

Design and Development of Strip Straightening Machine

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Abstract: In these paper straightening process for wheel rim for various vehicle like Hondas, Suzuki, etc. It can reduce various factor which is an economical for industry. Now a days roller straightening process are widely using various industries. it is an economical as well as effective process straightening is one of the most important operation which is perform of straightening machine. straightening is non cutting operation a roller straightening process is metal forming technique to increases the geometrical quality of strip such as straightness and flatness. Sometime straightening process is done by manually in industry by hammering process but it is difficult job. so now days automated process is done in industries straightening process in which curve length is change or transfer in to straight length.

Keywords: Rolling process, cold rolling, straightening wheel rim, non-cutting operation and stress inheritance.

1. Introduction

Metal straightening process or machine mostly heavy type in metal working industries which are use straightness and flatness. Different type of object otherwise would be very difficult to straightness. these metal straightening process use to straightness different type of metal object like wire, bar, beam, plate, angle, sheets, rod, pipe, metal, etc. It is made from different metal like iron, steel, copper, aluminum, and other metal. these metal straightening process is very important working process for straightening in various industries. Straightening process for straightening of any role ferrous and nonferrous material in cold condition. Important part of straightening: different type of straightening machine they are two roller, three roller, and malty roller machine. Various component of strip straightening machine; roller, spur gear, frame, gear and motor.

A. Problem identification

In various company they manufacture wheel rims for various vehicle for manufacturing they use stainless steel strip and using bending machine. They make band coiling and before butt welding the faces the wheel rim is manufacture but many time due to some error faces of band coiling does Nate match with each other hence, scrap is produce until now there was no fusible and efficient solution for these.

B. Objective

- To develop a machine which operated semi-automated.
- Develop a new technique and process for solution of reduce rejection rate.
- Design and build up for efficient operation
- Developing an inventing machine to reduce cost of final product.

C. Scope

- In the industries rejection rate is very high and there is no such a system/machine that I reuse the scrape and reduced the rejection.
- So we are design strip straightening machine which straight the deform bended strip so that can be use as fresh raw material for making of rims.
- While doing that we also consider that strip we are going to reuse is as good as new strip.

2. Literature review

Dr. Biju B: In his paper he done design and analysis of straightening mechanism for commercial steel bars. The results show that the design proposal of straightening system which is shown in this paper easy and it provides theoretical foundation for the development of commercial bar straightening machine.

Yi Yali: In his paper he done three roller curvature scotch straightening mechanism study and system design. Conclusions that equivalent curvature standstill-locking straightening roller system configuration of hot rolled ribbed bars is analyzed in this paper. The mechanism of equivalent curvature straightening and standstill-locking after three rolls large plastic deformation is revealed.

Wang Yongqin: The paper presents the Evaluation of straightening capacity of plate roll straightener. In his paper he done The straightening capacity model is proposed and there is a good consistence when the simulation result is compared with the field production data. The leveling possibility of a plate can be determined quickly and conveniently for a given shape and material properties.

3. Material selection

Table 1
Material selection

S. no.	Element	Material
1.	Gear roller	EN8
2.	Roller	EN8
3.	Upper bush	Mild steel
4.	Lower bush	Mild steel
5.	Frame	Mild steel
6.	Top plate	Mild steel
7.	Strip	SAPH60(steel)

4. Calculations

A. Spur gear

Pitch (P) = N/D = 18/72 = 0.25mm

Outer diameter (OD) = (N+2)/P
= (18+2)/0.2 = 80mm

Addendum (A) = 1/P
= 1/0.25 = 4mm

Dedendum (B) = 1.157/P
= 1.157/0.25 = 4.628m

Root diameter (RD) = (N-2)/P
= (18-2)/0.25 = 64mm

Base circle (BC) = D * cos (PA)
= 72*cos (0.25*4) = 71.9890mm

Circular pitch (CP) = (3.1416*D)/N
= (3.1416*72)/18 =12.56mm

Circular thickness (T) = (3.1416*D)/2N
= (1.57/P) = 1.57/0.25
= 6.2832mm

Module (m) = D/N
=72/18
= 4

1) Diameter of roller

Tensile strength of the strip

$\sigma_t = 60$ (Given)

$\sigma_t = F/A$ (1)

where,

A = Area of strip = 1*b
= 796*86
= 68456 mm²

From Equation (1)

60 = F/68456
F = 4.10*10⁶ N

Diameter of roller, material EN8, 700-850 MPa

$\sigma_t = F/A$

750 = 4.10*10⁶/A

A = 5466.66 mm²

$\pi/4 * D^2 = 5466.66$

D = 83.43 mm ~ D = 85mm

B. CAD model strip straightening machine

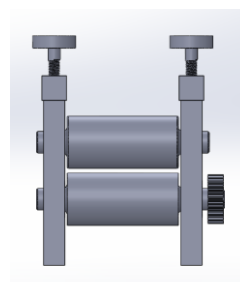


Fig. 1. CAD Model Strip straightening machine

A straightening machine are various type of roller use, it depends up on thickness of sheet or strip. which are the mostly common type are use in straightening machine are design for straight thin and thick strip in both cold and hot state. Straightening machine are mainly design for cold state. there are usually lower roller is five and upper roller is four straightening roller. most, modern straightening machine have support roller in addition to the straightening roller. The rate of straightening roller is 13-15 m/s depending upon thickness of roller.

5. Conclusion

At last of this paper we conclude that the project on Design and Development of strip straightening machine was carried out successfully. This project helped the company to increase the production in enormous form. Also the project helps to the company to reduce the reduction rate.

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