

## Researches on the Influences of the Working Rolls Shape Over the Hot Rolling Band Form

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### ABSTRACT

*In this work it is especially studied the influence of some parameters of the rolling process, the rolls shape on the final band shape rolled in a finishing train from LBC-ISPAT SIDEX S.A. Galati.*

### 1. Introduction

The shape of the hot rolling band is influenced by the thickness at each passing of rolling, by the form of the shape, temperature and by the stress of the traction of the band, e.t.c.

The demand of hot rolling band with a flatness leads to the necessity of influencing more precisely the shape of the band.

This can be made through the polishment of the rolls, through their bend, through the axial displacement of the intermediate rolls at sexto stand or through CVC or UPC rolls.

Hot strip mill from ISPAT SIDEX is proposed to be modernized especially for a more efficient control of the shape of the rolling band, by introducing rolls with continuous variable crown and a hydraulic system of axial adjustment of the rolls.

In order to use more efficiently this kind of system in rolling finishing lines, it is necessary to know which are the stands that influence more the shape of the band and up to what thickness of shape could be possible a efficient and permanent influence without waves.

### 2. Experimental results

During the research, measurements of the thickness rolling band were made at LBC-ISPAT SIDEX Galati taking in view the influence of some parameters of the rolling process over the shape.

The plant for hot band rolling posses a roughing stand and a tandem finishing train made of the seven quarto stands.

Data can be found in tab.1 concerning the values of some parameters of the rolling on finishing train of a OL 37 steel band.

Before rolling measurements of the shape of the rolls were made, a difference in thickness between the middle and the edges of working new rolls of stands of the finishing train of about 50-100  $\mu\text{m}$ . (values corresponding to the technical standards) was recorded (fig.1).

Table 1: Data regarding the constructive and technological parameters at the rolling on the finishing train.

Roughing stand-diameter of the working rolls		1150 mm	
Finishing stand-diameter of the working rolls		750 mm	
Diameter of the support rolls		1500 mm	
Length of the pane		1700 mm	
The stand	Sections reducing by passing		Rolling force
	[mm]	[%]	
F <sub>1</sub>	43,4-27,0	37,0	18,06
F <sub>2</sub>	27,0-17,8	34,1	17,89
F <sub>3</sub>	17,8-11,9	33,2	17,47
F <sub>4</sub>	11,9-8,8	26,2	14,60
F <sub>5</sub>	8,8-6,5	26,2	13,11
F <sub>6</sub>	6,5-5,3	18,5	11,26
F <sub>7</sub>	5,3-4,7	11,3	5,77

Through cutting strips of 100 mm width after each stand during a deconnecting damage, the resulting band shape was determined off line.

The shapes of the thickness for five samples of band the most signified reproduced in fig.2 lead to the following conclusions:

-the initial shape was relatively strongly deformed until the third passing.

-at the following passing the shape influenced only in the outside zone of the band

-up to a distance of maximum 100 mm from the edge of the band;

-the influence of the shape at thickness below 10 mm (under the given conditions: steel dimensions) is almost insignificant

