# SHEET SHEARING AND BENDING MACHINE

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## ABSTRACT

The sheet metal cutting process is a main part of the all industries. Normally the sheet metal cutting machine is manually hand operated one for medium and small scale industries. Any machine aimed at the economical use of man, machine, and material worth the most. In our project. Sheet metal is simply a metal formed into thin and flat pieces. It is one of the fundamental forms used in metal working and can be cut and bent into a different shape. Countless everyday objects are constructed of the material. Thicknesses can vary significantly, although extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6 mm (0.25 in) are considered plate. Sheet metal also has applications in car bodies, airplane wings, medical tables, roofs for buildings and many other things. Sheet metal of iron and other materials with high magnetic permeability, also known as laminated steel cores, has applications in transformers and electric machines. There are three primary procedures in Layout. They are Parallel, Radial, and Triangulation.

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# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

To complete a Diploma in Mechanical Engineering at Polytechnic Seberang Perai, it is a compulsory for a student to do final year project with their groupmates with their own ideas and creation. Our final year project is 'sheet shearing and bending machine'.

Sheet metal is simply a metal formed into thin and flat pieces. It is one of the fundamental forms used in metal working and can be cut and bent into a variety of different shapes. Countless everyday objects are constructed of the material. Thicknesses can vary significantly, although extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6 mm in are considered plate.

Sheet metal is available in flat pieces or as a coiled strip. The coils are formed by running a continuous sheet of metal through a roll slitter. The thickness of the sheet metal is called its gauge. Commonly used steel sheet metal ranges from 30 gauge to about 8 gauge. The larger the gauge number, the thinner the metal. Gauge is measured in ferrous metals while nonferrous metals such as aluminium or copper are designated differently; i.e., Copper is measured in thickness by ounce. There are many different metals that can be made into sheet metal, such as aluminium, brass, copper, steel, tin, nickel and titanium. For decorative uses, important sheet metals include silver, gold and platinum. Sheet metal also has applications in car bodies, airplane wings, medical tables, roofs for buildings and many other things. Sheet

metal of iron and other materials with high magnetic permeability, also known as laminated steel cores.

Moreover, sheet shearing machine and bending machine is very important in every factories and workshops because the machine cuts and bends machine which is needed to create any project using metal sheets. Machines like this are significantly important for creating projects or any other metal objects. Plus, small workshops need a machine that can save place and do the same work as other machines do. Small workshops will have a lesser budget. So, they need a machine that can save space and do the same work as the other machines do.

Finally, this project will help out people who has small workshops and who has difficulties in free space and budget problems. So, this project will be very helpful and useful for the people who are having difficulties and problems at workshops.

## 1.2 PROBLEM BACKGROUND

Sheet industries are there widely in the whole country. With more different types of sheets and with different thickness and length of sheets human needs more machine according to the size of the sheet metals they receive. In a similar way, industries also receiving a lot of metal sheets but there are only few big machines which uses a lot of energy and power to operate it. The industry needs an energy saving machine to shear and bend the sheets.

Moreover, spacing is one of the most important factor in every workshops in our country. According to research, most of the workshops and factories all over the world has difficulties in spacing. First is they have to make their workshops more bigger than usual housing space of workshops and factories. The simpler and better way is creating a machine which will save more space in workshop and factories.

Furthermore, time saving machine is also one of the important factor as well. According to researches, engineers and operators at workshops and factories, uses extra 15% of their time in operating a machine to work. The reason is most of machines used in factories are usually heavy machines. Heavy machines has a lot of procedures to carry on before working

using that machine. That`s the one of the reasons where more time will be used to use the facilities or machines to do one`s work.

This project aim is to save time and the space the machine takes to keep it at one place. Not even factories but the workshops are the main places because it has limited places to keep machines and any other facilities. Factories are huge places and there is usually a lot of heavy machines kept and used it as a daily routine. Factories have huge places and heavy machines because it handles bigger and heavier project or work to be settled. There are many steps and ways too to complete a work or a project.

## 1.3 PROBLEM STATEMENT

The sheets with smaller thickness are usually placed in the big hydraulic sheet shearing machine and caused it a lot of power and energy used just to shear and bend a smaller size of sheets. So, we came out with an alternative solution to safe power and energy used. It is planned and designed a sheet shearing and bending machine that manually operated for the smaller size and less thickness sheets. So, now engineers or the operator of heavy machines no need to use heavy and big machines to shear and bend thin metal sheets. This creation is able to make people life`s easier and reduce their works. This machine is fully operated and working by manually so that the industries can reduce the usage of power consumptions. This project also saves time and space at the same time. This project will be easily maintained and also will be easily dismantled if it`s needed. This machine also will be smaller in size compared to the hydraulic machine and can safe more space.

