

Design of Manual Roller Pipe Bending Machine

Chetan Deulkar

P.K.Technical Campus,Chakan

Rahul Shinde

P.K.Technical Campus,Chakan

Dinesh Pokharkar

P.K.Technical Campus,Chakan

Sachin Rajiwale

P.K.Technical Campus,Chakan

Prashant Vavhal

P.K.Technical Campus,Chakan

(Guide)

ABSTRACT

Here we study the design and fabrication of a manual roller bending machine that uses chain sprocket based roller mechanism to bend pipes/rods. The mechanism is widely used in industry to for bending purposes. The machine is made with a supporting frame that supports the roller mechanism between it. The work to be bent can then be rolled across it to achieve desired bending. The rollers are fitted with bearings so as to achieve the desired smooth motion. One of the rollers is integrated with a hand driven spindle wheel to drive it manually. This wheel is also connected to the other roller using a chain sprocket mechanism to drive it along with spindle at the same rate. The frame is made with a mechanism to fit a movable roller in the center through a screw mechanism. This is used to adjust the bending angle. The mechanism is fitted through a slot made in the frame center. This screw based mechanism along with the spindle powered rollers allows the user to achieve desired bending.

Keywords

3 Roller,Frame,Pipe Bend.

1. INTRODUCTION

In modern days, all area of industries are going to like manual, economically and accurate machinery .There is many types of pipe bending machine are available in market like hydraulic pipe bending machine, pneumatic pipe bending machine, manual pipe bending machine etc. The utility model discloses a manual pipe bending machine. Whole machine is supported by a base with four supporting legs which has enough strength to carry the weight and force of machine. Two parallel shaft are clamped on base by clamps which carry the lower pulley. Pulley are driven by chain drive mechanism. Here two guide ways are use for guide the working pulley for up & down linear motion. Pulley gets that motion from Lead screw is working as a nut and bolt mechanism. The lead screw is get rotary motion from upper dc motor. Guide way and lead screw are fitted between two horizontal supporting plate, which are fitted on frame by the help of the two vertical parallel supporting plate.

This study is about the work of designing a bending machine to bend a pipe. A bending is a process of bending a metal. The metal can be a sheet metal, tubes, square hollow, rod, and iron angle. This type of metal has its own thickness. The bending machine designer will take into consideration a number of factors including type of metal, type of the roller bender, power driven or manual and the size of the bending machine. Usually, the difference of these types of bending machine is only on the capacity of the bending machine that can bend a sheet metal or tube. Today, the bending machine that available in the market is for the sheet metal and tube bending machine. Many machine makers vary their products based on the capacity of the bending machine and power driven or manual. Moreover, most of the machine uses roll bending type. This type of machine has 3 rolls which is 1 roll

is fixed and the other 2 are adjustable. The metal pipe needs to put in the roller and then rolls around it until the desire shape is acquired. The products that can be produced with this machine are various curves, structural elements, automobile parts etc. The proposed machine uses a new method. When tubes are fed into the fixed and mobile dies, they are bent by shifting the relative position of the mobile die. The bending radius is controlled by the relative distance and orientation between the mobile die and the tube.

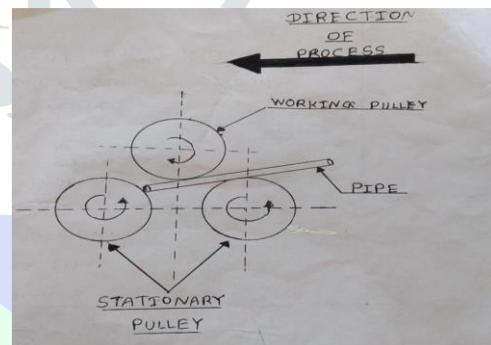


Fig 1.1 Basic Principle Of 3 Roller Pipe Bending

2. PROBLEM STATEMENT

Labour cost is more.

Time consuming in case of setting of operation setup.

Tremendous amount of human effort is necessary.

3. OBJECTIVE

The main objective of this project is to improve accuracy of Product at economical cost. This model that gives better accuracy with minimum material waste. It is a portable machine.

