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Research Paper

NUMERICAL SIMULATION AND OPTIMIZATION OF COLD ROLLING PROCESS PARAMETERS FOR STRESS

Ashish Mandloi[1]* and Abhishekyadav[1]

Corresponding Author:* ***Ashish Mandloi* ✉ *Erashishmandloi@gmail.com*

The present work influence the parameter used for the processing of the cold rolling mill. In the present work included the design of the experiment method for some outputs , response surface methodology were used for the designing the 20 experiment as discussed in this paper, there are 3 factors and the three levels were decided for the designing 20 number of experiment. Thickness, velocity, hardening exponent as factors and there three levels are decided. Finally, as a output stress is calculated for all the results, a simulation software Ansys is used for the calculation for the value of the stress. Anova analysis is performed in the model, for finding the best and the suitable case, and for rejecting null hypothesis. The Anova analysis is performed using Minitab software.

Keywords: Cold rolling mill, DOE, ANOVA, Explicit dynamics

INTRODUCTION

Due to the advantages of the technologies and the rapid change in the global environment all industries were continuously to adapt the adverse change in the technology and want to make their reliability on the top on the global level. In the cold rolling mill process the sheet is passes through successive pair of rolls to form desired cross section, the cold rolling process work on recrystallization temperature and after the recrystallization temperature the mechanical properties of sheet is changed. There is also deformation and change in mechanical properties occurs in sheet after the process but all this deformation and changed in properties depends upon various input and output parameters, such as input material hardness, input material chemical composition, input material thickness, input material width, rolling pass schedule in flat sheet output, total percentage in reduction in each pass, final pass reduction, draft in all passes, rolling load, entry tension/exit tension.

LITRATURE REVIEW

Salami Tehrni *et al.* studied that in this research researcher are trying to minimizing the edge

[1] Department of Mechanical Engineering, Jawaharlal Institude of Technology, Borawa.

buckling effect which is major defect facing in resultant product and also the allowable deformation that can be achieved in single stage is one of the important factor for the design of cold rolling forming process.

Zeng *et al.* studied that in this research paper a new booted finite element analysis model is using updated lagrangian method for multistate roll forming process is developed and validated. The whole work is compared with most of the literature related with cold rolling forming process.

Guo and Yang studied that in this research, effect of roll size on the result is discussed, as in the cold rolling process changing the size of driver roll or idle will leads to change in the feed and contact between the ring blank and forming roll, and because of this there is a change in the shape and dimension of deformation zone located in the gab of forming roll is found.

Table 1: DOE Table for 10 Experiments

S. No.	Thickness	Hardening Exponent	Velocity	Stress
1	3.5	0.46	2083	530.75
2	3.5	0.36	2083	555.11
3	3,5	0.41	2083	525.92
4	2.5	0.36	1666	486.56
5	2.5	0.46	1666	462.23
6	3.5	0.41	2083	545.55
7	3.5	0.41	2083	545.55
8	3.5	0.41	2083	545.55
9	4.5	0.41	2083	584.41
10	4.5	0.36	2500	542.70
11	2.5	0.41	2083	509.80
12	3.5	0.41	2083	593.30
13	3.5	0.41	1666	509.91
14	3.5	0.41	2083	593.30
15	2.5	0.46	2500	562.32
16	4.5	0.46	2500	538.50
17	3.5	0.41	2500	557.35
18	4.5	0.46	1666	493.32
19	4.5	0.36	1666	593.54
20	2.5	0.36	2500	535.50

METHODOLOGY USED

Design of experiment is technique developed to understand the behavior of the mechanical system. Data are collecting from the sets of the variable, and it can qualitatively explain the undergoing phenomenon. Hence, it is well known that aim of any research is design the experiment with minimum number of the experiment and with this experiment collects maximum information as much as possible.

