

DEPARTMENT OF MECHANICAL ENGINEERING  
**K. D. K. COLLEGE OF ENGINEERING, NAGPUR**

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**CERTIFICATE**

Certified that the project "*ESTIMATION OF WEAR RATE OF SHUTTER BENDING MACHINE ROLLERS USING FINITE ELEMENT METHOD*" is bonafide work done under my guidance and is submitted to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of post graduation degree, **Master of Technology (M. Tech.)** in Mechanical Engineering Design (M.E.D.)

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## ABSTRACT

Metal Forming is a specialized branch of manufacturing Engineering. That deals with changing of shape of metal by application of forces. Since time immemorial, metal forming has undergone numerous changes. Metal forming when applied of sheet metals is called Sheet Metal forming.

This project deals with estimation of wear loss that takes place during the sheet metal forming of galvanized mild steel sheet of thickness 0.58mm and 0.95 mm. the sheet is bent in S-shape by passing it through series of 5 roller pairs which gives the desired shape to the sheet by shear application of forces in stage wise manner, which happens by virtue of shape of roller pairs. Each roller pair is a male-female pair of the specified contour to get the exact shape of the bending of sheet. This sheet is used in shutter closer of shops. Finite element Method is used in this project to calculate exacta amount of wear as well as locating the points on surface if rollers where maximum wear is taking place .Also thermal stresses is a crucial which highly affects the deformation and presently has not been taken into consideration. Next crucial step i9s to reduce the cycle time between 2 dressing which is another highly bothering processes for the owner of the industry as a single dressing of roller pairs costs around 50,000/-. And that too only 4 people are there in whole Nagpur who do this kind of dressing jobs.

In this project detailed analysis of the shearing stresses, thermal stresses and the Spring back effects on the worked metal sheet by using analytical calculations and finally putting the soft model on ANSYS and other analysis softwares to see the red zones of all he type of stresses developed during operations of the rollers.







## CONCLUSION

In the previous chapter we have thus calculated the wear rate of the bending rollers by using FEA method, instead of traditional method of dynamic analysis or the other empirical method which involves the regulars measuring of debris after regular intervals of time.

In the following tables, wear rate have been calculated for 2 different rotational velocities of the rollers, presently being performed.

**For N = 22 rpm**

Depth of wear	Roller 1	Roller 2	Roller 3	Roller 4	Roller 5	Roller 6
Wear rate (in terms of depth of Material in mm removed per day)	0.04	0.04	0.00009	0.0464	0.0464	0.0464

**Table 8**

**For N = 24 rpm**

Depth of wear	Roller 1	Roller 2	Roller 3	Roller 4	Roller 5	Roller 6
Wear rate (in terms of depth of Material removed in mm removed per day)	0.0022	0.0047	0.0022	0.0022	0.0022	0.0022

**Table 9**

Change of the material of the rollers has not been taken in to consideration in this project because the other possible options of the roller material are not economical and financially viable for industry owner. The reason cited by owner is that no doubt better material if selected would give much lesser wear rate but the cost of such roller would be extravagantly high. Presently this wear rate is not posing very serious threats economically because once worn out, the roller are sent for dressing i.e. material filling in the bending areas. This happens usually after every 6 – 8 months interval of time the cost of this dressing is around-Rs. 50,000 for roller set of 6 rollers.