main advantage to this design is that you do not see an unsightly arm in the middle of your gate. The arm is usually positioned to match up with the bottom of the gate.

Of all the gate operators available, this is the fastest opening unit. It can open a gate in as little as six seconds. Another major advantage to this design is the cover opens without having to remove the arm first. This makes it one of the most accessible and easy to service operators. Manual release of this unit is by removing a lock and pin that is located on the arm.



**Figure 2.1:** Picture of bottom mounted swing arm

### **2.3.2 Top Mounted Swing Arm**

These units are favored as the work horses of the industry. These units on a majority of high use applications. This type of operator usually features two oil bathed gearboxes and a very heavy chassis. The circuit board can be accessed through the front panel, but you have to remove the arm to gain access to the mechanics.

To manually release the unit, the bonnet on the arm is removed by unfastening a bolt and a lever is lifted to release the gate. Some security is lost due to the units not having a locking mechanism. Need to use wrench handy open units during a power outage.



**Figure 2.2:** Picture of top mounted swing arm

### **2.3.3 Mechanical Ram Arm**

Ram arms are small and make a very clean looking installation. The mechanical ram arms use a jackscrew design. This long threaded shaft rotates and moves a piston. Most ram arms have a separate control box for the electronics and power supply.

Soft stop is a desirable feature when purchasing this type of unit. Many of the units now on the market are 12-24 Volts DC. Mechanical ram arms are well suited to lighter gates and lower duty cycle such as residential use.

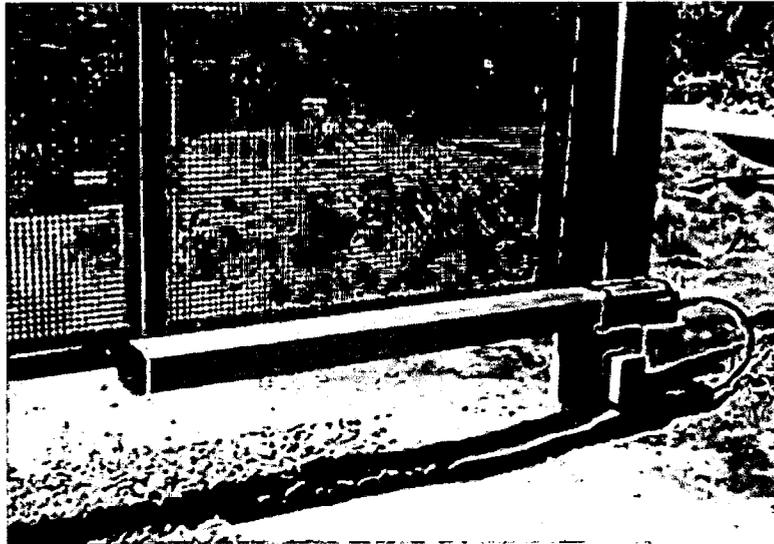


**Figure 2.3:** Picture of mechanical ram arm

#### **2.3.4 Hydraulic Ram Arm**

These compact and attractive units are operated by a hydraulic piston that has a self-contained pump. The hydraulic ram arms are usually more durable than mechanical ram arms and some units are suitable for commercial application. Hydraulic ram arms have a separate control box for the electronics and accessories.

Precision control over the force these units exert makes them extremely safe. All hydraulic units need a positive stop added either to the gate or internally. These stops allow precision positioning of the gates.

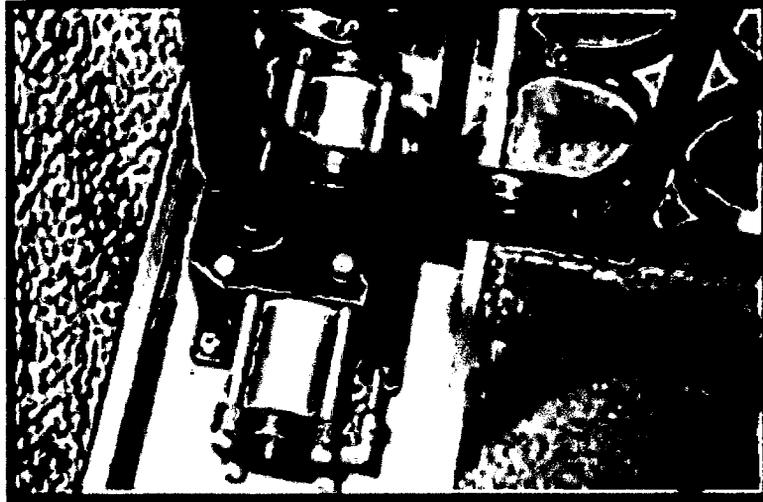


**Figure 2.4:** Picture of hydraulic ram arm

### **2.3.5 Underground Operator**

Underground operators are the most elegant of operators. The operators are mostly invisible and they can handle massive sized gates.

Electronics are located in a separate cabinet. When these units are installed with columns, the control unit can be flush mounted into the column for an even cleaner look. Underground operators are available in hydraulic and mechanical. Most units have a key located near the bottom of the gate to release the unit incase of power failure.



**Figure 2.5:** Picture of underground operator

#### **2.4 Comparison between the designs**

For bottom mounted swing arm design, the arm is mounting at the bottom of the gate. It can open the gate with the faster time than the others can. It also easy to install and service maintenance.

For top mounted swing arm design, the arm is mounting at the middle of the gate. It suitable for heavy weight gate. The power supply to generate the operator is high.

For mechanical ram arm design, the arm is small and mounts the body at bottom of the gate. It suitable for light weight gate and small gate.

For hydraulic ram arm design, the system operated by a hydraulic piston that has a self-contained pump. The hydraulic ram arms are more durable than mechanical ram arms and more precision positioning stop.

For underground operator design, the units are installing at the underground of the gate. It suitable for heavy and light weight gate. It is the most secure from the other because the mechanism located at below ground.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Project Flow Chart**

In fabrication of Automatic Gate Opener, there is a planning of the overall progress to assure the project can be finish on schedule

From the flow chart below, this project started with the literature review and research about the title. The main important of the project is to achieve the objective of the project. The study and make a lot of investigation about automatic gate opener mechanism. These tasks have been done through research on the internet, books and others.

After the information has been collect and gather, the project will be continuing with the design process. In this stage, the knowledge and lessons that have studied will be applied in sketching. There will be three different sketches for this project. Then, only one sketches will selected after collect the data analysis.

Next, the project continuing with the evaluate design process. The three sketches will be analyzed and make a comparison between the sketches. The data from the analysis will collect and the best sketches will selected. After the sketch has select, the design will transfer to engineering drawing by using Solidworks software.