



Effects of Roll Diameter on a Roll Forming Product

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Abstract: The roll forming process is a continuous bending of sheet metal. Different design parameters like roller diameter, distance between stands, roll gap, forming velocity, etc effects on a quality of roll formed products. Effects of roll gap is taken consideration for this study. A short investigation is presented in the paper on roll gap effects on a final quality of roll formed product.

Keywords: Roll gap, residual stress, longitudinal strain.

I. INTRODUCTION

Roll forming is a continuous bending operation. In the forming process long sheet metal is continuously bending and takes into desired shape. In the roll forming process metal sheet passes through sets of rolls. The process of roll forming is done by using two successive pairs of rollers. It changes the shape of sheet metal. This process continues the bending process. Long metal sheets, coiled sheets are passed through the rollers. This process works under normal temperature conditions. In roll forming process (Figure 1) reel, barrel, skewing and conical defects are produced.

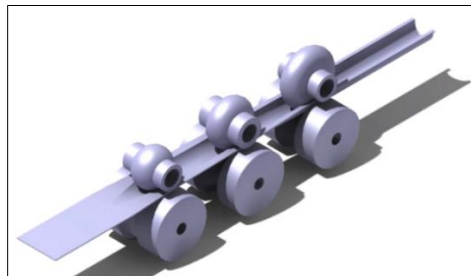


Figure 1: Roll Forming Process

II. METHODS

Paralikas.et al [1] research on the various parameters of the roll forming process for a U section type profile of AHSS, DP600 type material. In that they studied that changing the roller diameter 100 to 160mm, it affects strip deformation. They found out the roller diameter parameter has a 5.413% effect on the longitudinal strains. Also, the 8.349% effect in shear strain. These results are shown in Figure 2. They analyze the different diameter for roller, and which diameter is required to reduce the strain and stress at the strip. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

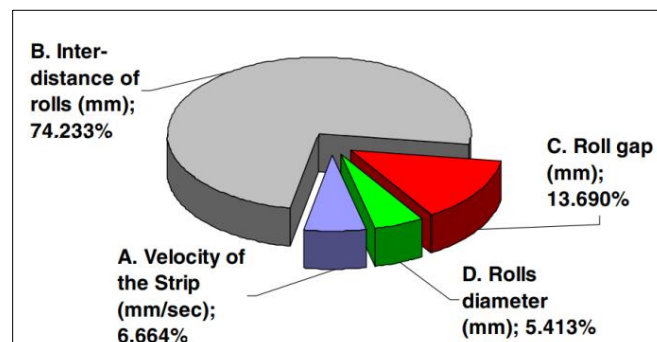


Figure 2: Effect of longitudinal strains



Jurkovic.et al. [2] did research on the cold roll forming process for improving the rate of production, by utilizing the parameters. Sheet steel DX51D materials were used for this study. The roller station has upper and lower rollers. The diameter of the roller parameter is 186mm necessary for modelling.

Bidabadi.et al. [3] worked on the defects in the cold roll forming process, U channel section. They found out the roller diameter parameter effect on the shear and longitudinal strains at the flange of the products. Flower pattern design studied shows that the roller diameter parameter will reduce the spring back and longitudinal strain.

Bidabadi.et al. [4] did research on the torque required in cold roll forming. They find out the fold angle increment at each station by analytical method. For that roller diameter, gap between the roller, distance between two stations these parameters are important for analytical methods for ingestions. These factors consume energy while production.

Bidabad.et al. [5] presented on the cold roll forming process to determine the bowing defects in the pre notched channel. Steel ASTM A283 G-A standard material were used, to form the product.

Wang.et al. [6] explained sheet metal forming process taking AHSS material, and the friction between roller and sheet. AHSS materials have high strength and low cost. So, it is more useful than the aluminium and magnesium material. They found out that it consumes less fuel because of the lightweight parts These parts are manufactured by use of AHSS material. They studied when different loads are applied, then there is variation in coefficient of friction. At the starting the coefficient of friction is more.

