International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

DESIGN AND FABRICATION OF THREE STAGE ROLLING MACHINE: A REVIEW

[1]Kevin H. Panchal, [2]Mihir D. Suthar, [3]Kewal D. Vania, [4]Vishwam N. Trivedi, [5]Darshan K. Bhatt.
[1234]*UG student* [5]*Assistant professor*
[12345]*Department of mechanical engineering*
[1,2,3,4,5] *Indus Institute of Technology and Engineering, Rancharda ,via Thaltej, Ahmedabad 382115, Gujarat, India.*

Abstract: *A square MS pipe is reshaped from a round pipe by rolling process. We investigated the effect of the roll diameter on the cross-sectional size of the square MS pipe by experimentation and three-dimensional finite element (FE) simulation., the cross-section width of the formed pipe is less than the height. To equilibrate them, we perform finish forming at the final stage. Furthermore, the width of corner part of the formed pipe is greater than its height. The difference between these two sizes of width and height of the corner part is final product size. Which developed by the rolling dais. Dias of roller formed round pipe into square pipe.*

Key words: roller dies, chain gear, housing, bearings, round pipe, chain, shafts, frame, gear reduction motor

Introduction:

Square shaped MS pipes, mainly produced by roll forming, are used widely as structural elements of buildings and machines. Generally, in the forming process stages of rolls is arranged. Then three roll sets are connected tandemly. The design of 3 stages rolling machine is to perform round pipe into square pipe with the help of roller dies. The gap between upper dies and lower dies create a rhombus shape holes in the center. A circular pipe is pushed into the almost rhombus-shaped holes of the center of the roll set. Then the circular pipe is changed to a square pipe.

When designing a roll-forming machine for square MS pipe production, upper and lower dies is connected to housing. By adjusting housing, we can change diameter of rhombus shaped holes and we can produce square pipe with any diameter which may not available in industry market.

Working Principles:

The system works on principle on roll forming which is created by roller dies. 3 stages of roller dies parallelly connected with the housing and shafting. Roller dies are driven by chain gears. The chain gears are connected with the reduction gear box which gives rotary motion to gear. 3 stages of roller dies give a different pressure to circular pipe. When a circular pipe is pushed into the rhombus-shaped holes, pressure will be high in the first stage then medium in the second stage and low in the last stage. upper and lower dies is connected to housing. By adjusting housing, we can change diameter of rhombus shaped holes and we can produce square pipe with any diameter.

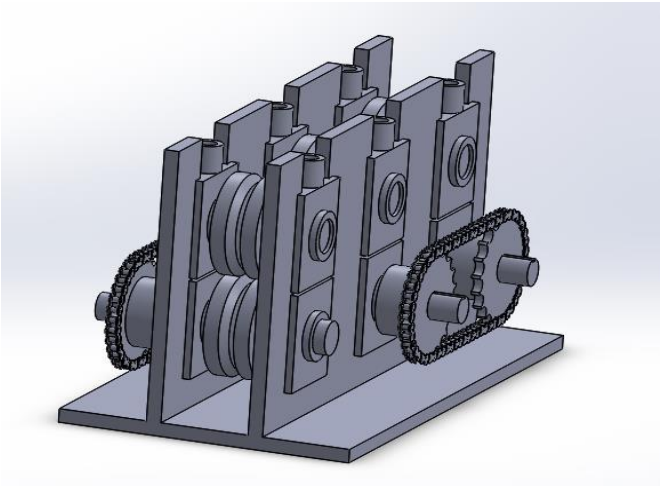

Figure: 1 Rolling machine (Forming machine)

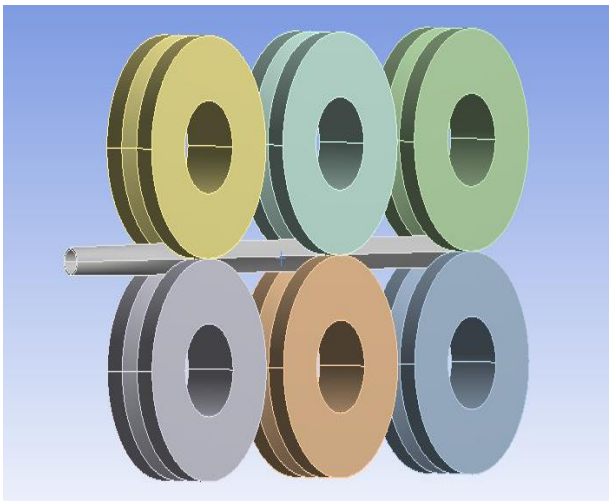

Figure: 2 Rollers (dies)

