

## Design and Fabrication of Roll Bending Machine

Anand Jayakumar A<sup>1</sup>, Pravinkumar K<sup>2</sup>, Pragadeeshwaran S<sup>3</sup>, Pratheeswaran S<sup>4</sup>, Nandakumar T<sup>5</sup>

<sup>1</sup>Assistant Professor, Department of Mechanical Engineering, SVS College of Engineering, Tamil Nadu, India

<sup>2,3,4,5</sup> Third Year Students, Department of Mechanical Engineering, SVS College of Engineering, Tamil Nadu, India

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**Abstract** - Hydraulic hand operated work piece bending is a machine which is used for bending the rod or work piece manually. By using hydraulic energy the pipe bending process can be carried out. The existing system is bending of pipes carried by men in a difficult way, but in the proposed system handled by hydraulic arrangement, which bends manually with the help of hydraulic jack. This project is designed with Hydraulic bottle jack and roller.

**Key Words:** Hydraulic, bending, manual, bottle jack, roller.

### 1. INTRODUCTION

Bending is a process by which metal can be deformed by plastically deforming the material and changing its shape. The material is stressed beyond the yield strength but below the ultimate tensile strength. The surface area of the material does not change much. Bending usually refers to deformation about one axis. Bending is a flexible process by which many different shapes can be produced. Standard die sets are used to produce a wide variety of shapes. Bending is done using Press Brakes. This project we are using the hydraulic power to bend the metal pipe. Because using this hydraulic system have good load capacity and good efficient. And also this project consumes no electrical power. So cost is less compared to electrical powered hydraulic systems.

### 2. ROLL BENDER

Roll bending may be done to both sheet metal and bars of metal. If a bar is used, it is assumed to have a uniform cross-section, but not necessarily rectangular, as long as there are no overhanging contours, i.e. positive draft. Such bars are often formed by extrusion. The material to be shaped is suspended between the rollers. The end rollers support the bottom side of the bar and have a matching contour (inverse shape) to it in order to maintain the cross-sectional shape. Likewise, the middle roller is forced against the top side of the bar and has a matching contour to it.

### 3. OPERATION

After the bar is initially inserted into the jig, the middle roller is manually lowered and forced against the bar with a screw arrangement. This causes the bar to undergo both plastic and elastic deformation. The portion of the bar between the rollers will take on the shape of a cubic polynomial, which approximates a circular arc. The rollers are then rotated moving the bar along with them. For each new position, the portion of the bar between the rollers takes on the shape of a cubic modified by the end conditions imposed by the

adjacent sections of the bar. When either end of the bar is reached, the force applied to the center roller is incrementally increased, the roller rotation is reversed and as the rolling process proceeds, the bar shape becomes a better approximation to a circular arc, gradually, for the number of passes required to bring the arc of the bar to the desired radius.

### 4. ELASTIC AND PLASTIC DEFORMATION

The plastic deformation of the bar is retained throughout the process. However, the elastic deformation is reversed as a section of bar leaves the area between the rollers. This "spring-back" needs to be compensated in adjusting the middle roller to achieve a desired radius. The amount of spring back depends upon the elastic compliance (inverse of stiffness) of the material relative to its ductility. Aluminum alloys, for example, tend to have high ductility relative to their elastic compliance, whereas steel tends to be the other way around. Therefore aluminum bars are more amenable to bending into an arc than are steel bars.

### 5. DESIGN OF ROLL BENDING MACHINE

The roll bending machine is designed using solid works software.

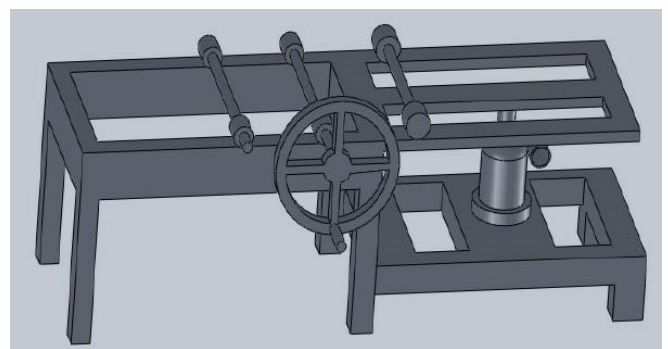


Fig -1: Roll bending machine

### 6. WORKING PRINCIPLE

In this project the work piece bending process is done by hydraulic bottle jacks. The operation of hydraulic bottle jack is with help of oil supply. A handle is provided in the jack for the pumping purposes. When the handle is pressed once the oil inside the cylinder helps the piston rod to move upwards. A roller is attached at the top of the piston rod. Between these arrangements a pipe is kept for bending process. As said above when the piston comes up to the rod to bend. Because of the arrangement of roller and two jack the pipe is

bent to the different angles. And when the pressure is released by the pressure relief valve which is provided in the hydraulic bottle jack the piston rod comes down and After the completion of this process the material can be removed.

## 7. FABRICATED MODEL



Fig -2: Front view



Fig -3: Top view



Fig -4: Side view



Fig -5: Working

## 8. ADVANTAGES

- Quite simple
- Compact
- Less cost
- Easy maintenance

## 9. DISADVANTAGES

- Leakage of oil affects the working efficiency.

## 10. APPLICATION

- Used in small and large-scale industries for metal rod bending operation.
- Used in civil engineering for bending pipes.
- Used for manufacturing of steering wheels, round bars etc.,
- Used in Automobile vehicles.

## 11. CONCLUSION

This project is made with pre planning, that it provides flexibility in operation. This innovation has made the more desirable and economical. This project "ROLL BENDING MACHINE" is designed with the hope that it is very much economical and help full to constructional areas and some industries.

## REFERENCES

- [1] Groover, Mikell P. (2010). Fundamentals of Modern Manufacturing: Materials, Processes, and Systems. John Wiley & Sons.
- [2] PSG Design data book.