International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169
Volume: 3 Issue: 6
3947 - 3950

Improved Performance for Stability of Screw down System by implement Fuzzy Logic

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Abstract:-Main problem in hydraulic cold rolling industries is the longitudinal strip thickness .In this random disturbance can increase the error of the system. For reduce this type of error ARM9 based gauge control system is design. In this paper screw down system by use of fuzzy logic. After apply fuzzy logic the screw down system is getting more stable. The output response is touching to the step response. Screw down System is getting stable in 1.8 second.

Keyword:- *ARM, FUZZY .*

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1. INTRODUCTION

The thickness of the plate is reduced by cylindrical roles which rotate to push the material in the middle of the machine [1].

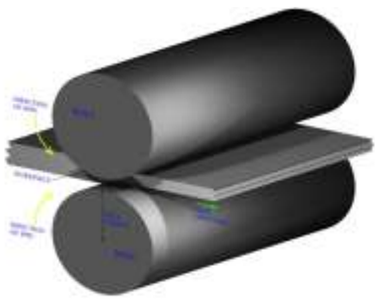

Figure 1 :- Plate thickness reduced by cylindrical role

2. METAL ROTATION

Metal rotation is a important manufacturing processes. The majority of all metal manufactured are processed through metal rotation in their manufacture. Metal rotation is the first method in raw metal making process. The casting is rolled hot into a plate, these are the general processes to produce various manufacture forms. Blooms mostly are of a square of 6x6 inches [2]. Plates are rectangular in shape and are usually bigger than 10 in width and 1.5 inches in breadth. Rotation is usually performed hot.

3. PRINCIPLES OF METAL ROTATION

Most metal rotation processes are same to that the metal is irregular by pressure duress in the middle of two constantly spinning rolls [5]. This duress acts to cut down the thickness of the metal and its grain structure. The reduction in breadth can be measured before and after, this is called the draft.

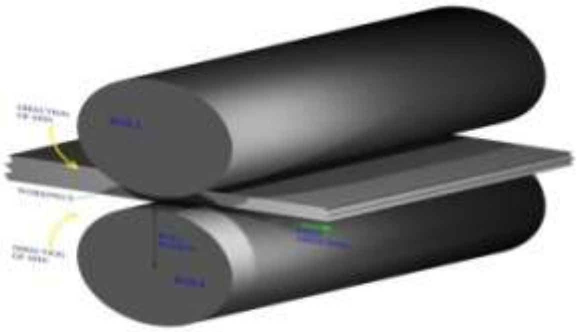

Figure 3 :- Process for reduce the sheet

During a metal rotation operation, the shape of the metal is changed but its volume remains the same. The roll area over the region which the rolls act on the material, plastic deformation occurs here. An important factor in metal processing is due to the preservation of the volume of the metal with the deduction in thickness, the metal lying between the roll region will move faster than the metal going into the roll [3]. The rolls rotates at a constant speed, thus at some point the speed of the rolls and of the metal are the same. This is known as no slip point. Earlier to this the rolls were moving much faster than the metal, after this point the material is moving exactly the same as the rolls.

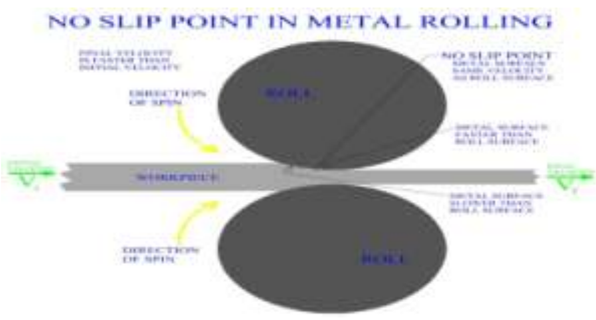

Figure4:- Slip point for Metal Rolling

ISSN: 2321-8169
3947 - 3950

Sometimes in metal rotation, tension is applied to a piece as it is being rolled. This force may be put to the front or to the back or both sides. This method will assist the duress required to form the work.