Abvab.et al. [7] did research on the roll forming process and effect of residual stress on it. Steel DP780 type material was taken for his study. They studied residual stress in the sheet. For that they used a 200 mm diameter roller with a roll speed of 456 rad/sec. And they find out the reduction in the thickness. The thickness is approximately 0.5,1.5 and 2.5%. Lubricant oil is used during the process.

Safdariana, R, N. and Moslemi, H, N. [8] research on the cold roll forming process and effect of the forming parameters on it. Steel St14 type material is used in these studies. Roller diameter, speed of roller, contact between roller and strip, distance between the two roller stands, these factors are effect on the edge longitudinal strain and bow defect. These parameters are considered while the roll forming process.

Kanga.et al. [9] research on the roll forming process and effect of parameters. Martensitic steel MS980 type material is used. They studied the strength of material, like yield strength is 1449.8 MPa and tensile strength is 1542.1 MPa.

Silvestre.et al. [10] research on the tensile cycle and compression cycle on the material. Steel 700 TRIP material is used for studies. They studied FEM for roll leveling. For that They used parameters like sheet thickness, roll diameter and distance between rolls. Roller diameter 45mm are used. By the FEA mode the coefficient of friction is 0.05. They studied stress and strain of the sheet for the leveling process.

Salonitis, k.et al.[11] Studied on the effects in parameters of the quality and numerical simulation, for researchers to provide a perfect model with numerical simulations, for the study of process parameters. Also, the deformation in the roll forming of AHSS material. The stress distribution at the longitudinal and transversal elongation at the end of the profile. The residual deformation can be calculated by the numerical simulation. To determine that line velocity, numbers of roller station, gap between the two rollers, diameter of roller and thickness of the strips. By these studies designing tools and optimization in designing. Redundant deformation might prevent some defects during operations.

Paralikas, J.et al [12] Studied on the roll forming parameters, cost of the process is made less by roll forming line speed, avoiding defects in product, increased productivity improves quality of product, Continues production. Quality of product de pends on spring back and redundant deformations. This thing depends on the yield limit, thickness of material and designed radius of component.

Salonitis, k.et al.[13] Studied on the effects in parameters of the quality and numerical simulation, for researchers to provide a perfect model with numerical simulations, for the study of process parameters. Also, the deformation in the roll forming of AHSS material. The stress distribution at the longitudinal and transversal elongation at the end of the profile. The residual deformation can be calculated by the numerical simulation. To determine that line velocity, numbers of roller station, gap between the two rollers, diameter of roller and thickness of the strips. By these studies designing tools and optimization in designing. Redundant deformation might prevent some defects during operations.



Park, H, S. and Anh, T, V. [14] Studied on the roll forming and bending sequencing, to obtain flawless products, by using High strength steel and Advanced High Strength steel are used to decrease the weight of product or make light weight product. By using lightweight parts in automobile vehicles, it consumes less fuel, due to this generation of CO₂ is less. When manufacturing sheets it adopts flatness defects and residual stresses will affect the quality of products. Studied on the friction in sheet metal forming, by the use of advanced high strength steels and the advantages of high strength and light weight alloys leads towards the use of aluminium, magnesium and advanced high strength steel. It has 550 MPa yield strength and 1000 MPa tensile strength. This material has high strength due to higher formability and work hardening characteristics.

III. CONCLUSION

A residual stress is produced in sheet at the end of roll forming process. There are design parameters like roller diameter, thickness of sheet, gap between the roller and velocity of sheet pass which affects directly final residual stress. Table 1 summarized Parameters under study and its effect on Longitudinal/residual stress. These parameters are taken by different researchers for their studies and they concluded that roll forming defects like edge longitudinal strain and shear stress, bow defects will be produced in final roll formed product due to improper selection of these design parameters. So optimum design parameter study is required for the good quality final roll formed product.

Sr. No	Parameters	Increase in parameters	Residual Stress
1	Material of sheet/Yield Strength	↑	↓
2	Distance between roll stand	↑	↓
3	Strip Thickness	↑	↓
4	Forming speed/Velocity	↑	Insignificant influence
5	Friction	↑	Insignificant influence
6	Roll Gap	↑	↑
7	Bending Angle	↑	↑

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