

# FABRICATION OF PIPE BENDING MACHINE

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## ABSTRACT

*Mechanical Engineering without production and manufacturing is meaningless. Production and manufacturing process deals with conversion of raw materials inputs to finished products as per required dimension, specification and efficiently using recent technology. The new development and requirements inspired us to think of new improvements in manufacturing field. In our project Electrical rod Bending Machine various diameters of pipe is being bend with the help of this machine and various shapes is obtained like U-shape, circular, square, channel etc. It is widely used in various industrial operations such as bending a tube to make coil or sheet metal to make certain shape such as 'U' shape.*

**Key Word:** *The frame motor, bending machine, joint holds, keyboard button, six simple machines, a bolted joint, Forming Roller and Radius Collar, Alexandria, brushless wound-rotor.*

## 1. INTRODUCTION

Bending is a manufacturing process that produces a V-shape, U-shape, or channel shape along a straight axis in ductile materials, most commonly sheet metal. Commonly used equipment includes box and pan brakes, brake presses, and other specialized machine presses.

### 1.1 Overview

A bending is a process of bending a metal. The metal can be a sheet metal, tubes, square hollow, rod, and iron angle. This type of metal has its own thickness. In bending machine designing several considerations is taken into including type of metal, type of the roller bender, power driven or manual and the size of the bending machine. Usually, the difference of these types of bending machine is only on the capacity of the bending machine that can bend a sheet metal or tube. Today, the bending machine that available in the market is for the sheet metal and tube bending machine.

Many machine makers vary their products based on the capacity of the bending machine and power driven or manual. Moreover, most of the machine uses roll bending type. The sheet metal needs to put in the roller and then rolls around it until the desire shape is acquired. The products that can be produced with this machine are coil, truncated cone, etc.

### 1.2 Need for Pipe Bending Machine

As we know that pipe bends are used in various household things therefore it is necessary to build an economical pipe bending machine. It is also used in designing of various machine components, without this bending

device a machine can't work properly. As far as industrial application is concerned it is used for piping purpose. The reason to design a bending machine is because there is no proper bending machine to bend a solid or hollow pipe for small scale. The bending machines found in the market come from variety of types. There are bending machine such as press brake bending machine, roll bending machine and a folding machine.

## 2. TYPES OF BENDING

### 2.1 Tube Bending

The Forming Roller method of tube bending is recommended for all large bends where the centerline radius is at least 4 times the outside diameter of the tube. It can also be successfully employed for bending pipe or heavy wall tubing to smaller radii and is the most practical method of bending very small diameter tubing.



Fig: 2.1 Tube Bending

The Forming Roller and Radius Collar must be grooved to exactly fit the tube and the tube must not be allowed to slip during the bending operation as even a slight amount of slippage will cause distortion.

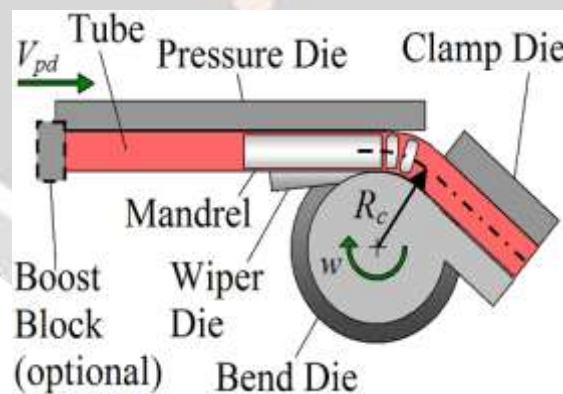


Fig: 2.2 Tube bending operation

### 2.2 Circle Bending

This operation is somewhat involved by the fact that most materials “spring back” after they have been formed. To compensate for this, it is often necessary to use a Radius Collar having a smaller diameter than that of the circle required. Actual size can best be determined by experiment, as the “spring back” varies in different materials. Material should be precut to exact length before forming.



Fig: 2.3 Circle Bending

### 2.3 Channel Bending

The same general bending rules which cover the forming of channel with “flanges out” also apply when it is formed with “flanges in.” Since it is necessary to compress the flanges as they are bent inward, the operation shown below requires considerably more bending pressure than when forming with the “flanges out” and it is recommended that the largest possible radius be used to allow for compression of the material. If a sharp 90° bend is desired, it can be obtained by cutting a notch out of the channel flanges before forming around a special Zero.



Fig: 2.4 Channel Bending

Radius Block as illustrated. It is sometimes possible to make a circle in channel by using a segment of a Radius Collar similar. By following the procedure outlined on, the circle can be formed in three operations. To form channel with the flanges facing upward it is necessary to first fill it with Cerro bend or some other commercial filler as it is not possible to support the flanges in this position with a radius Collar.