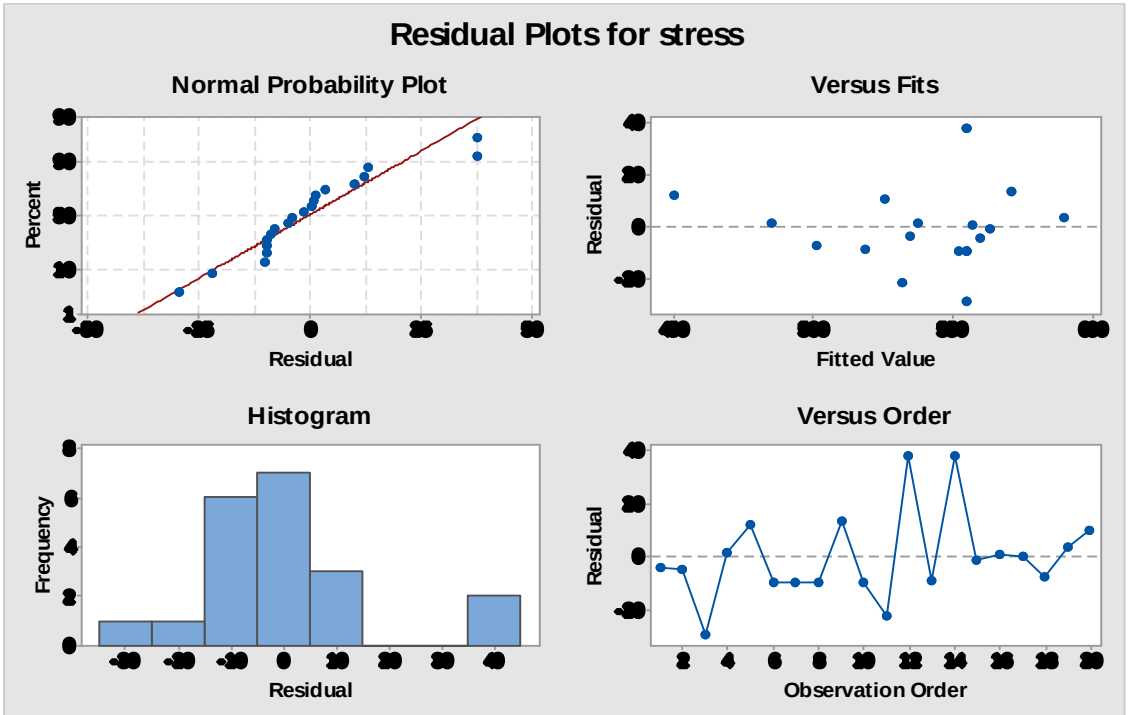
ANOVA ANALYSIS

In above residual graph for plot of normal probability, fitted value, histogram plot, and finally observation order are shown. In the first graph all the data were normally distributed to the plot it means data are well fitted for the observation and

Table 2 : Anova analysis

Source	Adj MS	F-Value	P-Value
Model	2178.47	4.16	0.018
Linear	3026.57	5.77	0.015
thickness	3843.95	7.33	0.022
hardening exponent	1594.92	3.04	0.112
velocity	3640.85	6.95	0.025

Figure 1: Residual Plot for Stress



have strong relationship between the input and the output variables. In the fitted value all the fitted observation are shown in third graph of the histogram, maximum data are falls on the value of zero it mean maximum data are near about on the normal probability line.

CONCLUSION

In the present study numerical simulation of the cold rolling process parameters had done for response stress, an finite element model is developed in the ansys explicit dynamics for solving such a complex problem and all the simulation cases were run in the ansys for evaluating all the results. Finally, all the value of the simulation comes from ansys were shown in the table and in the anova analysis it had been concluded that thickness and the velocity are the component having the value of P less than 0.05, it means they have the confidence interval of the 95%, and they are the factor responsible for the variation in the output and the quality of the cold rolled product is defected by the variation in this parameter's or the value for the stress in the simulation will increase or decrease in the further by changing in the value of the thickness and the velocity.

REFERENCES

1. Boman R, Papeleux L, Bui Q V, Ponthot J P (2006), "Application of the arbitrary LagrangianEulerian formulation to the numerical simulation of cold roll forming process", *Journal of materials processing Technology,* Vol. 177, pp. 621-625.
2. Guo Liang-Gang and Yang (2006), "Effect of size of forming rolls on cold ring rolling by 3D FE numerical simulation", *Trans. Nonferrous Met.Soc. china,* Vol. 16, pp. s645-s651.
3. Mehmet Okan Gortan, Dragsolav Vucic, Peter Groche and Haydar Livatyali (2009), "Roll forming of branched profiles", *Journal of Material Processing Technology,* Vol. 209, pp. 5837-5844.
4. Nefussi G, Proslier L and Gilormini P (1991), "Simulation of the cold roll forming of circular tubes", *Journal of materials processing Technology,* Vol. 95, pp. 216-221.
5. Salmani Tehrani M, Hartley P, Moselemi Naeini H and Khademizadeh H (2006), "Localized edge buckling effect in cold roll-forming of symmetric channel section , Science direct", *Thin-walled structures,* Vol. 44, pp. 184-196.

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Hyderabad, INDIA. Ph: +91-09441351700, 09059645577
E-mail: editorijlerst@gmail.com or editor@ijerst.com
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