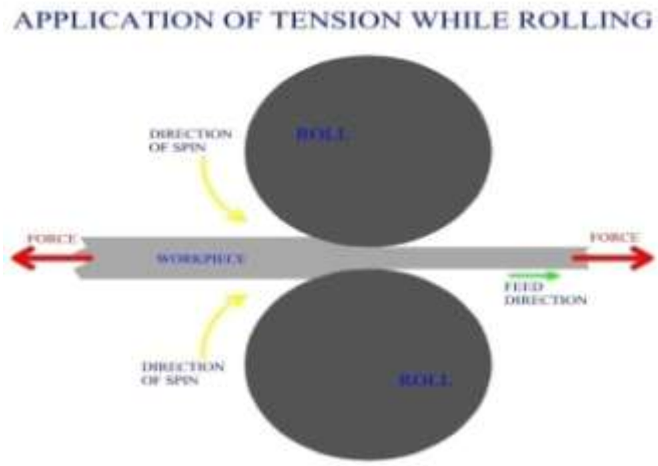

Figure5:- Tension in sheet while going through rolling wheels

4. PROBLEM STATEMENT

According to Previous work the main issue is coming for the stability. The system is not getting proper stability. According to image number 6 it is showing that the stability of the system is not so good.

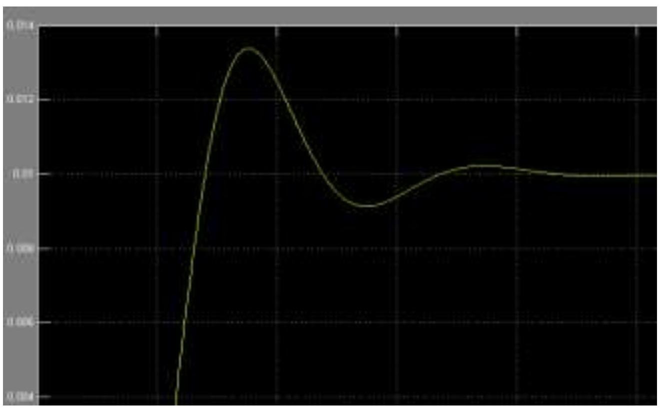

Figure 6:- stability Output wave form screw down system

Figure 7 is showing the block diagram of the screw down system .In this three main parts are working Servo Amplifier, Servo value, Hydraulic cylinder.

Gain for servo motor

$$G_{amp}(s) = \frac{0.0292s+0.146}{2.4s+1}$$

For Servo Value

$$G_{servo}(s) = \frac{0.05}{2.6375e^{-5}s^2+2.6491e^{-3s}+1}$$

For hydraulic cylinder

$$G_{hydralic}(s) = \frac{39.32}{2.9958e^{-5}s^3+3.8314es^2+s}$$

According to the basic model screw down system the stability of the system is getting after 5.5 seconds. The stability graphs of the screw down system are shown in figure number 6.

Second problem in the system is stability graph is not touching the step response. As the figure number 8 is showing that the graph is not touching to the step response graph.

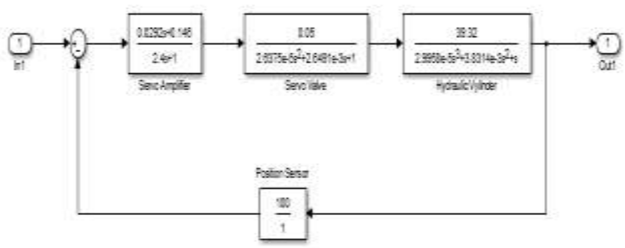

Figure 7:- Screw down system design

5. PROPOSED METHODLODGY

Fuzzy logic is using for improve the performance for improve the performance. According to table number 1, rules are design of fuzzy logic. We are designing the fuzzy rules for the two inputs and three outputs .Two inputs are error and error rate and three output are K_p, K_i, K_d.

