

Review on Design and Analysis of Portable Rolling and Bending Machine

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Abstract— In this paper we are discussing about the difference in roll pressure distribution was assumed linear. Using this model rolling parameters such rolling force, torque and the developed curvature were easily calculated. Bending moment can be applied in suitable direction. In addition, employing a bending moment at entry of the roll gap in a symmetrical rolling process causes pressure difference on the rolls and warping at the outlet, as happens in an asymmetrical rolling process. In Portable bending machine is device which gives the less efforts of man and gives the required work properly of the construction and other metal fabricated areas. The base of this machine is mounted on the large C-clamp; This C-clamp is attaches to workbench surfaces up to 2" thick; a rubber base pad protects the mounting surface. The orientation of the jaws is adjusted by a single clamping bar mechanism to provide quick repositioning of the work. Instrument makers will find many uses for this versatile vice. This machine work smoothly and gives proper dimension of the required jobs. A beam deforms and stresses develop inside it when a transverse load is applied on it. In the quasistatic case, the amount of bending deflection and the stresses that develop are assumed not to change over time. Its one end having metal bending device & another end having Bench vice which is rotating about its Axis and hold work piece at any angle? The base plate is rotating of an angle 360 about its central Axis. This machine is used for heavy duty metals which are used in construction areas and multiple operations are performing on it. It is light in weight and portable attach to any work table in Industries, Workshop and Construction areas.

Key words: C-clamp attachment, Bending Device, Rolling Die, Rotating Vice

I. INTRODUCTION

Due to the globalization, it is very much essential for the manufacturer to produce a goods having highest possible reliability. Metal Bending and Rolling is extensively used in fabrication as an alternative method for casting or forging and as a replacement for a bolted and riveted joint. Since it is related to human being, it is necessary to design and analysis the joint with prior attention to safely of its user. 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.

Bending is a process by which metal can be deformed by plastically deforming the material and changing its shape. The material is stressed beyond the yield strength but below the ultimate tensile strength. The surface area of the material does not change much. Bending usually refers to deformation about one axis. In engineering mechanics, bending (also known as flexure) characterizes the behavior of a slender structural elements subjected to an external load applied perpendicularly to a longitudinal axis of the element. The structural element is assumed to be such

that at least one of its dimensions is a small fraction, typically 1/10 or less, of the other two. When the length is considerably longer than the width and the thickness, the element is called a beam. For example, a closet rod sagging under the weight of clothes on clothes hangers is an example of a beam experiencing bending. On the other hand, a shell is a structure of any geometric form where the Length and the width are of the same order of magnitude but the thickness of the structure (known as the 'wall') is considerably smaller. A large diameter, but thin-walled, short tube supported at its ends and loaded laterally is an example of a shell experiencing bending. In the absence of a qualifier, the term bending is ambiguous because bending can occur locally in all objects. To make the usage of the term more precise, engineers refer to the bending of rods, the bending of beams, the bending of plates, the bending of shells and so on.

Bending is a flexible process by which many different shapes can be produced. Standard die sets are used to produce a wide variety of shapes. The material is placed on the die, and positioned in place with stops and/or gages. It is held in place with hold-downs. The upper part of the press, the ram with the appropriately shaped punch descends and forms the v-shaped bend.

A beam deforms and stresses develop inside it when a transverse load is applied on it. In the quasistatic case, the amount of bending deflection and the stresses that develop are assumed not to change over time. In a horizontal beam supported at the ends and loaded downwards in the middle, the material at the over-side of the beam is compressed while the material at the underside is stretched. There are two forms of internal stresses caused by lateral loads:

- Shear stress parallel to the lateral loading plus complementary shear stress on planes perpendicular to the load direction.
- Direct compressive stress in the upper region of the beam, and direct tensile stress in the lower region of the beam.

These last two forces form a couple or moment as they are equal in magnitude and opposite in direction. This bending moment resists the sagging deformation characteristic of a beam experiencing bending. The stress distribution in a beam can be predicted quite accurately even when some simplifying assumptions are used.

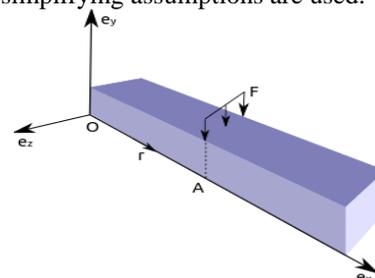


Fig. 1: Bending of an Beam

A better approach to the prediction of welding deformation is using the combined technologies of experiments with numerical calculation. With modern computing facilities, the Finite Element (FE) technique has become an effective method for prediction and assessment of bending residual stress and distortions various factors, the quantitative prediction and the control of Bending deformation especially for a large and complex welded structure is extremely difficult.

