Introduction

Tube bending is the umbrella term for metal forming processes used to permanently form pipes or tubing. Straight tube stock can be formed using a bending machine to create a variety of single or multiple bends and to shape the piece into the desired form.

This process can be used to form complex shapes out of different types of ductile metal tubing. Generally, round stock is what is used in tube bending.

However, square and rectangular tubes and pipes may also be bent to meet job specifications. Other factors involved in the tube bending process is the wall thickness, tooling and lubricants needed by the pipe and tube bender to best shape the material.

A tube can be bent in multiple directions and angles. Common simple bends consist of forming elbows, which are bends that range from 2 to 90°, and U-bends, which are 180° bends.

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 include 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. A wiper die is usually made of a softer alloy i.e. aluminum, brass to avoid scratching or damaging the material being bent.

The hydraulic pipe bender is a hand operated device specifically used to bend pipe. The hand operated hydraulic pump or jack has a former positioned on its end.
Identified Risks and Hazards

General hazards that may arise when operating portable equipment include:
- moving and rotating parts
- movement of the workpiece

A specific hazard that may arise when operating the pipe bender is that the fingers may get caught between the pipe and the formers.

Pre-operational Safety

Working parts should be well lubricated and free of rust and dirt.

Ensure the work area is clear of scrap, metal offcuts and tools.

The area around the bender must be kept free of materials, which might cause slips or trips.

Ensure the work area is clear of other persons before using the bender.

Ensure pipe bender ram is disengaged before fitting the appropriate former.

Operating Procedures and Precautions

Hydraulic Pipe Bender

The pipe bender can be mounted permanently to a work bench/stand, or temporarily it is placed on a flat level floor surface, such as concrete.

Select the desired pipe diameter former and place it in the end of the hydraulic ram. Place the bobbins and bobbin pins in the corresponding holes to the former being used. Place the pipe to be bent between the former and the bobbins.

Lock off the hydraulic bleeder on the jack. Place the handle in the jack. Pump the jack so that the ram moves towards the pipe. Keep pumping to gain the desired angle - max. 90 degrees.

When the pipe has been bent to the desired angle, turn the hydraulic bleeder to release the pressure, and push the ram back manually by
hand. For easy removal, remove the bobbins and the lift the pipe out the front of the frame. Lock the hydraulic bleeder.

If the metal pipe is only a short piece, the operator should hold the pipe securely at one end in a solo operation.

If the metal pipe is a long length, it should be held by two people - one at each end of pipe and have a third person operate the bending machine.

KEEP HANDS WELL CLEAR OF THE AREA BETWEEN THE FORMER AND THE BOBBINS.

If two people are holding the pipe - ensure they are well clear once the pipe is firm against the bobbins.

Remove handle from the jack and store properly.

If the pipe bender is not operating properly, check the hydraulic fluid level and top up if necessary.

**Manual Tube Bender**

The tube bender can be mounted permanently to a work bench/stand, or temporarily in a bench vice.

This guide block can be positioned anywhere over the eight holes to achieve the desired type of bend or radius. By moving the Guide Block from one side to the other, the Bender may be operated in either a clockwise or counter clockwise direction.

The bender typically is supplied with a number of formers, enabling different diameter tubing to be formed.

To change a former it is a simple matter of removing the pivot pin. Once the pivot pin has been removed, the support assembly can be removed leaving the former bolted to the body. Unbolt the former and replace it with the size former you require. Replacing the support assembly is a reversal of the removal procedure. The guide roller can be repositioned to achieve the type or radius of bend you require.

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The questions in the SOP knowledge test are general in nature. The manufacturer’s manual is to be used to develop specific questions relevant to this tool or machine.