International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.01, April 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

DESIGN AND FABRICATION OF HYDRAULIC BENDING MACHINE

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ABSTRACT

The hydraulic metal bending machine is planned to do bending activity for utilizing a hydraulic power pressure. This bending machine bends a small piece of sheet metal, plates, pipes, bars, rods. The motto of this project is to develop a portable low cost bending machine. This project comprises of a hydraulic jack, pedestal bearings, basic casing, driving and driven rollers, metal shaft, nut and bolts. The fundamental favourable position of our venture is Metal bar are twist fit as a fiddle (U-shape, circle twist) constantly and less human exertion in task.

Keywords: Bearing, Frame, Hydraulic Bending Machine Shape, Production, Rollers connection.

I. INTRODUCTION

This investigation is all about working and designing of bending machine. This bending machine can bends a small plate, rods, pipes, tubes. This kind of metal has its own particular thickness. The bending machine planner will think about various components including kind of metal, roller bender types, the kind of power supply and bending machine size. The bar is bending with the assistance of pressure driven power, in light of the fact that the energy of hydraulic power is vast, so with the assistance of hydraulic driven power we can bend the bar. Actually, bending is procedure of plastically deforming a metal bars, tubes etc and changing its shapes. Bending is adaptable process by which a wide range of shape can be achieved. Its produces shapes like v shape, u shape, and circular shapes can also be achieved. These Machines are to work easily and effectively.

Functions of Bending Machine:

- This bending machine can work manually.
- The hydraulic powered jack limit from 4 ton to additional.
- This machine needs less maintenance.
- To give U-shape, circular bend of metal bar.

Roller Requirement:

- Roller should be highly accurate and easy to manipulate.
- The minimum effort should be required to bend the pipe.
- It should provide the direction control.

Reason to Design a Hydraulic Bending Machine:

The motivation to outline a bending machine for pipe bending is that as there is no such a small scale bending machine. The bending machine found in the market comes with too many varieties. There are bending machine such as roll bending machine, press brake bending machine and folding machine. In addition, the plan for the bending machine for pipe bending is to bend a metal pipe. It produces sheet metal bending with want level of bending aside from 90°. Other reason in regards to the bending machine plan, the bending machine in the market comes with the enormous size and the bending machine is costly. The current bending machine in the market is made for huge capacity for bending a metal pipe. With the limit of bending machine that exists in the market, the current bending machine isn't satisfying the necessity of the use. The prerequisite of task of bending machine is basic. In this manner it isn't appropriate to buy existing bending machine to be utilized for straightforward bending machine activity. Besides, the machine is so heavy and it also requires some more space.

II.LITERATURE REVIEW

The paper oversees collecting of channels which use control worked sheet bending machine and physically worked sheet bending machine. It moreover fuses confinements of physically worked bending machine. From the outcomes of the paper the productivity of vitality worked bending machine is higher.

P. S. Thakare et al.[1].Author told in late year's pipe bending machine is used as a piece of both industry and domestic purpose behind bending the pipe under the required edges and angles. From time to time Heat treatment is used for pipe bending however this strategy isn't safe and have issues are made in the pipes, for instance, wrinkling, twist forming, decreased thickness, whole encircling, diminished quality, basic wobbly. These bending machines have a great advantage over the heat treatment method.

V. SenthilRaja et al. [2]. In this paper, a bicycle consolidated pipe bending instrument has been laid out and made. The usages of bowed directs are in traces, bars, handle of bicycle. The dominant part of endeavours uses bowed pipes as air conditioning, boiler, control age, send building, furniture, railroad, auto, go earth street frolicking and develop adapt, flying machine et cetera. In view of adequate human power in countries like India, the human controlled machine will achieve change of the economy and work of nation. In Asian countries people are defying power cut-off in the midst of most of the days so such system expects a basic part in commonplace areas.

H. A. Hussain et al. [3]. Weight driven equipment has wide use in various vehicle fields. These hydraulic controlled instruments are used for cutting down and bringing seat up in Barber shops and in dental clinics.

Hydraulic bending machine is the sensible equipment to contort channels, shafts and bars. The pipe or shaft to bend is kept between the rollers. With usage of water driven jack we realize compel on the pipe and bend it to the required point dependent upon the kicks the can used. Water controlled bending machine is less expensive, flexible and flexible stood out from those which are inspected previously. Along these lines it is quicker witted to supplant current standard machines by weight driven pipe curving machine.

III.DESIGN AND CONSTRUCTION

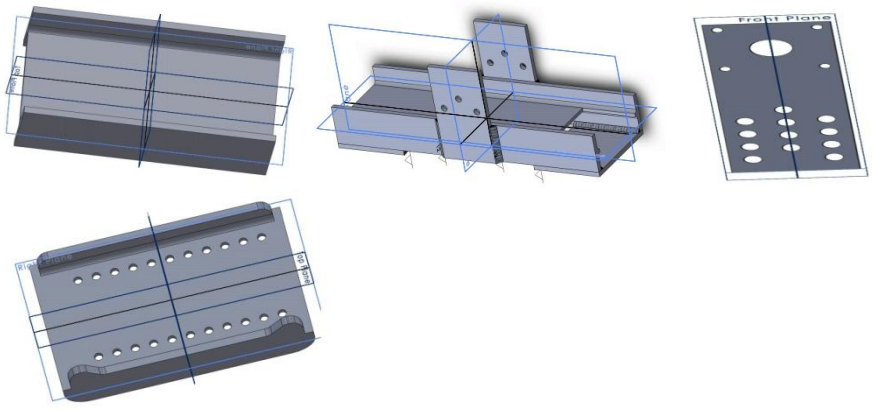
Fig(1). Solidworks model of bending machine

