

## Design of Pipe Bending Machine

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**Abstract:** The objective of the subject is to make new design of manually and hydraulically operated pipe bending machine and stress acting on pipe after bending of pipe. The pipe bending machine is use to bend pipe in different angle shape and curvature as requirement of work. The machine is useful to bend different thickness pipe as per the requirement of shop. The machine is fully portable type and less weight and easy to assemble and disassemble. The can operate unskilled operator. Our main objective is useless parts for manufacturing pipe bending machine. And analysis different stress act on pipe using ANSYS Workbench.

**Keywords:** Steel pulley, Metal Frame, Bending pipe, lever, Model Analy

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### I. Introduction

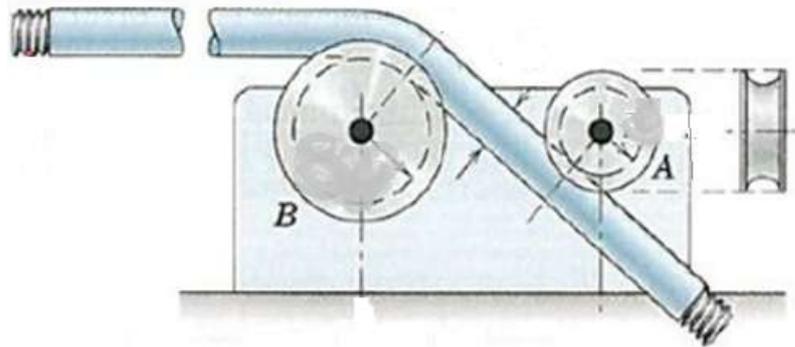


Fig.1 Design of PBM

Due to increase in globalization it is very important to produce a good with high precision and high accuracy or reliability. pipe bending machine is mostly use in fabrication industry generally using bending machine produce U-shape and V-shape {1}. In the design of pipe bending machine use only two pulleys for the bending of pipe in different angle. due to the no of compost use overall cost of machine low. and machine portable type the weight of the machine is less than is very full portable Our project is to design and construct a bending machine. This machine used to bend pipe into curve or other curvature shape. The size of the machine is very convenient for portable work. In various fabrication works as well as in architectural work pipe are use in different ways. To bend these pipes into these artistic forms is not easy thing to be done manually. Using a particular machine specially developed for bending of pipe help. Choosing component material is very important, because it will affect the overall cost of the machine and product quality. With this consideration, we will design this machine with the maximum quality and low cost, In pipe during bending operation stress concentration is occur in bend area of pipe. the bend section may be damage during service in particular case where significant validity and thickness version exist which are introduce during menacing process and operation time. Hence the acceptance of pipe depends on magnitude and shape of pipe. {2} in pipe bending process the thickness of pipe is change. The acceptability of pipe bend is depending on magnitude and shape imperfection. {3} Then we also study on failure analysis of pipe bend in these we assume pipe bend is uniform thickness.

### II. Literture Review

Akbar Khan, Pravin Ghule, anjit Shingar[1] (2011) "Journal of Industrial Engineering and its application" is published a mechanical model of symmetrical three-roller setting round process to finding a this way we can conclude that successfully we manufacture the low cost less effort required manually operates pipe bending machine is developed.

A.D Zope, R R Deshmukh .D.R mete[2] published in ISOR Journal of mechanical and civil engg IOSR-JMCE to determine a to develop portable bending machine used for bent sheet into curve shape. These machine is very small in size compare to other pipe bending machine. These machine used to bend up-to 8mm thick sheet. In these 3 roller is used for bending machine in a paper on design and development of metal bending machine.

Jun Zhao Gaochao Yu Rui Ma [3]“Journal Of Material Processing Technology” is discovered a mechanical model of symmetrical three-roller setting round process to finding the mechanical model of these static bending deformation in the symmetrical three-roller setting round process is established, and the quantities relationship between the upper roller load, bending curvature of each micro-pipe-wall element and the reduction are predicted. This not only lays a theoretic foundation for the development of the three-roller special setting round machine and control strategies, but also provides an idea for resolving a many degree of statically in determine problem with an elastic-plastic deformation.

K. Chudasama & HK Raval[4] (2013) “journal of manufacturing process” is published bending force prediction roll bending during 3 roller conical bending process. To determine As the thickness of the plate increase the bending force increase which is obvious fact that it will require higher force for bending the thicker plate. As the rate of decrease in bending force increase as the radius increase, as it has been observed. It is also observed that as the bend radius increase, required bending force decrease for same value of coefficient of friction and the thickness of plate. It suggest that bend with larger radius can be produced with less effort.

Dhaval T sutar, Kiran R Malvi, Denesh k Patel[5] of “journal of research in mechanical engg & technology” to determine a to Determine Final working of Rolling Pipe Bending machine. The current Machine Design Has The following feature. 1) Accuracy of operation 2)Cost & strength. The material used for the component of the machine is mild steel. Which is of considerable strength as weel as of low cost.

Mohan Krishna SA[6] (2014) “study of hydraulic and pneumatic bending machine” he concluded that this work has provided an excellent opportunity and experinace, to use limited knowledge. It has gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. The work is good solution to bridge the gates between institution and industries. The work is completed the work with the limited time successfully.