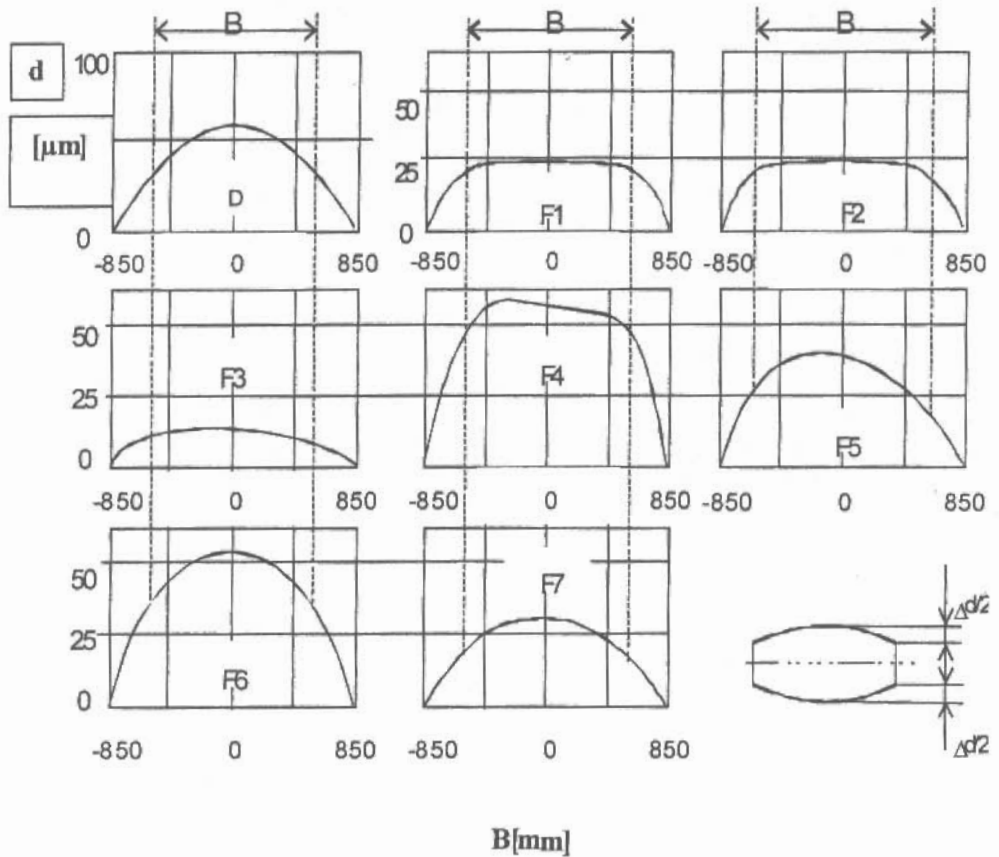


Fig.1. Shape form of working rolls (B-the breadth of the band).

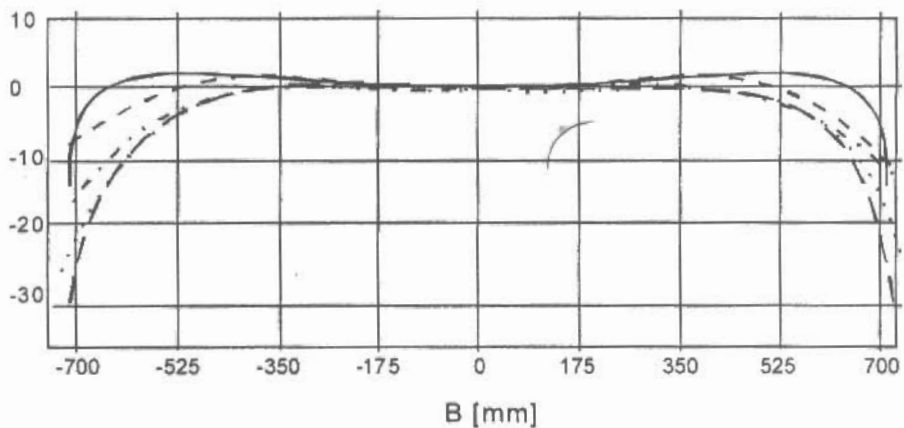


Fig.2. The band shape evolution on the tandem finishing train. The relative difference of thickness [%]: — in front of  $F_1$ ; ---- between  $F_1$  si  $F_2$ ; -.-.- between  $F_2$  si  $F_3$ ; ..... between  $F_4$  si  $F_5$ ; - - - after  $F_7$

The conclusion is that at a certain thickness at a total reduction about 75% for the transversal flowing for of the material a geometrical limited zone was reached up to which the flowing of the material without waves is possible. It was also studied the influence of the form of the rolls in order to determine the effect of this parameter over the shape of the band.