**FIGURE 1.3.1** A Specialized Manufacturing Machinery Factory

## 1.4 OBJECTIVE

The objective of this project:

- This machine is very useful to cut small pieces of metal sheets with a thickness between 0.1mm to 1.0mm with 1 feet width of sheets.
- Can be used to bend thin metal sheets up to various angle of 15° to 90° with the thickness between 0.1mm to 1.0mm.
- To create a machine that saves time, space and portable to use.

## 1.5 PROJECT SCOPE

- Our machine can cut a sheet with thickness between 0.1mm to 1 mm with 1 feet width of sheets.
- The machine is capable of cutting soft and thin sheet metals.
- The machine can be bend up to various angle of 15° to 90° with thickness of 1mm metal sheets.

## 1.6 ADVANTAGES OF THE PROJECT

Like hydraulics and pneumatics is a type of machines that can cost you more money and energy consumptions while our machine does not require any electrical energy to be run. Our machine is totally operated manually. Two people can work for bending and cutting the metal sheet at the same time. This machine also safe energy consumption and money to be maintained. Our machine also safe place as it is not so bigger than hydraulic sheet shearing and bending machine. We can cut the machine by using our legs. As we all know if using manually we need two people for holding and cutting the metal sheet if using hand cutting. By using leg only one person can work on shearing the machine because we can hold the metal sheets with our hands and operate the machine by using our legs. Another person can work on bending on the other side. We really hope that our machine can make workers work easier and safe cost for small industries for the maintenance.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

In this chapter, made some research on all aspects of project to design a sheet shearing and bending machine. From the research and studies, found that there are several aspects that need to be addressed so that product quality and the objective of the project is fulfilled. There is various types of shearing machine such as pneumatically operated, hydraulically operated, rack and pinion operated and spring operated.

The sheet shearing machine and bending machine is most important in sheet metal industry. This machine should be used for straight cutting machine with wide application. But in some industry hand sheet cutter and hand bender are used. For that machine to operate the human effort are required. The machine should be simple to operate and easy to maintain, hence we tried out to develop the Sheet Shearing and Bending Machine that is manually operated. In shearing operation as the punch descends upon the metal, the pressure exerted by the punch first cause the plastic deformation of the metal. Since the clearance between the punch and the die is very small, the plastic deformation takes place in a localized area and the metal adjacent to the cutting edges. In bending operation the bend has been made with the help of punch which exerts large force on the work clamped on the die.

The bending machine is designed in such a way that, it works automatically. The machine is designed by observing the factors to improve the efficiency and to reduce the cycle time by producing quality output. We achieved by creating a machine that can save electric and cost for maintenance because it is fully manually operated machine.

## 2.2 Type of Sheet Shearing and Bending Machine in Market

FIGURE 2.2.1 Hydraulic Shearing Machine

| **Source** | https://www.guojimachine.com/ |
|---|---|
| Automatic Grade | Semi-Automatic |
| Power | Electric |
| Sheet Material | Steel |
| Max Shearing Thickness | 0-25mm |
| Voltage (V) | 440 |

The hydraulic swing beam shearing machine has a steel welded construction, hydraulic transmission and accumulator return stroke. This effective, attractive machine is simple to operate. The indicators for adjusting gap between blades help to quickly, conveniently align shadow light. The top blade gap can be adjusted for full stroke, while shorter ones help to safeguard users. The machine also permits spindle allowance, and has a stock counter, internet time relay, inch-mm selector; and the integral factor can be easily programmed. The indicator helps to easily, rapidly adjust clearance of four edge cutting blade. The full-short stroke of blade holder is also adjustable. The front, preloading rail structure forces the blade holder to continuously move along upper and lower rail without any gaps. Further, the blade gap is adjustable for various plates to obtain better shearing.

