A REVIEW OF SPRING BACK EFFECT IN METAL COMPONENTS.

Mr. Bhushan R. Patil , Prof. Priyanka jhavar

[1] *M Tech scholar, Mechanical Department, SSSUTMS-Sehor, Madhya Pradesh, India*
[2] *Professor, Mechanical Department, SSSUTMS-Sehor, Madhya Pradesh, India*

ABSTRACT

Various shapes and size and sectional pipes form an important fragment of Indian Seamless tube market. The study work brings out the problem of Spring-back effect on sectional seamless steel tubes faced in production. The work will perform the analysis & amendment to be done on land width of Die in controlling the spring back of sectional seamless steel tubes. The work also includes the quality declaration trials taken during the production of sectional seamless steel tubes.This yashashree tubes and pipes pvt.ltd is focused in manufacture of the continuous tubes. It Manufactures tubes for most expanded solicitations like domestic and export uses, e.g. Auto axles, basic systems, Profitable Vehicles, Two-Three Wheelers, Bearings, Oil industry, Petrochemical Industry, Refineries, Fertilizer plant, Boilers, Heat Exchangers, Pressure vessel, Hydraulic and Pneumatic Cylinders, etc. .It also exports the continuous tubes to, Europe, Gulf countries etc. The plant is devised for manufacturing of seamless tubes from input round bars or ingots, various rolling mills are mounted to produce seamless tube in hot and cold condition. Pipes made by linking together the ends of a flat strip are known as welded tubes. Seamless tubes manufactured by hollowing out solid heated billets in a blanking mill and then cold drawing process continued. Cold drawing is the process of reducing the dimensions of sectional tubes as per required size. Both the tension & compression acts on the tubes. So required thickness of tube is achieved.

Keyword: - *Contraction,, and spring back,*

1. INTRODUCTION

The pipes are mostly seen as connection together the flat strip by welding. Continuous tubes are without weld. The pipe and tubes can be seamless or with seam. Tubes with seam are producer with various welding methods. Seamless tubes are made by Extrusion or blanking and hot rolling processes, often are cold finished by drawing. Cold drawing is used to obtained closer dimensional accuracy, to produce best surface polishes , to produce tubes with thinner walls or smaller diameters that can be obtain with hot-forming methods, and to produced tubes of irregular shapes such as Round, rectangular square, hexagonal and other shapes up to 12mm crosswise or in diameter. The raw material used for production seamless tubes are different types of steel i.e. carbon steel and alloy steel. Seamless tubes are used in both low and high temperature application. e.g. refrigeration, boilers, and transporting fluids and gas. Seamless tube find application in high pressure hydraulic cylinders, drilling deep bores etc. several locomotive components like truck axels, bearings, steering columns, pneumatic cylinders etc are made out of seamless tubes. [1, 2]

2. LITRATURE SURVEY

A.L.R. de Castro (1996) carried out an experimental program in order to evaluate the influence of effect of die semi-angle on mechanical properties of round section annealed copper bars. From their work it was clear that die semi-angle has more effect on mechanical properties in single pass drawing as compared to multi passed drawing. [3].

Kun Dai and Z.R.Wang (2000) explained the mathematical description of the value of shear stress, the regularity of the variation of the shear stress at one point and its figure in three-dimensional space. At the same time, the relationship between the Load parameter and the shape of the figure of the shear stress in three-dimensional space was described. In addition, the shear stress figures corresponding to the different positions of the thin-wall tube in the drawing process are also given. Combining the drawing process of a thin-wall tube with a conical die, a three- dimensional graphic description of the shear-stress values at one point based on numerical calculation according to the existing stress equations was presented in their

study. [4]

Bradley N. Maker and Xinhai Zhu (2000) studied the input parameters for metal forming simulation using LS-DYNA a finite element tool which was used widely for automobile crash. Default inputs parameters are generally chosen to give efficient, accurate crash simulation results. These defaults are not necessarily optimal for metal forming simulations. Their work presents a standard procedure for conducting metal forming simulations with LS-DYNA**. [**5]

C. Caminaga and F.C.Gentile et al. (2005) worked on numerical and experimental analysis of tube drawing with fixed plug. They studied the cold drawing of tubes with fixed plug which was simulated by FEM with the commercial software MSC.Superform to find the best geometry of die and plug to reduce the drawing force. The numerical analysis supplied results for the reactions of the die and plug and the stresses in the tube, the drawing force and the final dimensions of the product.[6]