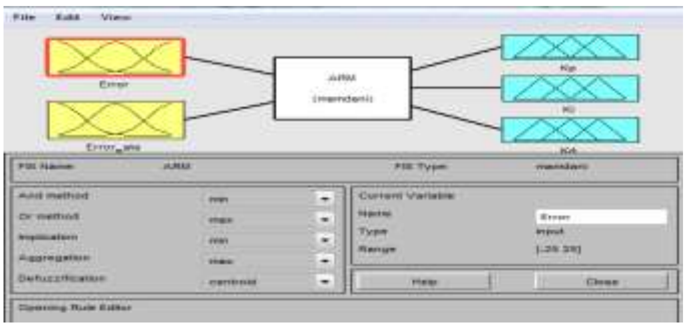

Figure 8:- Fuzzy rules for two inputs

ISSN: 2321-8169
3947 - 3950

Table 1:- Rules of fuzzy logic

Error	Error rate	K_p	K_i	K_d
NB	NB	PB	NB	PS
NB	NM	PB	NB	NS
NB	PM	ZE	ZE	NM
NM	NM	PM	NB	NS
NS	NB	PM	NB	ZE
NS	PM	NS	PS	NS
ZE	NS	PS	NS	NS
PS	NM	PS	ZE	PS
PS	PB	NM	PB	ZE
PB	PM	NM	PB	PS

Figure8 is showing the fuzzy logic rules design , in which error and error rate are inputs and K_p, K_D, K_I is output .The rules are design according to table number 1 . The range of the Error is [-25 to 25] and error rate range is [0 to 200].Output K_p range is [-3 to 3] , k_i range is [-3 to 3]and k_d range is [-3 to 1].

6. RESULTS

Fuzzy logic is improving the results for stability time and for desired output. The output of the screw down system graph is touching to the step response. The system is getting stable in 2 sec and after this it continue stable.

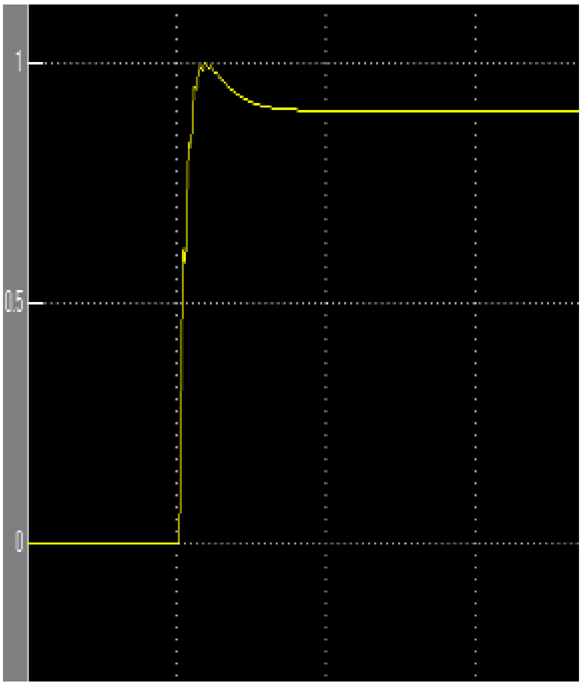

Figure 9:- Stability of Screw down system

Second improvement is , stability graph is touching to the step response according to figure number 10 . That means we are getting perfect values if the pressure which we want to spread the sheet of metal.

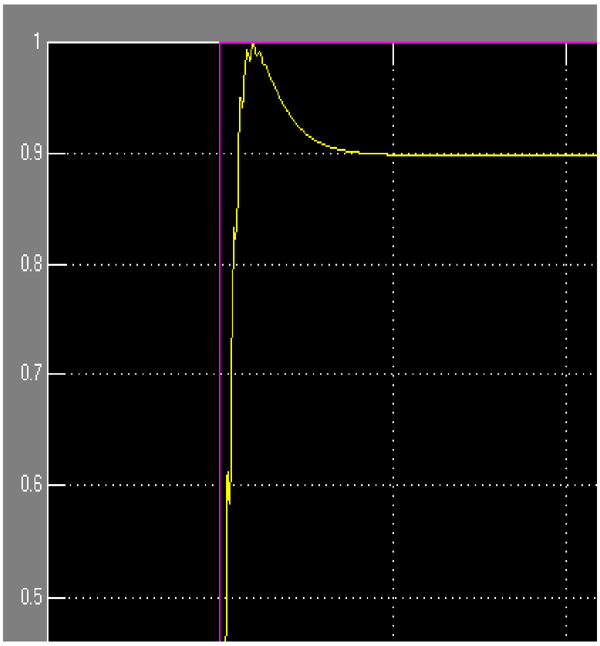

Figure 10:-Stability graph for Screw down system

7. CONCLUSION

We have improved the performance of screw down system by improve the performance of the stability. Proposed system is touching to the graph of step response.

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