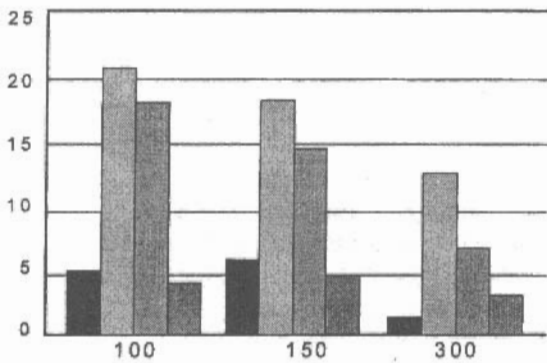


Fig.3. The effect of the rolling form over the finishing band shape

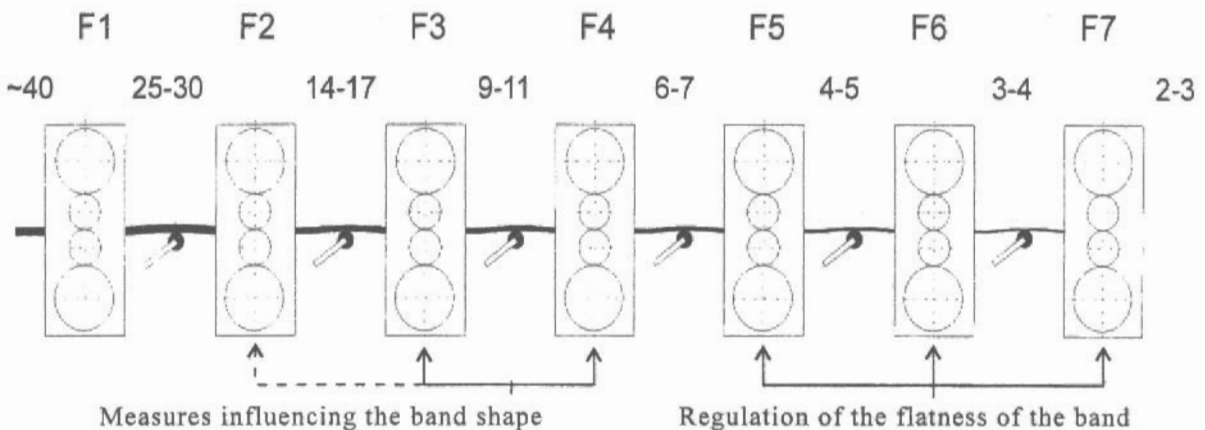


Fig.4. The influence of the thickness shape and the band flatness in finishing rolling line for the hot rolling shape

### 3. Conclusions

There is a limit of thickness of the hot rolling band up to which the band shape can be efficiently influenced. The transversal flowing of the material below this limit, is greatly prevented such as, during the rolling process the relative shape remains almost constant.

An influence of the band shape can be efficiently made within a thickness interval between 8 and 16 mm

In order to provide a corresponding shape of the rolling band it is necessary to use

The measurements were made on the rolling band after stand 7.

Having in view the influence of the working rolls shape with different forms (concave and convex) at F2-F5 stands (fig.3) the following conclusions were established:

-the most efficient influence over the shape of the finite band takes place at the F3 and F4 stands (the thickness of the band at the beginning between 16 and 9 mm);

-the modification of the shape of the working rolls at the F2 (the thickness of the band at the beginning 22 mm) and F5 (the thickness of the band at the beginning 6 mm) causes only a small modification negligible of the product shape.

The causes which determine a reduced influence of the F2 and F5 stand are different so at F5 stand, the form of the rolls shape does not influence it very much, because the form modification from concave to convex leads surely to a strongly modified form of the shape, but the modification is compensated to a great extent in the following stands: F3 and F5.

some adjustment elements at F3 and F4 stands taking into account that the following stands to ensure a adapting of the rolls shape to the resulting form of the band without waves (fig.4).

### Bibliography:

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- [2]. Witms, W., "Profile and flatness in hot stripe mills", Prospect S.M.S
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## **CERCETĂRI PRIVIND INFLUENȚA PROFILULUI CILINDRILOR DE LUCRU ASUPRA FORMEI BENZII LAMINATE LA CALD**

### **Rezumat**

Secțiunea transversală a benzii laminate la cald este influențată de grosimea semifabricatului inițial, reducerea secțiunii la fiecare trecere de laminare, forma profilului cilindrilor de lucru, temperatura materialului, tensiunea de tracțiune în bandă, ș.a.

Creșterea cererii de bandă laminată la cald cu planeitate mai bună conduce la necesitatea de a influența mai exact profilul benzii ceea ce se poate realiza prin rectificarea cilindrilor, contra-curbarea acestora, deplasarea axială a cilindrilor intermediari, la caje sexto, sau prin utilizarea unor cilindri cu o forma specială: CVC sau UPC.

Pentru a putea folosi eficient sistemele moderne de control al profilului benzii laminate în liniile de laminare de finisare, este necesar să se cunoască cajele care influențează cel mai puternic realizarea profilului benzii și grosimea minimă a benzii până la care mai este posibilă o influențare eficientă, fără apariția undulațiilor.

În cadrul cercetărilor realizate în acest scop au fost efectuate măsurători ale grosimii benzii laminate, urmărindu-se influența profilului cilindrilor de lucru asupra profilului final al benzii laminate.

## **RECHERCHES CONCERNANT L'INFLUENCE DU PROFIL DES CYLINDRES DE TRAVAIL SUR LA FORME DE LA BANDE LAMINEE A CHAUD**

### **Résumé**

Dans ce travail on étudie surtout l'influence de quelques paramètres du procès de laminage sur la forme de la bande laminée dans le train finisseur qui se trouve à LBC-ISPAT SIDEX Galati.