A. Bending Tools:

In the case of bending tools they are classified by the kind of generated bends. They can be constructed to adjust the bending angle by reference, stroke measurement or angle measurement. CNC machines usually abstain from a reference part. They grant a high bending accuracy starting with the first work piece. All bends without an extraordinary geometry belong to standard bends. The distance between a bend and the material end is quite high providing an adequate bearing area. The same with one bend to the next. Typical tools are a so-called bending former combined with a prisms with electronic angular measurement or a ordinary prism.

1) U Bending:

For U-bends where tight and narrow bends are necessary, the bending former is replaced by a bending mandrel. A bending mandrel has a narrow geometry.

2) Offset Bending:

Offset bending tools are used to assembly two bends with a small distance between in one step.

3) Edgewise Bending:

Edge bending tools are used, if the bending axis is placed parallel to the tight side of the work piece. Tools for bending on edge may include electronic angular measurement allowing a high bending accuracy.

4) Torsion Bending:

Torsion tools are able to rotate the work piece on the longitudinal axis. Alternatives are complex assembly groups with standard bends.

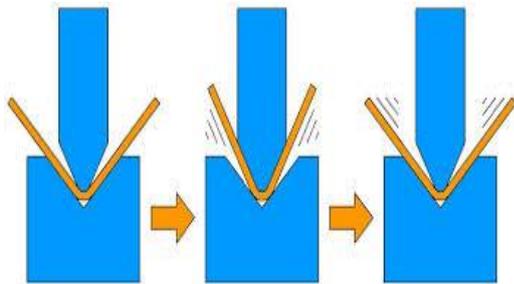


Fig. 2: Bending Tools

The roller is an agricultural tool used for flattening land or breaking up large clumps of soil, especially after ploughing. Typically, rollers are pulled by tractors or, prior to mechanization, a team of animals such as horses or oxen. A Rolling is a machine that is designed to roll either tobacco or cannabis into individual cigarettes or joints. To roll a cigarette with cannabis, one must break up the smoking material as well as remove any stems so they won't puncture the paper. Rolling a cigarette with tobacco does not require prep work because the leaf is already shredded. Once the material is ready, one opens up the rolling machine by sliding one of the rollers up and over; this exposes a channel where the material is loaded. Care must be taken to place a

uniform amount of product in the channel or the burn rate will change as the cigarette or joint is smoked. When ready the roller is slid back into position and locks into place. The product is cradled and confined in a round space and gets rolled when the user begins to turn one of the rollers.

Roll forming, roll bending or plate rolling is a continuous bending operation in which a long strip of metal (typically coiled steel) is passed through consecutive sets of rolls, or stands, each performing only an incremental part of the bend, until the desired cross-section profile is obtained. Roll forming is ideal for producing parts with long lengths or in large quantities. There are 3 main processes: 4 rollers, 3 rollers and 2 rollers, each of which has as different advantages according to the desired specifications of the output plate.

II. METHODOLOGY USED

A. Cad Modeling:

1) CAD Modeling:

Computer-aided design (CAD), also known as computer-aided design and drafting (CADD) is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design. Computer-aided drafting describes the process of creating a technical drawing with the use of computer software. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing.

As in the manual drafting of technical and engineering drawings, the output of CAD must convey information, such as materials, processes, dimensions, and tolerances, according to application-specific conventions. CAD may be used to design curves and figures in two-dimensional (2D) space; or curves, surfaces, and solids in three-dimensional (3D) space.

No.	Part Name	CAD Model
1	Bending Tool	
2	C-Clamp	
3	Rotating Body	
4	Roller	
5	Large Lever	

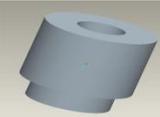
6.	Circular Die	
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Table 1: Main Parts of Machine

2) 3D Modeling:

The essential difference between Pro/ENGINEER and traditional CAD systems is that models created in Pro/ENGINEER exist as three-dimensional solids. Other 3-D modelers represent only the surface boundaries of the model. Pro/ENGINEER models the complete solid. This not only facilitates the creation of realistic geometry, but also allows for accurate model calculations, such as those for mass properties.

3) Assembly:

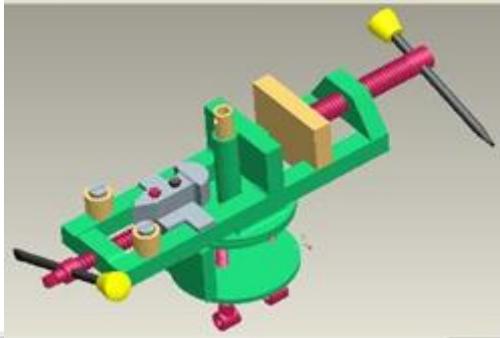


Fig. 4: Assembly

III. PROBLEM DEFINITION

- The present portable machines have taken only one operation on it.
- Machinery having multiple works is not portable for constructive areas.
- These machines are unable to slides over the work table

As many constructive areas men are not using proper machine which give the uniformity in their work. They used the harming tool which will not give the proper stress on the work piece and their work is lose, fatigue occurs many thing which not seen they will impact on performance of tool equipments. Therefore portable machine have more advantages as compared to the other machine

IV. WORKING PRINCIPLE

In this we are discussing working principle the tools are safe and easy to use and they do not require any heat or electrical power. All functions are carried out by hand power and are designed for beginners and professionals alike to work with metal without having to heat it up. The Bending function is a useful tool for shaping all manner of components out of flat strip, square bar and round wire in a production environment. For the Bending operation, material is placed between the square or diamond shaped former and the side roller.