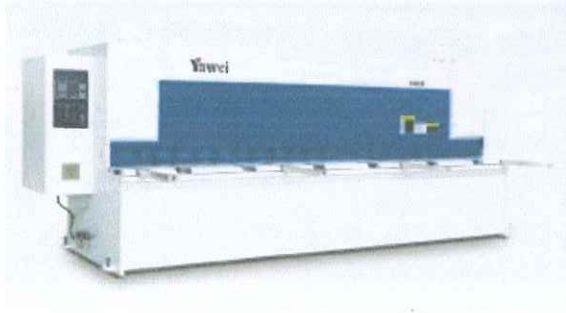

FIGURE 2.2.2 CNC Shearing Machine

| **Source** | https://www.guojimachine.com/ |
|---|---|
| Automatic Grade | Fully-Automatic |
| Power | Electric |
| Sheet Material | Steel |
| Max Shearing Thickness | 6 mm-20 mm |
| Voltage (V) | 220 |

The CNC swing beam shearing machine has a sturdy, lasting steel welded frame; hydraulic transmission, and swing blade holder. The full-short stroke is adjustable, and return stroke of oil cylinder is fast and steady. It has a hand wheel to adjust gap between upper and lower blades. The closed ring control system includes a numerical control system and position coder; which ensures fast speed, higher precision and better stability. Besides, the CNC guillotine shearing machine is another variety that incorporates the advanced method of hydraulic plate shearing. The adjustable rake angle minimizes distortion and deformation of the plate. While the inclining structure of upper blade holder enables easy blanking and accurate cutting. The top blade can be adjusted to work for full or short stroke. It has a section-wise shearing and lighting alignment, motorized back gauge and digital display.

**FIGURE 2.2.3** Sheet Bending Machine

Product Details:

| **Source** | https://www.guojimachine.com/ |
|---|---|
| Automatic Grade | Semi-Automatic |
| Power | Electric |
| Sheet Material | Steel |
| Max Bending Radius | 0-50 mm |
| Voltage (V) | 220 |

TABLE 2.2.4

From our literature review, we got many types of sheet shearing machine and sheet bending machine that are sale in market. But in market no one machine that sale like our project. That is (Sheet Shearing and Bending Machine). Our suggestion is, this project can sell in market. This project we combined sheet shearing machine and bending together. Application of this machine is this machine is very useful for small scale industries. These machines used to cut the roller sheet metal. All industrial application.

## 2.3 Materials in Sheet Shearing and Bending Machine

FIGURE 2.3.1 Sheet Bending Machine

Steel is the main component in our project. As an answer for the problem, while cut the sheet and the safety wise it will be more safety for consumer. Besides, steel rod won't be corroded at all and it can adjust the height that needed to reach the fan blades. Steel also can withstand a high tensile force and it lighter in weight. Because it won't break easily when fall down accidently. Finally, it an anti-fragile material so it will be last longer compare to other material.

FIGURE 2.3.2: Angle Bar

It is made of galvanized steel and often used in masonry or applied to different surfaces through welding or drilling. **Angle bars** are often utilized to support beams and other platforms, but their usefulness goes beyond their usual role.

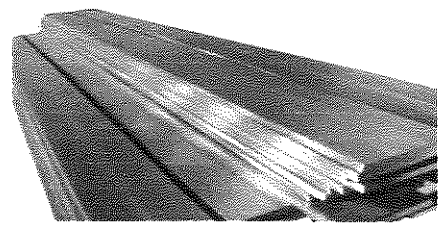

FIGURE 2.3.3: Spring Flat Bar

Spring Flat Bar Steel Available Sizes: Thickness:(3"): Spring Flat Bars are used for making leaf springs. Leaf Spring is used for the suspension in wheeled vehicles. For making knife, cutters, blades etc.

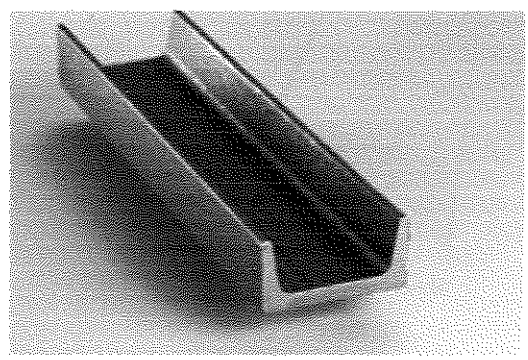

FIGURE 2.3.4 C-Channel

C-Channels are standardized channel section. The hot rolled execution has conical flanges, while the laser fused has parallel ones. Both their tolerances are defined by ASTM A 484, the laser fused execution has additionally the product standard defined by ASTM A1069. Channels or C-beams are often used where the flat, back side of the web can be mounted to another flat surface for maximum contact area. They are also sometimes welded together back-to-back to form a non-standard I-beam.