DESIGN AND FABRICATION OF HYDRAULIC PIPE BENDING MACHINE

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Abstract

Now a day's bar bending is done either manually or by bending machines but these are having many drawback, less productivity, This project describes the bending of bar by using hydraulic system. It is the new and simplest method of bar bending by using hydraulic system. Sometimes Heat treatment is used for pipe bending but the heat treatment technique is not safe and have problems are produced in the pipes, such as wrinkling, curve forming, reduced thickness, whole forming, reduced strength, easy breakable. In the hydraulic pipe bending machine having an good advantage compared to heat treatment methods, the advantages are accurate degree and radius, no crack formed in the pipe, easy handling, does not change in thickness and also a time consuming is very less. After that, the hydraulic pipe bending machine will be prime for the required pipe bending purpose under various required dimensions and angles.

Keyword: *Hydraulic system, Heat treatment, Forming. Angle*

I. INTRODUCTION

The project is designed based on the principle of Hydraulic system. The hydraulic load has more power compare to the other type of loads like pneumatic and electric. By using heavy loads we can increase the productivity of the product. The manual stirrup making process suffers from the many drawbacks. The construction worker not only subject their hands to hours of repetitive motion but also sometimes suffers internal injury to his body organ. the operating procedure simple machine to other bending machine. Biggest improvement we are placing the hydraulic cylinder near the die holder. Hydraulic pipe bending press is most bend accuracy due to less deflection in the table. The die holder is used to hold the die in the proper position. The size of the machine is very convenient for portable work. It is fully made by steel. Moreover it is easy to carried and used at any time at any place. To bend these pipes into these artistic forms is not easy think to be done manually. Using a particular machine specially developed for bending of pipes helps.

II. LITRATURE REVIEW

Design and fabrication of hydraulic bending machine[1], Pankaj Kumar Pandey et al, 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. These Machines are to work easily and effectively.

3D Tube Forming and Applications of a New Bending Machine with Hydraulic Parallel Kinematics.[2] Hiroyuki Goto et al Bent tube products are employed in manufacturing many kinds of products such as fluid arrangements, furniture, transport apparatus, and mechanical parts, as required for the reduction of production cost and weight.Rotary-draw bending, Press bending, and Roll-bending, have been commonly used for basic bending methods of tubes. Rotary-draw bending is the most standard method used on rotary-type bending machines, which can be powered, manual, or numerically controlled. Rotary-draw bending consists of the rotating bending form, clamping die, and pressure die.

III. COMPONENTS REQUIREMENTS

- Hydraulic cylinder
- Hydraulic pump
- Oil
- Handle
- Sewage block
- Wing plate
- Hydraulic piston
- Die
- Pressure relief valve

3.1 Hydraulic cylider

Single acting hydraulic cylinders are the simplest form of hydraulic cylinder which is used for pulling, lifting, moving and holding the load. Single acting hydraulic cylinder is displayed here in following figure. Single acting cylinder, as shown in figure, will have one port i.e. cap end port. Single acting cylinder, as name indicates, will be operated hydraulically in one direction only.
Single acting hydraulic cylinder will have one piston within a cylindrical housing. When hydraulic oil will be supplied to its cap end port, hydraulic pressure force will be applied over the piston or plunger and hence piston will be extended and this stroke of cylinder will be termed as forward stroke. A single acting cylinder will have one port for connection hydraulic cylinder and hydraulic hose fitting. A single acting hydraulic cylinder is simpler, so there is less to maintain. With only one line the action of the cylinder entirely by the pressure on that one line. They often have a spring or something similar to push or retract the piston rod, but they might rely on the force on end to push it back. Simplicity is always good for equipment that needs to be rugged and reliable. Shown in fig 1

Fig.1 hydraulic cylinder

3.2 Hydraulic piston

The main function of the piston is to separate the pressure zones inside the barrel. The piston is machined with grooves to fit elastomeric or metal seals and bearing elements. These seals can be single acting or double acting. The difference in pressure between the two sides of the piston causes the cylinder to extend and retract. The piston is attached with the piston rod by means of threads, bolts, or nuts to transfer the linear motion. The piston rod is typically a hard chrome-plated piece of cold-rolled steel which attaches to the piston and extends from the cylinder through the rod-end head.