4. LITERATURE REVIEW

Prof. A.D.ZOPE at all has developed during the roll bending process the sheet or plate or pipe is passed through consecutive rollers that gradually apply pressure on pipe. Because of this pressure the change in radius of pipe or sheet occurs. The aim of this project is to develop a portable metal bending machine. This machine is used to bend sheets into curve and the other curvature shapes. The size of machine is very small as compare to other machines. And it is convenient for portable work. We are developing manually operated metal bending machine with use of metal shaft, hydraulic bottle jack, pedestal bearing and support (frame). This machine works on simple kinematic system instead of complicated design. Due to its light weight and it is portable so it can be used by small workshop, fabrication shop, small scale industry etc. Bending machine is a common machine in machine shop that is used to bend a metal. There is no proper small scale bending machine for bending a pipe. A Metal Bending machine uses roller to bend metal. There are 3 roller used in bending machine. The common product of metal

bending machine are pipe (square and circular) bending if separate attachment of die is provided, sheet bending. During the roll bending process the sheet or plate or pipe is passed through consecutive rollers that gradually apply pressure on pipe. Because of this pressure the change in radius of pipe or sheet occurs. The rolling process is generally performed by a three roll bending machine often called as pyramid type, because of these types of arrangement of the three rollers.

The process mainly consist 3 steps:

- 1) Positioning of the sheet or pipe.
- 2) Lowering of central roller.
- 3) Repeating feed of sheet or pipe.

Prof. Anand Jayakumar at all this innovation has made more desirable and economical. It is helpful to constructional areas and some industries. 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. 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 crosssection, but not necessarily rectangular, as long as there are no overhanging contours, i.e. positive draft. 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. 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 bars are more amenable to bending into an arc than are steel bars. 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. 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.

Prof. Nilesh W. Nirwan at all developed model under FEA analysis. A beam deforms and stresses developed inside it when a transverse load is applied on it. In the quasistatic case the amount of bending deflection and stresses that developed are assume not to change over time. In a horizontal beam supported at the end and loaded downwards in the middle the material at the overside of beam is compressed while the material at the underside is stretched. There are two forms of internal stresses caused by lateral load.

Roll forming, Roll bending or plate rolling is continuous bending operation in which long strip of metal is passed through consecutive sets of roll, or stand, each performing only an incremental part of the bend, until the desired crosssection profile is obtained. Roll forming is ideal for producing part with long length or in large quantity. There are three main processes: 4 rollers, 3 rollers, 2 rollers, each of which as a different advantages according to desired specification of output plate.

The material is fed in between two rollers called working rollers rotated opposite direction. The gap between two rollers less than the thickness of strating material, which causes it to deform, in material thickness caused material to elongate. The bending function is useful tool for shaping all manner of components out of flat strips, square bar and round wire in a production environment.

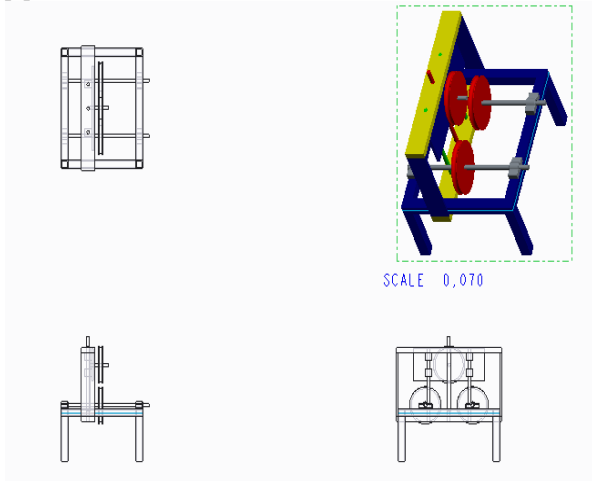
The three roll push bending is the most commonly used free form bending process to manufacture bending geometry consisting of several plane bending curve, the position of the forming rolls defines the bending radius.