## 3. DESCRIPTION OF EQUIPMENT

- Supporting Frame
- Ac motor
- Pulley
- Nut and bolt

### 3.1 Support frame

Support Frame can be used with [Frame Motor](#) to move smaller structures and even build airships or similar flying or moving machines. They can be used to create contraptions such as bridges. Note that when joined to a block that is being blocked in any way by another block, the frame motor won't be able to move them. To stop this, place a Cover of any kind and the support frame will then 'ignore' that side.

Also, you can transport items via support frames any block touching the support frame would be moved, except other Frame Motors with their moving side touching the support frame itself or any red power machine (such as deplorers or block breakers) facing the support frame.

To place things like solar panels or bundled cables on a support frame and not have them dislodged when the support frame moves, use Panels. While items like these can be placed on a cover, they will not stick when the support frame is moved.



Fig- 3.1 Support Frame

### 3.2 AC Motor

An AC motor is an electric motor driven by an alternating current (AC). The AC motor commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing a second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets, reluctance saliency, or DC or AC electrical windings.

When an AC motor is in steady-state rotation (motion), the magnetic fields of the rotor and stator rotate (move) with little or no slippage (near synchrony). The magnetic forces (repulsive and attractive) between the rotor and stator poles create average torque, capable of driving a load at rated speed. The two main types of AC motors are classified as induction and synchronous. The induction motor (or asynchronous motor) always relies on a small difference in speed between the stator rotating magnetic field and the rotor shaft speed called slip to induce rotor current in the rotor AC winding.

As a result, the induction motor cannot produce torque near synchronous speed where induction (or slip) is irrelevant or ceases to exist. In contrast, the synchronous motor does not rely on slip-induction for operation and uses either permanent magnets, salient poles (having projecting magnetic poles), or an independently excited rotor winding. The synchronous motor produces its rated torque at exactly synchronous speed.

The brushless wound-rotor doubly fed synchronous motor system has an independently excited rotor winding that does not rely on the principles of slip-induction of current. The brushless wound-rotor doubly fed motor is a synchronous motor that can function exactly at the supply frequency or sub to super multiple of the supply frequency. Other types of motors include eddy current motors, and also AC/DC mechanically commutated machines in which speed is dependent on voltage and winding connection.



Fig- 3.2 Ac Motor

### 3.3 Pulley

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a taut cable, rope or belt along its circumference. Pulleys are used in a variety of ways to lift loads, apply forces, and to transmit power. In nautical contexts, the assembly of wheel, axle, and supporting shell is referred to as a "block."

A pulley may also be called a sheave or drum and may have a groove or grooves between two flanges around its circumference. The drive element of a pulley system can be a rope, cable, belt, or chain that runs over the pulley inside the groove or grooves.

Hero of Alexandria identified the pulley as one of six simple machines used to lift weights. Pulleys are assembled to form a block and tackle in order to provide mechanical advantage to apply large forces. Pulleys are also assembled as part of belt and chain drives in order to transmit power from one rotating shaft to another.

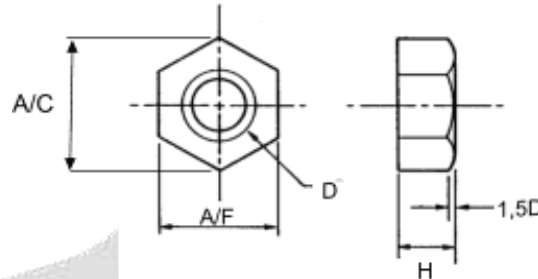


Fig- 3.3 Pulley

### 3.4 Nut and bolt

A nut is a type of fastener with a threaded hole. Nuts are almost always used opposite a mating bolt to fasten a stack of parts together. The two partners are kept together by a combination of their threads' friction, a slight stretch of the bolt, and compression of the parts. In applications where vibration or rotation may work a nut loose, various locking mechanisms may be employed Adhesives, safety pins or lock wire, nylon inserts, or slightly oval-shaped threads.

The most common shape is hexagonal, for similar reasons as the bolt head - 6 sides give a good granularity of angles for a tool to approach from (good in tight spots), but more (and smaller) corners would be vulnerable to being rounded off. It takes only 1/6th of a rotation to obtain the next side of the hexagon and grip is optimal.



In normal use, a nut-and-bolt joint holds together because the bolt is under a constant tensile stress called the preload. The preload pulls the nut threads against the bolt threads, and the nut face against the bearing surface, with a constant force, so that the nut cannot rotate without overcoming the friction between these surfaces.