Basic components:

The basic components of Hydraulic bending machine is given below:

Basic Frame:

Cross-section length for base=60cm
Cross-section length for upper beam =28cm (each)
Flange length=9cm
Flange thickness=1cm
Web length= 18cm
Web thickness=1cm



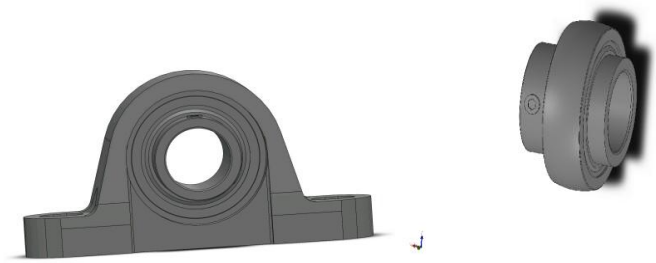
Fig(2): Frame

Roller:

In this undertaking the roller is utilized to twist a pipe fit as a fiddle. There are 3 rollers are utilized to twist a pipe in arch shape. Roller is a chamber that turns about a focal pivot and is utilized as a part of different machines and gadgets to move, level or spread something. A roller dependably comprises an orientation.

Length of driving roller= 36cm
Diameter of driving roller= 25mm
Length of driven roller= 30 cm
Diameter of driven roller=20mm

Bearings: Bearing are utilized to give simple and helpful movement to roller by utilizing shafts which is append to roller. We take 4 bearing of 20 mm, for 2 piece of each driven roller, 2 bearing of 25 mm for driving roller.



Fig(3):Bearing

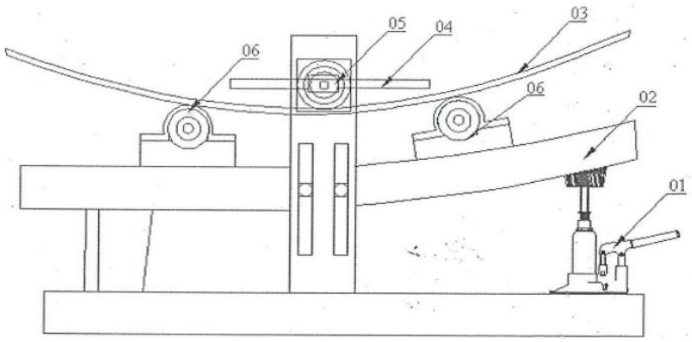
Hydraulic jack:

The Hydraulic jack is worked with the assistance of the given handle. This jack can be utilized to apply a lot of power and weight, because of the nearness of pressure driven liquid. The hydraulic jack that can lift up to 4 tonnes.

Fig(4): Hydraulic jack

IV. WORKING

Here, we are going to design and develop a hydraulic metal bending machine with the help of hydraulic jack and rollers as shown in the figure. The one driving roller is at the upper position for positioning of the metal workpiece. The two driven rollers are at the lower position. The hydraulic bottle jack is used to give the motion by applying pressure while bending the metal. The metal piece is feed from the roller and because of the hand wheel the metal piece is passed from the rollers by the rolling motion. The work piece is inserted between the driven roller and driving roller as shown in fig. The bending force is applied through hydraulic jack when the handle is operated and the workpiece can be adjusted. Thus the work piece is bend. It works on the hydraulic principle due to pressure of hydraulic is very high. The figure shown below is working of hydraulic bending machine.



Fig(5):Sketch of hydraulic bending machine

1-Hydraulic Jack
2-Workbench
3-Workpiece
4-Handle
5-Driving Roller
6-Driven Roller

CALCULATION:

Load calculations for Hydraulic jack
W = Load applied through jack
A = Area
Syt = Yield strength of material
δ = Deflection
L = Length between two bobbins
E = Modulus of elasticity

I = Moment of inertia

W = S_{yt} * Area

$\delta = \frac{WL^3}{48EI}$

Table 1. Load and Deflection Calculation:

S.NO	Length(mm)	Pipe Diameter(mm)		Load(N)	Deflection(mm)
		Outer dia	Inner dia		
1.	200	20	18	22085.4	6.48
2.	200	25	20	65384.4	4.98
3.	300	20	18	22085.4	21.90
4.	300	25	20	65384.4	15.47
5.	400	20	18	22085.4	51.92
6.	400	25	20	65384.4	36.70

V. RESULTS

As per research of different working territories this machine is valuable for bending a pipe, metal piece. This machine can be used for domestic purpose or for small scale industry.

VI.CONCLUSION

Hydraulic Bending machine is a procedure which is utilized to make part for car, aviation, families and control plant ventures and so on. Our Hydraulic bending machine is more affordable, light in weight in contrast with different machines along these lines, it can be ideal for small industry holders, small workshop holders, in school organizations and so forth.

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