Prof. Akbar H. Khan at all developed low cost, less effort required manually operated pipe bending machine. This paper gives the brief description about the design and construction of the pipe bending machine which is used to bend metal pipes into curve and the other curvature shapes, the size of machine is very convenient for portable work. It is fully made by steel. Moreover it is easy to be carry and use at any time and any place. It reduces human effort and also required low less skill to operate this machine. We designed manually operated pipe bending machine with use of dies, gears and support (frame). Our objective is to increase accuracy at low prize without affecting the pipe bending productivity. This machine works on simple kinematic system instead of complicated design. This machine can bend up-to 01-10 mm thickness of pipes. The operating procedure of manually operated pipe bending machine is simple when compared to other pipe bending machine. Tube bending as a process starts with loading a tube into a pipe bender and clamping it into place between two dies, the clamping block and the forming die. By comparing Ensley tools model which is fixed on a table to the one of Jesan Kovo, it is clear that the tripod fixation is not as stable as being fixed to a table. This is because when a force is applied on the jack arm; there will be a tendency for the whole machine to rotate over one of the tripod struts. The jack gives a small feed of motion (2 mm per time). This is important because if its minimum feed was high, it could have caused sudden fracture. The small feed is an advantage because it gives a chance for very reliable. The manufacturing of this Machine is done in the workshop and all the work is been done with the help of welding, drilling alignment and the lathe machine. The machine can be run by one operator, but a second hand to help handle the pipe is recommended. It is also recommended that the angle be checked before and after performing the last bend to assure that it is correct. Keeping the ends of the pipe at the same level throughout the bending process is essential to keep "spiralling" effects to a minimum. The replication of identical parts was achieved in a short amount of time, eliminating the need for the pipe to be shipped off for "hot" bending work. The pivoting head acted like a vice, eliminating pipe slippage, and providing for safer operation.

Prof. Prashant P. Khandare at all this machine is used to bend steel pipes into curve and the other curvature shapes. The size of machine is very convenient for portable work. It is fully made by steel. Moreover it is easy to be carry and use at any time and any place. It reduces human effort and also required low less skill to operate this machine. We are designing manually operated pipe bending machine with use of pulley, motors, gears and support (frame). The pipe bending machine is power and manually both operated. Therefore, our objective is to increase accuracy at low prize without affecting the pipe bending productivity. The bending machine designer will take into consideration a number of factors including type of metal, type of the roller bender, power driven or manual and the size of the bending machine. Usually, the difference of these types of bending machine is only on the capacity of the bending machine that can bend a sheet metal or tube. Today, the bending machine that available in the market is for the sheet metal and tube bending machine. Many machine makers vary their products based on the capacity of the bending machine and power driven or manual. Moreover, most of the machine uses roll bending type. This type of machine has 3 rolls which is 1 roll is fixed and the other 2 are adjustable.

The roller of bending machine can be two rollers, three rollers, or four rollers. The common product of roll bending machine are tube bending, plate bending and a coil. All modern roll bending machine is power driven and some of the bending machine equip with electronic control for more.

During the roll bending process the pipe extrusion, or solid is passed through a series of roller(typically 3) that apply pressure to the pipe gradually changing the bend radius in the pipe.



7. FUTURE SCOPE

We can modify the bending machine to bend tube and pipes by changing the roller guides. Semiautomation and automation of the hydraulic bending machine by adding different components.

8. CONCLUSION

Manual bending tends to minimize wrinkles and can reduce springback. By its design the defects can be easily overcome. Simpler design not only reduces the defects but also contributes to fluid pressure test during bending. It should be noted the tendency to wrinkle and the cross section of tube deformation are reduced. Thus, this approach can be used for bending a thin walled tube over a small radius of the die, which can be achieved with a conventional method of bending

Fig.6.1. Working Model

the tube. The problem of bending and axial stretching the internal pressure is investigated using the machine coordinate system measurement. The objective of the study is to develop a tool that accurately predicts the change of the wall thickness and the cross-section of the tube distortion under different loading conditions.

9. REFERENCES

1. A.D.Zope, R.R.Deshmukh, D.R.Mete, V.S.Mane "Review paper on design and development of metal bending machine", Department of mechanical engineering, Modern Education Society College Of Engineering, SPPU.
2. Nilesh W. Nirwan, Prof. A.K.Mahalle, "Design And Analysis Of Portable Rolling And Bending Machine Using CAD And FEA Tool", Department of mechanical engineering, G.H. Raison College Of Engineering. 2013 April: 279-284
3. Anand Jayakumar, Pravinkumar, Pragadeeshwaran, Pratheeswaran, Nandakumar "Design and Fabrication of Roll Bending Machine", SVS College Of Engineering. 2018 April: 3213-3214.
4. Prashant P.Khandare, Dhiral N.Patel, Mayur K.Aher, Ravi S.Parbat, Prof. Swapnil S. Patil, "Study of Portable 3 Roller Pipe Bending Machine", Department of mechanical engineering, BVCOE and RI, Nashik. 2016 March: 624-629.
5. Akbar H Khan, Pravin K Ghule, Ranjit P. Shingare, "Design Development and Experimental Study of pipe Bending machine", Department of mechanical engineering MGM's Polytechnic, Aurangabad, 2017.