### **III. Objective**

This project is developed to study about the automation in process of pipe bending machine industries. Mainly preferable for small industries. The purpose of this project is listed below:

- To increase the accuracy of product.
- To reduce the time consumption.
- Less machine setup time is required.
- To produce curve and curvature shaped bend pipe.
- Pipe should be bent in 90 degree.
- Pipe bent by using two pulleys.

### **IV. Reasons To Design A Pipe Bending Machine**

The Reasons to design Bending machine for pipe bending is because there is no proper bending machine to bend a metal pipe for small scale. The bending machine found in the market comes from variety of types. There are bending machine such as press brake bending machine, roll bending machine, three roll bending machine. Moreover the design for the bending machine for pipe bending machine for pipe bending is to bend a metal pipe. It produces pipe metal bending with desire degree of bending except 90 degree. Other reason and regarding to the bending machine design, the bending machine in the market come with big size and the bending machine expansive.

The requirement of operation of bending machine is simple. Thus it is not suitable to purchase existing bending machine to be used for simple bending machine operation. Moreover, the machine is heavy sans use up a lot of small space.

## V. Components Used



**Fig.2 Component of PBM**

The basic construction and main component of portable 3 pulley type pipe bending machine is given below:-

### 1) pulley:-



**Fig.3 Pulley**

In this project the pulley is used to bend a pipe in angular shape. There are two pulleys are used to bend a pipe in curvature shape. pulley is a cylinder that rotates about a central axis and is used in various machines. a rolling pulley always consist bearing.

One pulley is driving of larger diameter and small pulley is driven with small diameter is attached to lever. The both two pulleys are made up steel material.

### 2) Lever:-



**Figure.4 Lever**

Lever is attached to drive pulley which force is applied to bend the pipe and manage a force.

### 3. Main Frame: -

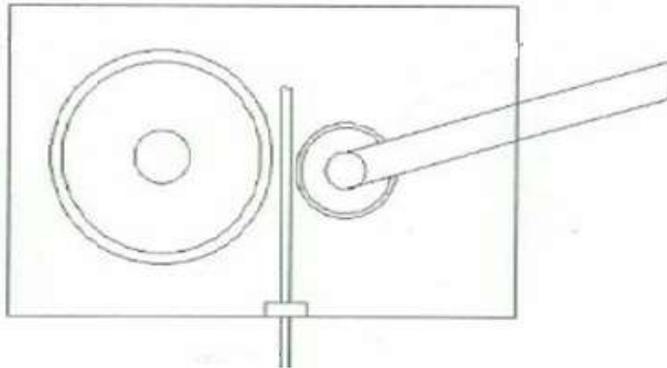
The square pipes of material of mild steel are selected for the frame. The pipes are cut into required size by cutting machine. These are two identical plates between which the tube is supported to rest. It should be strong and rigid so as not to move during the bending process, causing any of the previously mentioned defects.

#### **4. Stopper: -**

Stopper is used the machine as a provision to avoid over bearing of pipe It is fitted to the frame at the out coming end of pulley. End product model and analysis:

The FE modeling and stress and strain analysis is carved out by ANSYS. {4} in the anises we take 90 degree bend pipe. And first make FE model for analysis .

### **VI. Construction And Working.**



**Fig.5 construction of PBM**

The pipe bending machine is consist two pulley, lever, main frame, stoppers etc. In this machine all design in fixed on the main frame, main frame is hold the pipe in position with the pulley over which it has to bend two rolling pipe bending machine is used to producing 90 Degree bend pipe. This method is used two pulleys. Normally one pulley is rotating and another pulley is fixed on main frame. Lever is mounted on small diameter fixed pulley, the stopper also used in the machine provision to avoid over bending of pipe fitted to the frame at the out coming end of pulley.

This work piece is passed forward to backward through the both pulley while gradually moving the working pulley closer to the counter pulley which change the shape and angle of pipe. This method of bending cause very little deformation in cross-section of pipe. Man force applied to the lever and lever is move then, Small diameter fixed pulley are move through the lever the pipe is forward to the rotating pulley to fixed pulley thus this pipe is bend between both pulley and the stopper are provide to bend perfectly 90 degree bended pipe remove through in the small pulley.

### **VII. Material Selection**

The Pipe bending machine is choosing to Mild steel and Steel material is for the part the following reasons.

1. Affordable cost.
2. Easy to Machine.
3. High strength materials which can be withstand the load.
4. Long expected life durable.
5. Easy availability of the material.

Following Material of part :-

- For Main Frame :- Mild Steel.
- For Pulley :- Steel.
- For lever :- Mild Steel.
- For Pipe (work piece) :- Mild Steel (1 inch)

### **VIII. Future Scope**

Some following advance type of machine can be construct and they should be increase the future scope for pipe bending machine.

1. In a future this machine can be operated by using Electrical, Pneumatic, and supply.
2. We can be used for different curve and different shape of pipe.
3. This machine is design by using two or more pulley arrangement.
4. Movable stopper is used to give more accuracy.

5. Pipe bending machine is higher initial cost involved we have tried to make the system cost effective and also add different enhancement to make the system more efficient so that it may work around the year.

The most basic consideration when choosing hydraulic bending and bend removing machine is that the formation of bends. And well lubricated provide many year trouble free operation.

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