A. M. Camacho, E.M. Rubio et al. (2006) worked on a Central burst which was a Common defect in drawing processes. He shows that central burst appearance was restricted to large die semi angles and small reductions. Aim of his work was to avoid their occurrence by means of the observation of variables such as the hydrostatic stress and the strain rate. [7]

Rahul k.varma and A.hadlar (2007) predicted the result of anisotropy on spring back amount by using finite element approach. An analytical model was developed to cross check the prediction from the finite element analysis. Both the model predicts that higher anisotropy was not good for spring back. Finite element analysis of the problem shows that spring back was the minimum for isotropic material, however it does not agree with the analytical model prediction for normal anisotropy less than 1. [8]

S.W. Kim, Y.S.Lee et al. **(2007)** investigated the process parameters related with tool configuration of mandrel for automobile steering input shaft .It shows that conventional straight type and terraced type of mandrels have been proposed in order to obtain successfully formed shaft without any defects. For both types of mandrel, FE analyses of drawing processes were carried out and a ductile fracture criterion was utilized to predict forming failure. As the results, the advanced mandrel shape, which effectively can transmit drawing force to deforming tube was designed. [9]

3. EVALUATION OF OPERATING PRINCIPLE

M.P.nagarkar, R.N.zaware et al. simulate successfully sink pass of round tubes using ANSYS showing clearly that variation in land and die angle can be studied and optimum land and die angle can be obtain using ANSYS. **Maciej Pietryzyk and Lucjan Sadok** shows that finite element model can be used for simulation of tube sinking process and its ability to predict wall thickness variation has been proven. Results of investigation gives an indication that the model can be used to simulate tube sinking process for wide range of drawing parameters.

Zhengie Jia investigation on extrusion and drawing of hollow cross section have revealed similar and distinguishing features between two processes and have set up a base to expand the scope of this software package to design of dies for tube drawing process.

Kamaruzuman Bin Lias studied the use of ANSYS as finite element software for analyzing the behavior of flow patterns of material, force and speed of sliding under the plastic deformation state in the drawing process. **F.O.Neves, C.Caminaga et al.** simulate cold drawing in MSC Superform to find the best geometry of die and plug which will be validated by analytical results showing that there is great variation of equivalent stress along the die length.

P.Tiernan, M.T.hillery et al. applied ELFEN as FEA software for cold extrusion process investigating the influence of die angle, reduction ratio and die land on the extrusion force during process.

The limitations of various approaches adopted for tube drawing process simulations by analytical, numerical and experimental models is discussed in section 3.1. Generally the major contribution to the spring back is based on the length of the die and plug land (die geometry). The die and plug entry angles are made optimum based on maximum cross section reduction with minimum load. Papers studied shows that many researchers work on analytical, experimental and numerical methods cold drawing process analysis, but less work related to effect of variation of die land on elastic recovery problem in process is found. Thus spring back study by using finite element software's like ANSYS can be done which will be validated by experimental results.

4. OBSERVATION AND DISCUSSION

The cold drawing process is generally a precision tube making process in which the accuracy of the product manufactured is maintained. The problems faced in the cold drawing process are discussed above. One of the major problems faced in cold drawing process is spring back (elastic recovery) in the drawn tubes. In this report the major emphasis is given on the spring back studies of circular tubes and dimensional stability.

A general study will be done on evaluation of the spring back, causes of spring back and techniques to reduce it. A contact non-linear analysis in ANSYS will be done in order to simulate the cold drawing process in which the spring back and the dimensional study will be carried out. The simulated results

will be compared with the practical results for verification.

5. REASERCH OBJECTIVE

- To measure Spring-back in various shaped Seamless tube
- To study defects in hexagonal tubes of cold drawing process.
- Study of various designs for dies and plugs.
- Modeling of Dies & Plug for hexagonal shaped tubes using CAD software.
- To simulate the cold drawing process using ANSYS and analyze the results.
- Optimization of the tool profile (Dies and Plugs).
- Reduction of the cost of expensive trials required for new product or process development.

6. REASERCH METHODOLOGY

- Designing of Die and Plug for sectional Tubes (circular OD and hexagonal ID) Using CAD.
- Simulate the Process by Using ANSYS as finite element analysis Software.
- Dimensional Study for spring back.
- Validation with Experimental results

7. CONCLUSION

In this paper, we have studied various papers about spring back effect in metal component. For this we have taken general review of spring back effect. We also found that there are several methods regarding spring back effect.in this paper we compared some topologies with their advantages and limitations.in any metal components seamless manufacturing is carried out with generation of heat. After processing of metal it gets contract due to elastic recovery or spring back effect.so now we are going to research in a same area. For its better improvement.

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