Objectives:

- To reduce time
- To reduce human efforts
- Less human power required
- Easy to operate
- Get various dimensions of pipe

Literature Review:

1. Chan et al [3] presented their research paper on finite element analysis of corrugated web beams under bending. The effect of web corrugation on the beam's strength is presented in this paper. Beams with vertically, horizontally, plane corrugated webs were investigated using LUSAS finite element package. To investigate effect on the beam's strength, three different corrugation radii were taken for each type of the beam. With plane web, Ordinary I-beams were tested experimentally. Result showed that corrugated web beams with larger corrugation radius could sustain higher bending moment and it is true for the sizes used

2. Tehrani and Bahrami presented theory work on analytical and numerical investigation of deformation length in roll forming process of circular tubes. Deformation length in the roll forming of the circular cross section was examined and determined. Deformed sheet geometry is more complex, so related equations of strain and deformation energy would also become more complex. Thus analytical solution is more difficult compared to symmetric channel section. Analytical results were compared with the results of finite element simulation of the ABAQUS commercial software. Correlation between the finite element simulation and analytical results demonstrated the validity of the presented analytical method.

3. Lindgren. highlighted his research work on modeling and simulation of the roll forming process. The objectives of thesis were to create a FE-model and improve the simple formulas and thereby give better design of roll forming machines. A FE-model of a U-channel roll forming was build and used investigate the longitudinal peak membrane strain and the deformation length when increased yield strength, the simulation showed that when the yield strength increases, the peak strain decreases and thdeformation length increases.

4. Ferreira studied both experimentally and numerically, a deflection of roll stands during the forming process with a main aim to better predict defects.

5. Park and Anh. put forward different methods in analyzing roll forming process of automotive component. This paper investigated many RF processes of automotive components by using both methods, in order to identify differences between them as well as build the foundation for using the combination of different methods in analyzing and designing RF process.

6. Moona et al.predicted polygonal-shaped defects during hot ring rolling using a rigid-viscoplastic finite element method. They applied a rigid-viscoplastic finite element method to investigate polygonal-shaped defects thatoccur during ring rolling. They developed an improved analysis model with relatively fine finite elements near the roll gap which will reduce the computational time, also minimize the volume change.

Conclusion;

By three stages of rolling machine process we can make a round bar into square pipe with the help of the roller dies sets. we can make different shape and size of pipe by using different roller sets.

Acknowledgment:

Foremost, I would like to express my sincere gratitude to my guide Prof. Darshan k. Bhatt for the continuous support of my project study and research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research. I could not have imagined having a better advisor and mentor of my project study. I offer my special gratitude to all the faculty members, mechanical engineering department, Indus university for their help and support. I would like to express endless gratitude to "MY PARENTS" who gave me everything they could to enable me to reach the highest possible education level. I only hope that they know how their love, support and patience encouraged me to fulfil their dream.

References:

1. C.L. Chan, Y.A. Khalid, "Finite element analysis of corrugated web beams under bending," Journal of Constructional Steel Research 58, 1391–1406, 2002

2. Mehdi SalmaniTehrani, Moslem Bahrami, "Analytical and Numerical Investigation of the Deformation Length in Roll Forming Process of Circular Tubes," International Journal of

3. Michael Lindgren, "Modelling and Simulation of the Roll Forming Process," ISSN: 1402-1757, 2005

4. Ferreira, P.B.F. (2016). Roll forming – A study on machine deflection by means of experimental analysis and numer-ical developments, Master of science thesis, Faculty of Engineering, University of Porto, Portugal

5. Park, H.S. & Anh, T.V., "Different Methods In Analyzing Roll Forming Process Of Automotive Component," Daaam International Scientific Book, Pp. 057-072, 2010

6. Ho Keun Moona, Min Cheol Leeb, Man Soo Joun, "Predicting polygonal-shaped defects during hot ring rolling using a rigid-viscoplastic finite element method," International Journal of Mechanical Sciences 50, 306–314, 2008.