

DESIGN AND FABRICATION OF 3 ROLLER BENDING MACHINE

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ABSTRACT

The objective of this research paper is to present the new design and development of manually operated pipe bending machine which is useful to bend a pipes of different thickness in workshops as well as in engineering works. 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 shaft, hydraulic and support (frame). Our objective is to increase accuracy at low cost 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. In this paper we study this machine experimentally in different workshops and as well as taken the readings at different degrees of bending which gives the opportunity to reduce cost of machine and to reduce the human efforts.

Keywords: Shaft, Hydraulic Jack, Frame, Clamp Bearing

1.0 INTRODUCTION

The hydraulic bending press is one of the most flexible machines in the market allowing the fabricator or iron worker to punch, bend, scroll, and press thousands of different parts. When considering industrial machinery, the hydraulic bending machine is the perfect machine shop tool for the metal fabricator. The hydraulic pipe bending press fits any small to medium-sized industry when machinery for large-scale production must necessarily make way for machinery with distinctly lower production costs. 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. The tube is also loosely held by two other dies, the wiper die and the pressure die. The process of tube bending involves using mechanical force to push stock material pipe or tubing against a die, forcing the pipe or tube to conform to the shape of the die. Often, stock tubing is held firmly in place while the end is rotated and rolled around the die. Other forms of processing including pushing stock through rollers that bend it into a simple curve. For some tube bending processing, a mandrel is placed inside the tube to prevent collapsing. The tube is also held in tension by a wiper die to prevent any creasing during stress [1-6].

2.0 LITERATURE REVIEWS

Hiroyuki go to, Kenichiru, Hidenobu saitro, Yuu ishikura and Yutaka tanaka (2011). This research presents a new flexible bending machine and its practical applications. 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.

Prashant Khandare, mayor Aher, Swapnil Patil (2013) in his research paper “Study of Three Roller Bending Machine” concluded that Such type of bending machine more important for small scale work as well as industrial work in less cost and more precision and accuracy of different type of pipe bending. The machine capacity can be increased according to the need. 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.

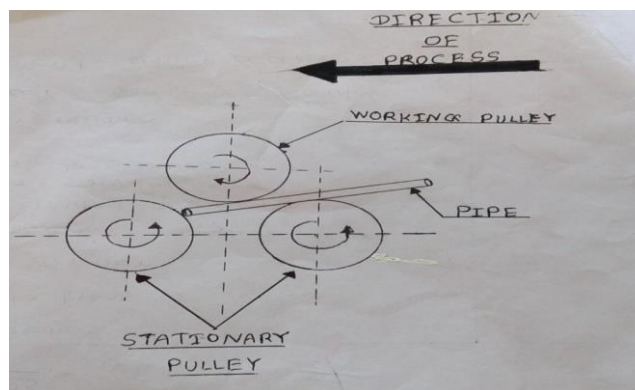
Mohan Krishna S A (2014) “Study of Hydraulic and Pneumatic bending machine” he concluded that this work has provided an excellent opportunity and experience, to use limited knowledge. It has gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. The work is a good solution to bridge the gates between institution and industries. The work is completed the work with the limited time successfully.

3.0 Construction and Principle: -

The machine that was selected for manufacturing is the first modeled based on the Ensley tool machine. A large part of the for manufacturing was done using Reverse Engineering. First, using the internet and getting manuals for similar machines. Next, a similar model for the machine was studied thoroughly and their measurement was taken. Finally, a new design was implemented to overcome the problems of the large price and other problems of the original design.

3.1 Working

3-roll bending is used for producing work pieces with large bending radii. The method is similar to the ram bending method, but the working pulley and the two stationary counter-pulleys rotate, thus forming the bend. Normally there are 2 fixed pulleys and one moving pulley and the work piece is passed forward and backward through the pulley while gradually moving the working pulley closer to the counter pulley which changes the bend radius in the pipe. This method of bending causes very little deformation in the cross section of the pipe and is suited to producing coils of pipe.



3.2 RESEARCH METHADODOLOGY

In present study, we create the CAD model of Pipe banding machine. The analysis of the design will be performed. If required the optimization and analysis of optimized design will be performed after that results will be discussed and design will be finalized.

3.3 Problem identification:

Manufacturing is a field of transferring raw material into finished goods. There are many manufacturing firms that can be found such as automobile factories, bakery factories, electrical

factories, etc. Many of the factories produce their products in mass production. So, these factories or companies are competing each other to get their products in the market. Therefore, they must have good manufacturing facilities to improve their productivity. Except this machine is hydraulic operated machine so that it requires hydraulic jack, shaft, and shaft bearing arrangement. Here hydraulic jack lift the top frame. Now this top frame with shaft arrangement transmits the power to the shaft. In the process the pipe is inserting in between the lower shaft and upper shaft then with the help of jack given at lower is lowered by pressing the rod. Now this screw shaft at the end, and when screw rotates in downward direction then shaft is also lowered their position. Now much distance the upper shaft should come or the setting of shaft is depends upon the thickness & diameter of pipe which is to be bend in the machine. Once the setting over, operator start the machine, the pipe passes towards the other side of the machine. After the one pass, again the setting of screw is to be done if requires and next pass is again start; it is restricted up to the cylindrical pipe is made. After getting a cylinder pipe, some positions of pipe is welded called tacking. After the welding, the welded position of pipe is passing through the shaft. Then this pipe is removed from the machine by removing the base after removing the screw the side body is tilted to the side. Before tilting the body, one rod is inserted in between the upper shaft and lower shaft, and then the body is tilted and removes the pipes from the machine.

3.4 PROJECT OBJECTIVE

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

- a. To increase the accuracy of product.
- b. To reduce the man effort.
- c. To reduce the time consumption.
- d. To reduce the material waste compare of the manual pipe bending
- e. Less Machine setup time is required
- f. To produce uneven shaped bend pipes or products.

3.5 STUDY OBJECTIVE OF RESEARCH

This research pertains literature review reveals that trial-and-error experience of operator is still a common practice in the industry. Sequential bending on a shaft bending machine is widely used in practice but involves very high amount of labor in marking, locating, shifting and inspecting the pipe after each sequential bend. An operator must have knowledge of different machine

parameters to obtain cylinders with desired diameter. Overall objective of the research work is

- a. Modeling and Simulation of pipe Bending Machine.
- b. Force Analysis of pipe with Different Materials and Different Thickness.

3.6 SPECIFICATIONS OF BENDING MACHINE

- a. Rated Capacity: 30000(kg)
- b. Lifting capacity: 180mm
- c. Operation force of handle: 400N
- d. Net Weight: 16.0 kg

4.0 RESULT AND DISCUSSION

This work has provided an excellent opportunity and experience, 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 a good solution to bridge the gates between institution and industries. The work is completed in the limited time successfully. The “HYDRAULIC PIPE BENDING MACHINE” is working with satisfactory results. Such type of bending machine is more important for small scale work as well as industrial work in less cost and more precision and accuracy for different type of pipe bending. The machine capacity can be increased according to the need.

5.0 CONCLUSION

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 “spiraling” 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. With the inculcation of a suitable pulley for all the 3 shafts we can reduce slippage to certain extent. This way we can conclude that successfully we manufacture the Low cost less effort required manually operated pipe bending machine is developed.

6.0 References

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