Review Paper on Design of Cold Rolling Machine for Controlling Strip Thickness

Prasad Bhagwat[1] Sachin Kadam[2] Gaurav Pagar[3] Yashwant Donge[4] Prof Santosh Y. Khalkar[5]
[5]Professor
[1,2,3,4,5]Department of Mechanical Engineering
[1,2,3,4,5]Sanghavi College of Engineering Nashik, Maharashtra, India

Abstract— A rolling process is process in which metal is pass through the pair of revolving rolls. The thickness of metal reduces when the metal comes in the contact with the two rolls. There are two types of rolling operation: - Hot rolling and cold rolling, both process is used for uniform thickness reduction. Most metal rolling operations are similar in that the work material is plastically deformed by compressive forces between two constantly spinning rolls. These forces act to reduce the thickness of the metal and affect its grain structure. The present work involves the design of machine operating on cold rolling process, to control the strip thickness as per the requirements.

Key words: Gears, Bearing, Gearbox, Cold rolling, Rollers

I. INTRODUCTION

Rolling is a metal forming process that deforms the work using rolls. Rolling processes include flat rolling, shape rolling, ring rolling, and thread rolling, gear rolling. In this process in which metal stock is passed through one or more pairs of rolls to reduce the thickness and to make the thickness uniform. Rolling is classified according to the temperature of the metal role. If the temperature of the metal is above its recrystallization temperature, then the process is known as hot rolling. If the temperature of the metal is below its recrystallization temperature, the process is known as cold rolling. Cold rolled thin strip has wide application in various purposes. Thickness precision is one of the most important dimensional factor in strip thickness.

In cold rolling process the metal is pass through the two revolving rolls below its recrystallization temperature. Cold rolling is a process by which the sheet metal or strip stock is introduced between rollers and then compressed and squeezed. The amount of strain introduced determines the hardness and other material properties of the finished product.

II. LITERATURE SURVEY

During literature survey it is found that many researchers had worked on the rolling mill and its components. Many authors have worked on the thickness parameter of rolling process.

Waleed I. Hameed et.al proposed a mathematical model of single stand cold rolling mill is developed and PI controller has been used to control exit thickness of the strip. Authors propose FNN to reduce the effect of roll eccentricity. The error between the reference exit thickness and output thickness of stand is used as trajectory to adopt the primes part and the consequence part of the FNN so that the error goes to the zero. The output of FNN is added to the desired position roll gap to reduce periodic deviation in the output thickness. [1]

L. Mikhailov et.al proposed an optimal control system is presented for the Sendzimir cold rolling mill with 10 control inputs and an integrated thickness/flatness object function. An experimentally verified mill model and an online mill state observer has been used. The reference strip profile is generated adaptively using the process measurements and the observer estimations. The optimization problem itself is solved by sequential quadratic programming under consideration of technical limitations on each control input. The optimal control system is developed for running simultaneously with the rolling process and the observer. The optimization results using operation date of the mill show considerable improvement of the strip flatness and thickness. [2]

Gow Yi Tzou et.al proposed the analytical models for the minimum thickness of hot and cold PV rolling are established. It is concluded that the minimum thickness of PV rolling is constrained by R/hi and front and back tensions. The minimum thickness constrained by zero front tension for me is not equal to zero is different from that constrained by front tension equal to 2k for me equal to zero. So considering constant shear friction to developed analytical model of the minimum thickness of hot and cold PV rolling provides useful knowledge in the past schedule design. [3]

TANG De lin et.al proposed the cross-shear ratio brought into establishment of the permissible minimum thickness equation. The thickness of the rolled piece decreases with the increase of cross-shear ratio. In addition, the was constituted by the linear speed slower roller, asymmetrical ratio and entry speed of rolled piece. Therefore, the minimum equation of this study provides a reference for process parameters setting such as reduction schedule, rolling speed and asymmetrical ratio. [4]

III. FIELD OF THE PROJECT

This study relates to the cold rolling machine which is designing to reduce the metal strip thickness as per its application. The application of this project is well suited where the ultra-thin metal strips are needed.

The metal strip pass through the upper and lower work rolls out of which the upper roller is movable with the help of spur gears. The motion is given to the lower roller with the help of gearbox through the shaft on which the lower roller mount.

IV. CONCLUSION

The studied literatures give the idea about controlling the thickness by proposing various models. The main study of this paper is to design a machine for the reduction in thickness of metal strip as per its application.

REFERENCE

[1] Waleed I. Hameed et.al "Strip Thickness Control of Cold Rolling Mill with Roll Eccentricity Compensation by Using Fuzzy Neural Network" Vol 27-32, 2014

[2] L. Mikhailov et.al "Optimal Control of Thickness and Flatness for the 20 Rolls Sendzimir Cold Rolling Mill" 14th World Congress of IFAC, China
[3] Gow Yi Tzou et.al "Study on Minimum Thickness for Asymmetrical Hot and Cold PV Rolling of Sheet Considering Constant Shear Friction" Journal of Material Processing Technology 119(2001) 229-233
[4] TANG De lin et.al "Permissible Minimum Thickness in Asymmetrical Cold Rolling" Journal of Iron and Steel Research 2013, 21-26

