

# Fabrication of Metal Bending And Twisting Machine

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**Abstract-** Bending or twisting machine is a common tool in machine shop that is used to bend a piece of metal. It is widely used in various industrial operations such as bending a tube to make coil or sheet metal to make certain shape of regular polygons or twist the metal to required angle. There are much kind of bending and twisting machines that can be found in small scale industries which have different capacity for bending and twisting smaller metal. But integration of both operations in a single machine benefits the industries and their by reduction in the cost of labor and machine can be considered. The present work deals with a machine that integrates both bending and twisting operation in same machine which is manually operated with less time, skill and human effort.

**Keywords-** Bending, Twisting, Integration, Manually.

## I. INTRODUCTION

Metal working consists of deformation processes in which a metal billet or blank is shaped by tools or dies. The design and control of such processes depend on an understanding of the characteristics of the workpiece material, the conditions at the tool/workpiece interface, the mechanics of plastic deformation (metal flow), the equipment used, and the finished-product requirements. These factors influence the selection of tool geometry and material as well as processing conditions (for example, workpiece and die temperatures and lubrication). Because of the complexity of many metalworking operations, models of various types, such as analytic, physical, or numerical models, are often relied upon to design such processes. This Volume presents the state of the art in metalworking processes. Various major sections of this Volume deal with descriptions of specific processes, selection of equipment and die materials, forming practice for specific alloys, and various aspects of process design and control.

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## II. SURVEY CONDUCTED FOR DATA COLLECTION

**Manufacturer Name:** Makam Traders and Cements

**Address:** #1573/2. Opp. Lakshmi Janardhana High School K.R. Road, Mandya- 571401

The following are the parameters essential for the bending and twisting operation, which has been observed during the survey.

**Machine:** EL-DN25, EL-DN25D and EL-DN25E are the program controlled machine which has been utilized during the operation. The power and voltage requirements for the machines are 4kw and 220v-380v respectively. The cost of machines is expected to be around 4.5L-7L.

**Work Piece:** Mild steel (steel bar grade of FC415 or FC500) aluminum, iron, wrought iron is the materials which are commonly used in construction field and also to construct grills and gates etc. The work piece may be in square, rectangle, or circular cross-section depending on the type of work, strength, hardness or the requirement of the user.

**Dimension:** The length of the bar which is commonly utilized is 300mm long with a varying diameter of 10mm, 12mm, and 20mm which depends on user requirement.

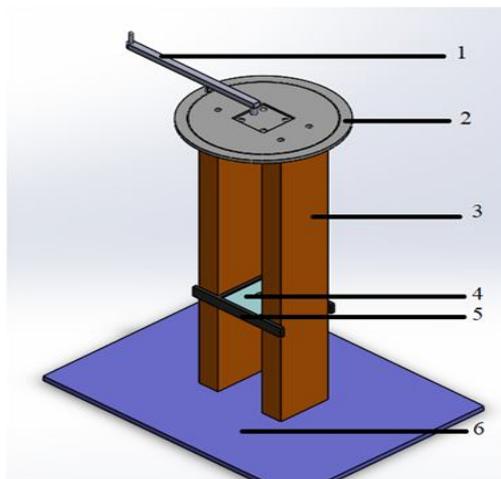
**Time taken for completing operation:** The time required bending the metal bar of various dimension and cross-section is 4-5 minutes and for twisting operation through machine is 5-8 minutes.

**Labour cost:** The labor cost for metal bending operation in construction field is 350 per day, were as to perform twisting operation to construct grill and gates is 400 per day.

### III. DESIGN AND MANUFACTURING

#### Design Process

A new or better machine is one which is more economical in the overall cost of production and operation. The process of design is a long and time consuming one. From the study of existing ideas, a new idea has to be conceived. The idea is then studied keeping in mind its commercial success and given shape and form in the form of drawings. The figure 1 shows the modeling of the machine developed.



1.HANDLE

2.CIRCULAR WORKBENCH

3.VERTICAL COLUMN

4.DIE

5.DIE HOLDER

6.BASE PLATE

**Fig 1. Model of Metal Bending and Twisting Machine.**

### IV. MANUFACTURING PROCESS

The acquaintance of industrialized processes is of great importance for a drawing engineer. The following are the various industrialized processes used in Mechanical Engineering.

Following fabrication processes were followed.

1. Machining
2. Welding
3. Mechanical Fastening

### V. WORKING PRINCIPLE OF MACHINE

The figure 1. Shows the modeling of the machine, its working is as follows bellow:

#### In case of metal bending:

- The metal or rod which should be bent is mounted on the circular plate with required jigs arrangement (i.e. as per the required angle).
- On the circular plate a slot is provide for the spindle attachment, so that the spindle can be rotated against work piece along the centre of the circular plate.
- As a result of this the metal is bent to required angle.

#### In case of metal twisting:

- Metal twisting can also be done through this machine; here the metal rod is placed vertically through the circular slot which is provided for the spindle arrangement.
- To hold the work piece firmly at the bottom of the slot is provide where the fixtures are placed corresponding to the metal rod size or shape.
- Simultaneously the top of metal rod is attached to the spindle knob with the fixtures.
- Once the setup is completed the spindle is rotated along the center of the circular plate due to metal rod will subjected to twist.

### VI. ESTIMATION & COSTING

The purpose of cost estimating is to forecast the cost of a project prior to its actual construction. Cost estimating is a method of approximating the probable cost of a project before its construction. The exact cost of a project is known after completion of the project. The table 1 shows the costs involved in fabrication of the machine.

**Table 1. Cost of fabricated Machine.**

<b>Particulars</b>	<b>Amount</b>
Lathe operation Cost	Rs.3000
Material Cost	Rs.3000
Labour Charge	Rs.1000
Miscellaneous Cost	Rs.3000
Die Casting Cost	Rs.5000
<b>Total</b>	<b>RS.15,000</b>

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## VII. CONCLUSION

The developed metal bending & twisting machine which can manually operate the following are the outcomes.

- **A Fast Setup:** In the case of setups, experience with the machinery will improve the setup time and avoid over time. Familiarity with the machine and the process will increase setup time and result in faster cycle than initially.
- **Rapid Cycle Times:** Comparatively improved bending of metal bars, although factors such as shape complexity if involved; it may reduce the disparity between the two pieces of equipment.
- **Consistency:** The parts produced and reproduced are consistent in quality and shape.
- **User Friendly:** The dedicated manual machines are easy to operate. Except for a few minor issues, a company can instruct and train an operator with ease fairly quickly.

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