

Design and Development of Hydraulic Pipe Bending Machine

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Abstract: The design of pipe bending machine has undergone many changes, development and improvements over a period of time. Bending of pipe plays an important role in many of the industries, instruments, transporting of fluids, etc. Keeping in mind the requirement of bend pipe in various fields we have designed a hydraulic pipe bending machine which can be used at construction sites, small scale industries etc. with less cost compared to the existing bending machines in the market, and it also increases the productivity of the bend pipes. The important parameters to be considered in pipe bending are Radius of bend, Angle of bend, Diameter of pipe, and thickness of the pipe. The concept of press bending is used to perform the operation and the required pressing force is applied with help of single acting hydraulic jack. This type of pipe bender is used to bend a round pipe of outer diameter within the range of ½ inch to 3 inches, maximum thickness 3 mm and radius of curvature up to 325 mm with maximum 90 bend angle.

Keywords: Bending Machine, bending pipe, hydraulic jack, angle of bend

I. Introduction

Types of Bending Processes and Equipment Used in Pipe bending techniques are varied and offer different advantages and disadvantages depending on the function of the bend and the type of material being bent. Some use mechanical force and some use heat treatment, the most common are as follows:

- Press Bending
- Rotary Draw Bending
- Mandrel bending
- 3 Roll Bending
- Bending springs
- Heat induction bending
- Sand packing/hot-slab bending

Press bending is the simplest and cheapest method of bending cold pipe and tube. The pipe or tube is restrained at two external points and a ram in the shape of the bend advances on the central axis and deforms the pipe. The bent pipe or tube is prone to deformation on both the inside and outside curvature. The pipe or tube is often deformed into an oval shape depending on the wall thickness of the material. This process is used where a consistent cross section of the pipe is not required. This type of bending is suitable for bending electrical conduit and similar light gauge product.

II. Construction

Main Components of Bender

Front frame and Back frame The front plate and the back plate are required to hold and fix the bobbins. Both the plates consists of number of holes, each hole corresponds to a unique diameter of the pipe. For example to bend a pipe of diameter ½ inch then the bobbins should be fixed in the first hole with help of the bobbin pin. The bobbins should be placed on the respective pipe marking on the plates. Serious damage may be caused to the machine and the piston if they are placed asymmetrically. The material of the plate is selected according to the load applied by the hydraulic jack during operation.

Base plate: - The base of the bender is 12 mm thick MS plate. The front and the back frame are fixed on the base plate with the help of L angles. The vertical surface of the L angles are attached with the front and back plate with the help of bolts and the horizontal surface of the L angles are welded to the plate. The hydraulic jack is centrally fixed on the base plate.

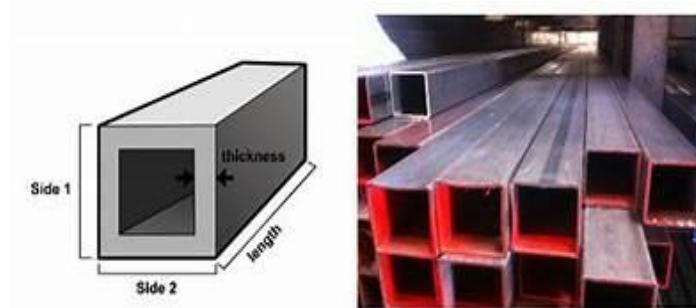


Fig 1 Construction

III. Working

This hydraulic pipe bender is based on the principal of press bending. The hydraulic jack consists of a plunger which is used to apply force required for bending. The plunger moves up when the operator applies the force with help of the handle provided in the lower portion of the jack. The bending die is fixed on plunger with the help of connector. The pipe is placed on the fixed bending die which moves up with the plunger. The bobbins or the clamping die is fixed on the front and the back frame. The clamping die restricts the motion of the pipe from both the ends and allows the motion of the pipe only from the center. The force is applied with the lever till the desired angle is achieved. Now the plunger is retracted and the bobbins are removed which frees the bent pipe.



Fig 2 Working Model

IV. Advantages

1. Hydraulic pipe bending machine develops greater forces than mechanical pressure and hence it is for forming, bending, and drawing and extrusion operations.
2. The hydraulic pipe bending machine can exert its full forces at any position of the ram stroke whereas the force is maximum at the end of stroke in mechanical press.
3. The sliding action of the punch slide is uniform.
4. The length of stroke can be varied even within small ranges.
5. No noise, no vibrations and hence smooth operation.
6. Stroke length and position of stroke can be varied easily.
7. Wide speed ranges.
8. Inertia losses are less.

V. Disadvantages

1. Initial cost is high.
2. High maintenance cost.

VI. Applications

1. The hydraulic pipe bending machine brakes can be fitted with hundreds of tooling options for acting as a press brake (using the table as the level for accuracy),
2. Ram bender (for pipe or solids),
3. Rotary draw tubing bender
4. Shear, punch, ornamental iron twisting machine, straightener, etc.

5. This machine tool is great for any welding shop, fabricator, or general job shop.

VII. 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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