Specialized locking nuts exist to prevent this problem, but sometimes it is sufficient to add a second nut. For this technique to be reliable, each nut must be tightened to the correct torque. The inner nut is tightened to about a quarter to a half of the torque of the outer nut. A bolt is a form of threaded fastener with an external male thread. Bolts are thus closely related to, and often confused with, screws. The defining distinction, per Machinery's Handbook, is in their intended purpose: Bolts are for the assembly of two unthreaded components, with the aid of a nut.

Screws in contrast are used with components, at least one of which contains its own internal thread, which even may be formed by the installation of the screw itself. Many threaded fasteners can be described as either screws or bolts, depending on how they are used.

Bolts are often used to make a bolted joint. This is a combination of the nut applying an axial clamping force and also the shank of the bolt acting as a dowel, pinning the joint against sideways shear forces. For this reason, many bolts have a plain unthreaded shank as this makes for a better, stronger dowel. The presence of the unthreaded shank has often been given as characteristic of bolts vs. screws, but this is incidental to its use, rather than defining.

Where a fastener forms its own thread in the component being fastened, it is called a screw. This is most obviously so when the thread is tapered (i.e. traditional wood screws), precluding the use of a nut, or when a sheet metal screw or other thread-forming screw is used.



Fig – 3.4 Nut and Bolt

### 3.5 On /off switch

A switch is an electrical component that can "make" or "break" an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch removes or restores the conducting path in a circuit when it is operated. It may be operated manually, for example, a light switch or a keyboard button, may be operated by a moving object such as a door, or may be operated by some sensing element for pressure, temperature or flow.

A switch will have one or more sets of contacts, which may operate simultaneously, sequentially, or alternately. Switches in high-powered circuits must operate rapidly to prevent destructive arcing, and may include special features to assist in rapidly interrupting a heavy current. Multiple forms of actuators are used for operation by hand or to sense position, level, temperature or flow. Special types are used, for example, for control of machinery, to reverse electric motors, or to sense liquid level. Many specialized forms exist. A common use is control of lighting, where multiple switches may be wired into one circuit to allow convenient control of light fixtures.

- **Power switching**

When a switch is designed to switch significant power, the transitional state of the switch as well as the ability to withstand continuous operating currents must be considered. When a switch is in the on state, its resistance is near zero and very little power is dropped in the contacts; when a switch is in the off state, its resistance is extremely high and even less power is dropped in the contacts. However, when the switch is flicked, the resistance must pass through a state where a quarter of the load's rated power (or worse if the load is not purely resistive) is briefly dropped in the switch.

For this reason, power switches intended to interrupt a load current have spring mechanisms to make sure the transition between on and off is as short as possible regardless of the speed at which the user moves the rocker. Power switches usually come in two types. A momentary on-off switch (such as on a laser pointer) usually takes the form of a button and only closes the circuit when the button is depressed. A regular on-off switch (such as on a flashlight) has a constant on-off feature. Dual-action switches incorporate both of these features.



Fig: 3.5 on /Off Switch

## 4. WORKING

Rod bending as a process starts with loading a tube into a rod 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. A rod bending machine is a simple bending machine which is operated by an a.c motor. The motor is attached to the frame of the machine and also consist of a circular die on which a vice to hold the rod is welded.

First of all the rod to be bend is set in the vice of the machine and then power supply is put on, then the motor begins to produce torque and depending upon the dimension of the rod it is bend. The power from the motor

is transferred which rotates the circular plate in anticlockwise direction and bend the rod for given radius. Various die can be used as per requirements namely v-die, wiping die, roller die, etc.

## 5. APPLICATION AND ADVANTAGES

### Applications:

- Angle Bending
- Metal Folding
- U Hook
- Marine Tube
- Heat Exchanger
- Scroll Bending

### Advantages

- Easily operated
- Simple construction
- Low cost
- Rigid construction

## 6. CONCLUSION

In this project, an iron rod is efficiently bend for a given power of motor, whose diameter is 2.8 cm. the various pipe bending machines consisting of various dies used for production in Industries are known in this project This bending tool is very useful in household application as it runs at very low cost and very efficient. In this project various pipe shape that is square, U-shape; channel bends, circular shape are bending the rod at any angle.

## 7. FUTURE SCOPE

In the next stage we are trying to make a pipe bending machine which will be helpful in easy bending of pipes. Although there is higher initial cost involved we have tried to make the system cost effective and also add different enhancements to make the system more efficient so that it may work around the year

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