3.3 Die

When first approaching bending tooling, it is necessary to understand a bit about bending in general as well as the various components that are used in the task. Each component contributes to the success of the operation, but the basic components include the bend die, clamp die, pressure die, wiper die, and mandrel. Before we dive into each of these specific tooling components, however, let's look at some of the basics of tube and pipe bending in general. Six various type dies are used in bending purpose of this project. Shown in fig 2

Fig.2 Die

3.4 Lubrication Oil

Check the oil level regularly by removing the Vented oil plug found on the top of the pump Housing. When changing or adding oil, fill the tank Through the Can Screw. Normally about 820 ml of ISO VG of 22 or ISO VG of 32 hydraulic oil is recommended. Hydraulic Pipe Bender and 3000 ml for model. Lightly grease all moving parts if necessary**.**

3.5 Hydraulic piston

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3.6 pressure relief valve

Pressure Relief Valve The relief valve (RV) is a type of valve used to control or limit the pressure in a system or vessel which can build up by a process upset, instrument or equipment failure, or fire. The pressure is relieved by allowing the pressurized fluid to flow from an auxiliary passage out of the system.

IV. WORKING PRINCILE

Hydraulic pump consists of piston, piston rod and oil. The hydraulic pump reciprocating handle is move forward and backward continuously, so that the compressed oil goes to the hydraulic cylinder. The hydraulic cylinder consists of piston and piston rod. The end of the piston rod the ram is fixed. The compressed oil pushes the hydraulic cylinder piston forward. Already the pipe to be bended is fixed in between die and ram.

The die is supported by the die holders. By changing the die in the hydraulic pipe bending machine, we have to produce different shape of bended pipe such as "V" type, "U" type etc. The ram is strike the pipe forcedly, so that the pipe is bended according to the shape of the die in the die holder. This is a simple pressing mechanism.

The hydraulic jack is a device used to lifting heavy loads by the application of much smaller force. It is based on Pascal's law. This states that intensity of pressure is transmitted equally in all direction through a mass of fluid at rest. The bending force is applied with hydraulic jack when the handle is operated. Thus the pipe is bending.

4.1 Pascal's law

Pascal's Law Pascal's Law states that pressure acting on a confined fluid is transmitted equally and undiminished in all directions. In the figure below, a 10 pound force acting on a 1 square inch area generates a pressure of 10 pounds per square inch (psi) throughout the container acting equally on all surfaces. Shown in fig.3

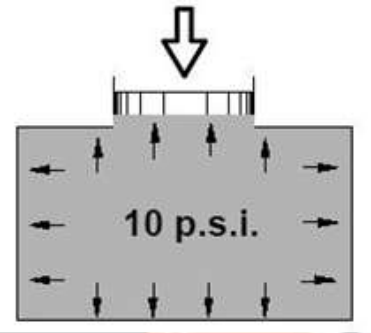

Fig.3 working of Pascal's law

The principle is that the pressure in any portion of a hydraulic system is equal throughout that system. This statement is valid with the omission of the force of gravity, which would have to be added,
according to the fluid level.

V. COMPLETE SETUP

Fig.4 work setup

VI. ADVANTAGES

- Hydraulic pipe bending machine develops greater forces than mechanical pressure and hence it is for forming, bending, and drawing and extrusion operations.
- 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.
- The sliding action of the punch slide is uniform.
- The length of stroke can be varied even within small ranges.
- No noise, no vibrations and hence smooth operation.
- Stroke length and position of stroke can be varied easily.
- Wide speed ranges.
- Inertia losses are less.

VII. CONCLUSION

The current urgent demands for high efficiency and precision production are vitally related to the accurate prediction and effective controlling of the various failures or instabilities in pipe bending. This depends on the insight into the occurring mechanisms and influences rules of different defects or instabilities. Thus, advances on the studies of these common topics in pipe bending are summarized including wrinkling instability, wall thinning (cracking), spring back phenomenon, cross-section deformation and process/tooling With the increasing needs for better performance, the design/optimization. More complex three dimensional spatial tubular bent components with more lightweight materials are required. These components are characterized with the thin wall thickness, large diameter, small bending radius, and the tubular materials are generally hard to- deform ones with limited ductility and high strength.

VIII. APPLICATION

- It is use in workshop
- It is very useful in all small scale industries.
- It is used in automobile industry.
- Ram bender (for pipe or solids),
- Rotary draw tubing bender
- Shear, punch, ornamental iron twisting machine, etc.
- This machine tool is great for any welding shop, fabricator, or general job shop.

IX. REFERANCE

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