Operate the lever to gradually bend to required angle. The Bending function is a useful tool for shaping all manner of components out of flat strip, square bar and round wire in a production environment. For the Bending operation, material is placed between the square or diamond shaped former and the side rollers. Operate the lever to gradually bend to required angle. The Rolling facility

enables circles and arcs of varying radii to be easily and consistently rolled without the need for pre-heating of the materials.

Rolling is achieved by using the winding handle to drive the bar forwards and backwards through the rollers. As this is done with each pass, the long lever is used to gradually increase pressure to roll and ever tighter curve.

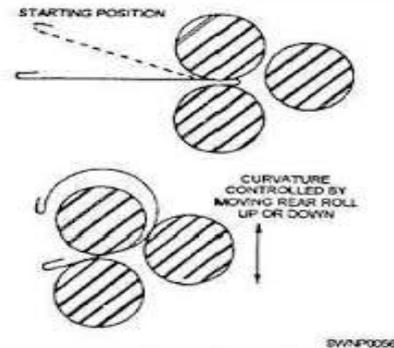


Fig. 5: TRPB

The Three-Roll Push Bending (TRPB) is the most commonly used freeform-bending process to manufacture bending geometries consisting of several plane bending curves. Nevertheless, a 3D-shaping is possible. The profile is guided between bending-roll and supporting-roll(s), while being pushed through the tools. The position of the forming-roll defines the bending radius. The bending point is the tangent-point between tube and bending-roll. To change the bending plane, the pusher rotates the tube around its longitudinal axis. Generally, a TRPB tool kit can be applied on a conventional rotary draw bending machine.

The process is very flexible since with a unique tool set, several bending radii values R_m can be obtained, although the geometrical precision of the process is not comparable to rotary draw bending. Bending contours defined as spline- or polynomial-functions can be manufactured.

V. OVERVIEW OF PROJECT

In this project we are going to Reduce time and cost associated with engineering analysis through a high performance intuitive graphical interface for multi body dynamic modeling and post processing. Enable easy implementation of high quality graphics for pre and post processing of multi body dynamic models through automated translation from many CAD formats .Provide automatic result visulation upon solvent completion tightly coupled pre and post processing.

REFERENCES

- [1] Design And Analysis Of Portable Rolling And Bending Machine Using CAD And FEA Tool 1Nilesh W. Nirwan, 2Prof. A. K. Mahalle Department of Mechanical Engg., G. H. Raisoni College of Engg. Hingna Road, Nagpur-16. "M.Tech (CAD/CAM), GHRCE, Nagpur"
- [2] Hydraulic sheet metal bending machine hydraulic servo valve synchronization system research
- [3] Design, Manufacture and Simulate a Hydraulic bending press" ISSN 2278 – 0149 www.ijmerr.com Vol. 2, No. 1, January 2013

- [4] Analysis of Shear Walls under Compression and Bending”B K Thakkar Visiting faculty, M. S.University of Baroda, Vadodara.Volume: 1, Issue: 2(Sept.-2012 ISSN : 2279-0535.
- [5] Modeling and computation of the three-roller bending process of steel sheets†Ahmed Ktari*, Zied Antar, Nader Haddar and Khaled Elleuch Unité de Recherche de Chimie Industrielle et Matériaux, ENIS, BP W, 3038-1173 Sfax Tunisie
- [6] Development of Analytical Model of Bending Force during 3-Roller Conical Bending Process and It Experimental Verification Mahesh Chudasama, Harit Raval World Academy of Science, Engineering and Technology International Journal of Mechanical, Aerospace, Industrial and Mechatronics Engineering Vol:7 No:11, 2013
- [7] Analysis of Plate Bending Machine using RADIOSS and OptiStructK. Rajasekar Reddy Assistant Manager Larsen & Toubro Limited, Heavy Engineering Ship Building Center, Godavari Gate, Scindia Road, Visakhapatnam - 530 014,India rajasekar.reddy@vzw.ltindia.com
- [8] Case study & stress analysis of a 3 rolle bar bending machine tabreez ahmed, mohammed faheem& m. a. murtaza, indiaInternational Journal of Mechanical and ProductionEngineering Research and Development (IJMPERD)ISSN 2249-6890Vol. 3, Issue 3, Aug 2013,
- [9] 3D Tube Forming and Applications of a New Bending Machine with Hydraulic Parallel Kinematics” ISSN 2468 – 6109 www.ijmerr.com Vol. 3, No.4, March 2010